# WASHINGTON STATE DEPARTMENT OF TRANSPORTATION DESIGN-BUILD PILOT PROJECT EVALUATION: A MEASUREMENT OF PERFORMANCE FOR THE PROCESS, COST, TIME, AND QUALITY

SR500 THURSTON WAY INTERCHANGE


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# Credit Sheet

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# DESIGN-BUILD PILOT PROJECT EVALUATION: A MEASUREMENT OF PERFORMANCE FOR THE PROCESS, COST, TIME AND QUALITY

## Executive Summary

This report is an evaluation of the Washington State Department of Transportation's (WSDOT) Design-Build Program and the first design-build pilot project at the SR 500 Thurston Way Interchange in Vancouver, WA. From 1998 through 2002, WSDOT contracted with the Georgia Institute of Technology and the University of Colorado to provide an independent evaluation of the level of effectiveness achieved by the design-build process for the State of Washington.

### Overall Project Performance

The design-build process developed by WSDOT and applied on the SR 500 Thurston Way interchange delivered a high quality product, which was delivered on time with minimal cost growth after award. However, the value of the project was diminished due to the excessive project costs when compared to the traditional delivery method and undue administrative burden placed on the Department. Both the design-builder and WSDOT teams were comprised of top management personnel with strong leadership skills. The quality of the team had much to do with the successful aspects of the project.

WSDOT developed a comprehensive design-build program through research from other states' experience with the process and through input from the professional community. Much of the original WSDOT design-build process was based upon lessons learned from other states that were working on very large corridor level projects. This program was then applied to a relatively small pilot project. The process resulted in a Request for Proposal (RFP) designed by WSDOT that placed an undue amount of risk on the design-builder and its subcontractors for a project of this size. Additionally, the RFP included a highly defined project scope with the aggressive schedule, which gave the design-builder little opportunity to take advantage of the innovations that can be achieved from design-build.

Many lessons learned on this pilot project evaluation are documented in this report. There is a potential for WSDOT to realize expedited delivery and lowered administrative burden. However, the Department will need to consider applying design-build to different types of projects and making changes to streamline the current process and allocate risk more appropriately are also required.

### Project Cost Performance

The actual design-build project costs were approximately 23% more than the expected traditional cost ($25,610,004 vs. $20,878,121). This comparison is based primarily upon a WSDOT engineer's estimate used to construct an equivalent design-bid-build cost model. Although the initial cost was higher than expected, the project costs were fixed

through a lump sum contract much earlier in the design process (≈ 30% design) and the project experienced only 1% cost growth after award. Substantial cost increases have been identified in preliminary engineering and construction costs when compared to more traditional project delivery methods. These cost increases far outweigh the decreases identified in contract administration and change orders. It should also be noted that the cost modeling process did not include future implications of innovations resulting from the design-build process. For example, the design-builder employed an innovative of horizontal signals, which lowered the bridge height, would not likely have been achieved in a traditional design process. This innovation may result in large savings on future bridge projects resulting from lower earthwork quantities and better alignment issues.

Possible reasons for higher than expected costs may be attributed variability in the quantities estimated by the engineer, market conditions, risk for errors and omissions, risk due to novelty of program, risk for the required warranty, risk for pricing quantities without full drawings, a highly competitive prequalification process, and/or the nature of the mandated construction schedule. These possible reasons for the cost increases outweighed the potential benefits of contractor innovation, design/construction overlap, and increased partnering. The report explores specific cost center including preliminary engineering, construction, change orders, WSDOT management, and warranty costs.

## Project Time Performance

The project was completed on time and the evaluation team estimates that the design-build method delivered the project at least 5 months, or 16%, faster than the traditional method. No change orders were issued for additional time. This time savings primarily stemmed from the overlap of design and construction. The project did not realize all of the possible time savings from the design-build method due to the prescriptive nature of the schedule mandated by WSDOT because of its proximity to the Vancouver Shopping Mall and lack of any incentives to further reduce either the construction impacts or overall project duration. Had the project been delivered through the traditional method, additional delays caused by the shortened construction window, permitting delays, and right-of-way issues may have become more significant factors than actually realized in the design-build delivery. These possible delays were not modeled in the 16% time savings previously noted.

## Project Quality Performance

Stakeholders closely involved with this project felt its quality was equal or better to the quality that design-bid-build would have facilitated. There is no doubt that the project team was of superior quality. WSDOT took advantage of the opportunity to complete design QA/QC plans during the RFP phase. An over-the-shoulder design review was anticipated, but the final review process took the form of a highly expedited design submittal process. The QA/QC plan for construction was followed, resulting in a high quality construction project. Both the design-builder and the WSDOT team stated that the QA/QC plan as outline in the RFP was excessively redundant and much too stringent given the nature of the liability placed upon the design-builder for final construction quality. All stakeholders interviewed on the project agreed that the traffic control safety was sufficient and no concerns existed. Given the apparent cost savings in contract

administration, the QA/QC plan for design and construction were cost effective as implemented.

## Management Implications

The design-build process used significantly less personnel from WSDOT's perspective. However, a more experienced staff is required due to the conceptual nature of preliminary engineering during the proposal stage and the fast-track nature of engineering decisions during contract administration. The WSDOT process also requires the "massing" of a large number of employees for a relatively compressed period of time during the RFP development and evaluation stage. The contract administration process required fewer personnel, but design experience was required in the field to review the design during construction.

## Lessons Learned

Throughout the course of the pilot project, the evaluation team documented a number of lessons learned and recommendations. These were derived from both the analytical performance evaluation and interviews with project stakeholders. Each stakeholder group provided valuable input about what was beneficial, as well as areas of the process that can be improved. Several issues concerning the RFQ/RFP evaluation and contract administration processes were documented and these issues are presented in chronological order.

**Lessons Learned**

| Request for Qualifications | Request for Proposals | Contract Administration |
|---|---|---|
| • RFQ Clarity and Interpretation<br>• WSDOT/Design Builder-Interface During the RFQ Process<br>• RFQ Point Weighting and Scales<br>• RFQ QA/QC Requirements<br>• Financial Statement Requirements<br>• Design-Builder Past Performance<br>• Scoring Team Experience | • RFP Lessons Learned & Recommendations<br>• Overly Prescriptive RFP<br>• Point Distribution<br>• TET and PEB Training<br>• Amount of Stipend<br>• Use of Warranties<br>• TET Scheduling<br>• WSDOT/Design-Builder Interface<br>• Teamwork<br>• TET Review Schedule | • Clarification of the Proposal - Betterments and Deficiencies<br>• Design Development and Design Review<br>• Co-Location of Project Team<br>• QA/QC<br>• Partnering<br>• Communication |

## Recommendations

The following is a summary list of recommendations from lessons learned throughout this pilot project evaluation.

- Design-build has the potential to greatly reduce project delivery time for the Washington State DOT and the majority of stakeholders closely involved with the pilot project stated that design-build has a place in the delivery process. However, fundamental changes to the current process must be made to reduce

costs. Additionally, only consider projects for design-build when they can readily employ performance criteria for design and significantly benefit from the compressed schedule.

- WSDOT should only use the design-build process when there are clearly stated objectives that can benefit from the characteristics of the design-build project delivery process. Additionally, these objectives must remain consistent throughout the life cycle of the project design and construction.
- WSDOT should continue to work closely with the professional community to allocate risks appropriately to the party that can best control them.
- Internal and external training and education must continue if there is to be a true cultural shift towards design-build project delivery.
- A comprehensive set of performance specifications needs to be developed to allow for more innovation in design and construction while ensuring quality and safety to the traveling public.
- The best-value selection process should tested and refined on future projects to ensure that it is not overly burdensome for the industry or too costly for the state. The amount of stipends should be considered individually on each project on the basis of the amount of design required in the proposal.
- WSDOT should reconsider the use of warranties in conjunction with design-build. It is the evaluation team's recommendation that WSDOT should develop a warranty separately. Once WSDOT is satisfied with the use of warranties on their own merit, only then should they consider combining this practice with the design-build process.
- Co-location of team members and over-the-shoulder design reviews should be attempted again in future projects that are larger in size. The full potential of these design development tools was not realized due to this lack of co-location.
- The testing responsibilities and frequency of the construction QA/QC system should be revisited on future projects. Although the costs were not excess, the system should focus more on areas of concern and eliminate redundancy in areas that are under the contractual obligation of the design-builder.

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# Introduction

The Washington State Department of Transportation (WSDOT) is engaging in a Design-Build Pilot Program to investigate the effectiveness of the design-build delivery process for the State of Washington. The Washington State Legislature authorized approval for this pilot program in 1998 under Substitute Senate Bill (SSB) 6439. WSDOT contracted with Dr. Keith Molenaar of the University of Colorado to provide an independent evaluation of the design-build pilot program. This report is the final evaluation of the SR 500 Thurston Way Interchange, WSDOT's first design-build pilot project. The report analyzes the effectiveness achieved by the design-build process on the SR500 Thurston Way Interchange pilot project and also comments on the development and effectiveness of the overall design-build program. The evaluation provides lessons learned to assist WSDOT in their goal of continuous improvement on any possible future projects.

WSDOT developed the design-build program in an effort of continuous improvement in its project delivery processes. Design-build project delivery offers many potential benefits, but it requires a substantial change in the management practices and culture for both the department and the industry. Perhaps the largest benefit of the process is the potential to shorten the project schedule by overlapping the design and construction processes. The largest drawback is the loss of control over the design that results from awarding a contract for a fixed fee before the design is 100% complete.

The design-build project delivery method is a relatively new to the highway industry. Design-build projects of less than $50 million currently require special approval under the Federal Highway Administration's (FHWA) Special Experimental Project (SEP) #14. Figure 1 displays the rapid growth of projects under the FHWA SEP 14 Program.

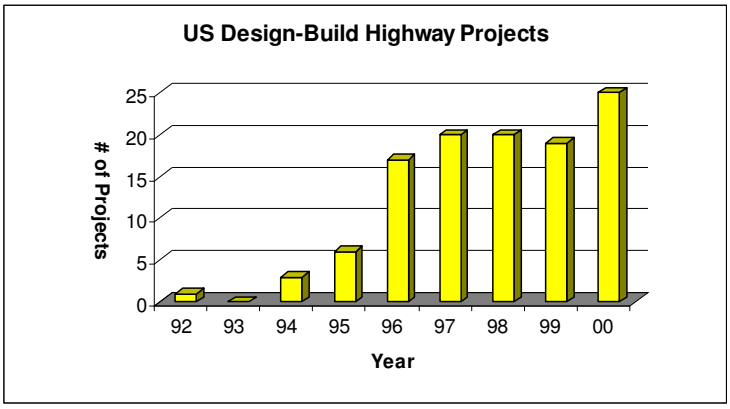



**Figure 1: US Design-Build Highway Projects**

As displayed in Figure 1, there has been a rapid growth of design-build projects in the late 1990s. A small number of states have seen the potential for design-build benefits and have begun to experiment with the process. However, there has yet to be an overall measurement of the effectiveness of the design-build process for the industry. Only a

few states have well-established design-build programs. The state of Florida documented the success of their first seven projects in 1991 and their design-build program has flourished into 2002 (Ellis et al 1991; Vreeland 2002). Conversely, the state of New Jersey documented poor performance on their initial design-build pilot projects and has since discontinued its use until the appropriate modifications can be made to their procedures (NJDOT 1999). A number of the other states shown in Figure 1 have not documented the effectiveness of their program and it is difficult to draw any conclusions about the effectiveness of their processes. The FHWA is currently conducting a comprehensive national study of design-build effectiveness (FHWA 1307 – Report to Congress on the Effectiveness of Design-Build), but the study will not be complete until 2004. Currently, it is up to the individual states to document performance and develop their own guidelines on the use of design-build. This study documents the performance and lessons learned in the State of Washington on its first design-build project.

# WSDOT Design-Build Process Summary

A WSDOT road construction project, regardless of delivery method, begins with the development of a number of design solutions to a road deficiency through the scoping process. One of these solutions is selected and is further developed. At this stage of the development the delivery method is decided. The design solution is eligible for the design-build pilot program if it exceeds $10 million in value, involves highly specialized construction activities, offers the opportunity for innovation, and holds the potential for savings in delivery time if design-build is used (pilot program limitations). If the project is selected for the design-build pilot program, WSDOT begins development of a project description and scope of work. This represents a significant effort by WSDOT staff and consultants. WSDOT defines the project scope by collecting base data and performing an analysis of the transportation deficiency. Base data includes site survey control, traffic analysis, environmental investigations and geotechnical investigations. Design-builder involvement in the early stages of project development, such as the environmental investigation, would require special programs and contractual arrangements. Contracting with a design-builder at this stage of development is complicated by the high probability of project scope changes.

During the development of the design-build process, WSDOT investigated the question of "Risk Allocation" and determined that high-risk areas such as environmental studies, permit acquisition, public involvement, right-of-way acquisition, and utility relocation agreements should remain with WSDOT. As a result, WSDOT is retaining responsibility for the preliminary decisions that define the basic project design. The advantage of this risk allocation method is that the design-builder does not have to assume responsibility for potentially costly risks. The price of this security is a muted opportunity for innovation, as many of the design decisions are made prior to the selection of a design-builder. When risk allocation to the design-builder is appropriate, such as when a significant potential for innovation is present, WSDOT will consider allocating some of these high-risk areas to the design-builder or retain it in-house but roll the activity into the contract.

Preparations for design-builder selection follow scope definition. WSDOT staff incorporates selection criteria into a Request for Qualifications (RFQ) and a Request for Proposal (RFP). A selection committee, responsible for evaluating the responsiveness of the design-builders, is established at this point in the process. The selection process consists of two steps:

1. Pre-qualification of potential design-builders; and
2. Final selection from short-list of proposing design-builders.

The two-step selection process begins with advertising the project for a set period of time. Firms responding to the advertisement are sent a RFQ, along with a draft RFP that details criteria for pre-qualifying. The interested design-builders prepare a Statement of Qualifications (SOQ) that addresses the design-builder's ability to meet the criteria listed

in the RFQ. WSDOT compares the SOQs to the selection criteria and creates a short-list of between 3 and 5 design-builders that are most qualified to proceed to the second step.

A final RFP is then sent to the short-listed design-builders and they are given a fixed period of time to complete the Best and Final Proposal (BAFP). The BAFP includes two separate submittals, a technical proposal describing the design solution and a price proposal that represents the total cost to WSDOT for the project delivery. WSDOT staff is available to answer questions regarding the proposals during the preparation period. Answers prepared for the design-builders are to be kept in strict confidence unless the questions deal with an item that will necessitate a change in the project description or the Scope of Work. Confidentiality of these questions is paramount to the design-builders so that they can maintain a competitive advantage with their unique proposal responses.

Upon receipt, the technical and price proposals are separated. The selection committee evaluates the technical proposal and assigns a technical score based on selection criteria detailed in the RFP. Selection criteria vary between projects, but they generally consist of items such as previous experience of the design-builder, key personnel, construction schedule, technical solutions, etc.

After the technical scores have been assigned, the price component of the proposal is opened and the "Best Value" proposal will be determined using the following formula:

$$\text{Best Value Score} = \frac{\text{Technical Score x 10,000,000}}{\text{Lump Sum Price}}$$

The design-builders not awarded the project will be compensated with an honorarium to be determined for the project under consideration. The winning proposal is the one with the highest best value score. WSDOT then negotiates a final contract to ensure that all required scope items and all design deficiencies are included. Appendix D provides the final proposal evaluation scoring matrix from the Thurston Way pilot project.

The design-build contract administration process has a few fundamental differences for both the owner and design-builder when compared with the traditional delivery method. Key differences from the owner's point of view are: design review for compliance with the BAFP and contract rather than approval of design, performance-based requirements in lieu of prescriptive-based specifications, the need for design assets in the field for fast-track reviews and a higher level of trust between the owner and the design-builder. The key differences for the design-builder are that the design-builder owns details of the design and is responsible for any errors and omissions in the plans, the designer must design to budget and schedule in order to make money, the contract needs to assist the owner in defining their needs rather than building to plans and specifications and the fundamentals of the contracts are different as shown in Figure 2 below. A design/builder is allowed to make changes to the design throughout construction without interference from the owner unless the changes do not meet the requirements of the BAFP/contract.

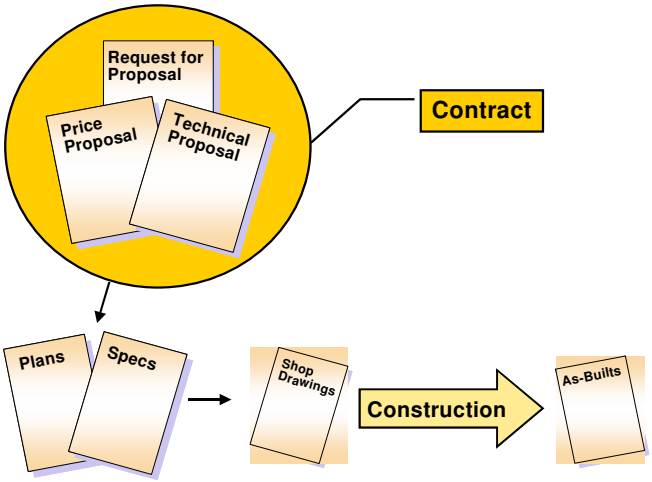



**Figure 2: The Design-Build Contract**

The fundamental difference in the contract is that the plans and specifications are no longer the contract but rather they are deliverable to the contract, which is comprised of the RFP and the design-builder's Technical and Price Proposal. Therefore, all of the owner requirements must be defined in the RFP and clarified in the negotiation of the final contract when the design-builder is hired. For the owner to truly shift the responsibility for design details and errors and omissions to the design-builder, they should not take an approval role in design review but rather the role of reviewing for compliance with the original contract documents.

WSDOT oversees the development of the design by informal reviews. This is different from design-bid-build where the WSDOT actually approves the design at various milestones. WSDOT does not take any approval or formal review actions on design except as noted for requested design deviations or deviations from the intended scope of work for the project. An over-the-shoulder review plan was developed in response to stakeholders' concern about WSDOT involvement during the design process relating to the department's ability to effect change, reaction to field issues, and reviews of design development. This type of arrangement helps to alleviate these concerns.

The role of WSDOT in Quality assurance/quality control (QA/QC) is fundamentally different from the design-bid-build process. The design-builder is responsible for more of the construction QA/QC program than a typical contractor in the design-bid-build process. Much of the documentation currently being collected under design-bid-build is still necessary under design-build, such as the test report, inspection reports (i.e., compaction reports, welding reports) and the materials certifications. The design-builder is responsible for the quality of construction and materials incorporated into the project. Verification sampling and testing will be performed by WSDOT to validate design-builder sampling and testing as well as the quality of the material produced.

# WSDOT Pilot Project

The SR 500 Thurston Way Interchange in Vancouver, WA is the first design-build pilot project and is the subject of this evaluation report. This project is a redevelopment of the "at grade" interchange of SR 500 and Thurston Way located in the southwest region of WSDOT. The project lies between the SR 500 Andresen Road Interchange and the SR 500 I-205 Interchange. This tight corridor creates many challenges and opportunities for innovative approaches to the logistical transportation concerns of the area. Traffic volumes on the mainline, the proximity of the main entrance to Vancouver Mall, and another plaza on the south side, along with challenging weave requirements made this project demanding for traffic control.

***INSERT PROJECT PICTURES HERE***

**Figure 3: SR 500 Thurston Way Interchange Construction**

A new interchange was needed at this site because the existing interchange was listed by WSDOT as one of the most hazardous in the state with a high number of vehicle and pedestrian accidents. The finished interchange featured an overcrossing of the intersection to improve safely for vehicles, pedestrians and bicyclists.

The SR 500 Thurston Way Interchange was selected as a pilot project because it was at the appropriate stage of design (in preliminary engineering) and offered the potential to capitalize on some of the perceived benefits of the design-build process. The project was initiated in 1998, but was put on hold due to funding problems caused by the passage of Bill I-695 in the November 1999 election. The following list outlines the timeline for the project once funding was finally obtained:

- Summer 2000: Funding Obtained
- Fall 2000: RFP Developed
- December 2000: Proposals Solicited
- January 2001: Proposals Evaluated
- February 2001: Project Award
- March 2001: Execution
- October 2002: Substantial Completion

# Research Methodology and Data Collection

The pilot project evaluation was conducted concurrently with the project development and construction. The evaluators attended a number of project meetings, conducted interviews, and analyzed raw performance data from both the Thurston Way project and a large number of completed projects from across the state. The analysis methodology is explained in detail in the 1999 Interim Evaluation Report (Molenaar 1999), but a short definition is provided below. There were two main methodologies employed in this evaluation.

- **Questionnaires and Interviews:** The evaluation team used a combination of questionnaires and interviews to gather feedback from the engineering and construction community, as well as the internal WSDOT personnel. The external questionnaires and interviews investigated areas such as investment of time and personnel, perception of design-build risk, and the equity of the selection process. The internal WSDOT questionnaires and interviews examined the more qualitative aspects of the evaluation formed the basis of recommendations and revisions to areas such as proposal preparation time, outreach, training, and industry resources.
- **Equivalent Design-Bid-Build Models:** To analyze the quantitative aspects of the design-build effectiveness, the researchers used WSDOT's historic data to develop statistically based models of the SR500 Thurston Way Interchange had it been delivered using the traditional design-bid-build process. These models are termed "equivalent design-bid-build models." These statistical models are used to analyze the overall project cost, overall project time, change order amounts and other evaluation criteria.

This evaluation is based upon one case design-build study and one equivalent design-bid-build model. Quantitative results will be presented, but it is impossible to draw any absolute conclusions on design-build performance from this one case study. WSDOT will need to continue to collect data from a number of pilot projects with different design and management characteristics before any absolute conclusions can be made as to the program effectiveness. However, a number of significant conclusions and lessons learned can be drawn from this methodology to improve the design-build process on the next project.

# Performance Evaluation

The main criteria of this evaluation are the performance measures of time, cost, quality, and management. These highest-level criteria can be disaggregated into sub criteria as defined in Table 1. Each criterion is discussed in detail in the following section.

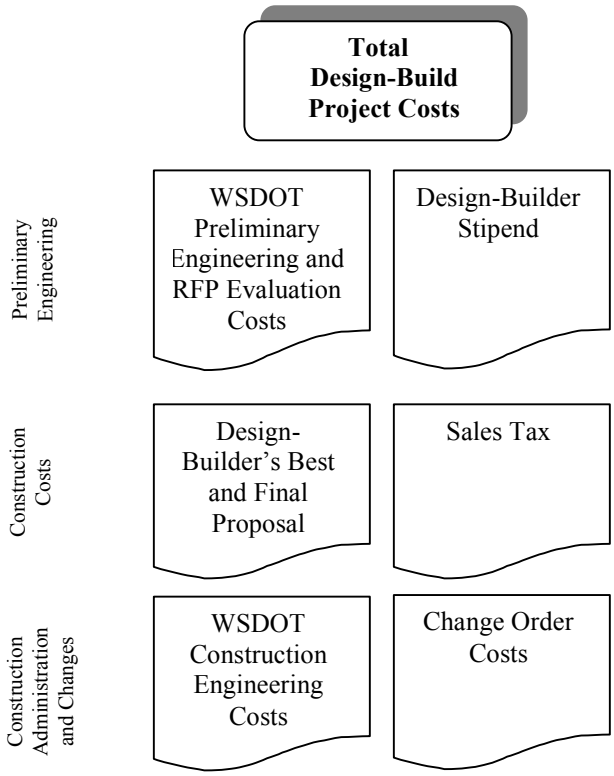
**Table 1: Performance Criteria for Evaluation**

| Cost Analysis | Time Analysis | Quality Analysis | Management Analysis |
|---|---|---|---|
| • Project Cost<br>• Engineering Cost<br>• Construction Cost<br>• Change Order Costs<br>• WSDOT Management Costs<br>• Cost of Warranty | • Project Delivery Time<br>• Design Time<br>• Construction Time<br>• Change Order Time Extensions | • Overall Project Quality<br>• Design QA/QC<br>• Construction QA/QC<br>• Impacts on Safety<br>• Impacts of Warranties | • Required Investments and Work Leveling<br>• Training<br>• Dispute Resolution Process<br>• Lessons Learned and Recommendations |

## Cost Analysis

### *Actual Project Cost*

The total design-build project cost is shown in Figure 3 and Table 2. This total is intended to be inclusive of all design and construction costs for both the WSDOT and the design-builder.




**Total Cost = $ 25,610,004**

**Figure 4: Total Design-Build Project Costs**

*WSDOT Preliminary Engineering and RFP Evaluation Costs*: WSDOT spent approximately $700,542 to develop the RFP for the project. This value was determined through an analysis of actual employee time records and an estimate of what was spent on preliminary engineering for the project. The RFP contained an average of approximately 30% design performed by WSDOT. Some items, such as preliminary bridge design, were accomplished with much less than 30% design through the use of performance specification and direct references to design standards and guidelines. Other items, such as geotechnical design, needed more than the average 30% preliminary engineering to adequately convey the scope of design in the RFP. More than 30 individuals from Olympia and the Southwest region participated in the RFP evaluation, so the evaluation costs were substantially more than a typical bid evaluation of 100% complete engineering documents.

*Design-Builder Stipend:* The two design-build teams who were not selected to do the project after the best and final proposal (BAFP) was submitted were paid a stipend of $50,000.00 each, resulting in the total stipend cost of $100,000.00. The goal of using a stipend was to compensate the unsuccessful design-builders for their design efforts, the preparation of a design-build proposal with substantial design requirements is very costly (much more so than a traditional construction bid). Initially, the stipend was set at $75,000. After the project was put on hold, then reinstated, the stipend was decreased to

$50,000. The design-builders were very concerned about this decrease. They felt that the amount awarded for the submitted BAFPs was insufficient. However, this concern did not impact the number of proposers as no non-responding teams noted the amount of stipend as a factor for not proposing.

*Design-Builder's Best and Final Proposal:* The total cost of the design-build project was bid for $22,725,000. This cost included all design and construction costs incurred by the design-build team. The successful design-build contractor was Kuney Construction Company & Entranco Engineers. Since a complete design is not available at the time of award, it is impossible to use a unit-price contract. A schedule of values was negotiated with the design-builder and they were paid monthly based upon successfully completing design and construction milestones throughout the project.

*Sales Tax:* Sales tax must be taken into consideration and WSDOT is spending approximately $1,439,137 for sales tax on construction. That amount may increase vary slightly as sales tax was not yet paid at the time of this report. WSDOT construction costs are not exempt from sales tax, therefore an additional percentage of 7.7% must be added to the design-build bid for construction activities. WSDOT does not pay sales tax for design-services. At the time of this report, sales tax was not estimated for design. However, design services in design-build are contained in the design-build contract, which is considered a construction contract. There has been some discussion with the State about whether or not sales tax should be paid on design in design-build contracts. At the date of this report, WSDOT was not expecting to pay sales tax on design and it was not included in the cost model described here.

*Construction Engineering:* Approximately $417,109 was spent for construction engineering on the project. An attempt was also made to review WSDOT's actual expenses, but the values shown on WSDOT's internal accounting records were not consistent with what was expected to the spent and the project and were therefore discounted. This value used is the analysis determined by taking the WSDOT construction engineering estimate, had the project been executed design-bid-build, and multiplying by the approximate percentage of each item that WSDOT believed they completed as part of the design-build project. For example, General Project Management was estimated by WSDOT at $600,758 using design-bid-build, but they believed that the design-build method used approximately 25% of that amount. Therefore General Project Management was determined to $150,190. This approach determined that WSDOT stayed approximately close to completing 30% of the construction engineering items had the project used design-bid-build. Construction engineering in a design-build project is different from a traditional project. The WSDOT time for design-review is included in construction engineering because the design review occurs after the design-build contract is awarded. The traditional construction engineering tasks (general project management, surveying, inspection, etc.) are included in this value as well. However, design-build involves a much different workload for construction administration because WSDOT take a much different role in quality assurance/quality control as previously stated. More discussion on construction engineering is discussed later in this evaluation.

*Change Orders:* In addition, there were twenty change orders on this project totaling $228,216. The nature of change orders is different with design-build. WSDOT is not responsible for change orders due to errors and omissions in the drawings as the design-build owns the details of the design. However, changes due to owner design requirements or preferences, as well as changes due to unforeseen conditions are still included. A more detailed analysis of change orders is included later in the report.

Table below shows the breakdown of costs and the total to be $25,610,004.

**Table 2: Actual Project Costs**

| Total Design-Build Costs | |
|---|---|
| Preliminary Engineering & RFP Eval. | 700,542 |
| Stipend | 100,000 |
| BAFP | $22,725,000 |
| Sales Tax | 1,439,137 |
| Construction Engineering | 417,109 |
| Change Orders | 228,216 |
| **Total** | **$25,610,004** |

***Equivalent Design-Bid-Build Model***

In order to compare the design-build project cost to the traditional project delivery cost, an equivalent design-bid-build model was created based on the WSDOT engineer's estimates and the researcher's analysis of WSDOT historic data. The equivalent design-bid-build model is composed of: Preliminary Engineering Estimate, Construction Engineering Estimate, and the Construction Estimate. Figure 5 graphically depicts the equivalent design-bid-build model and the individual elements of the model are described below.

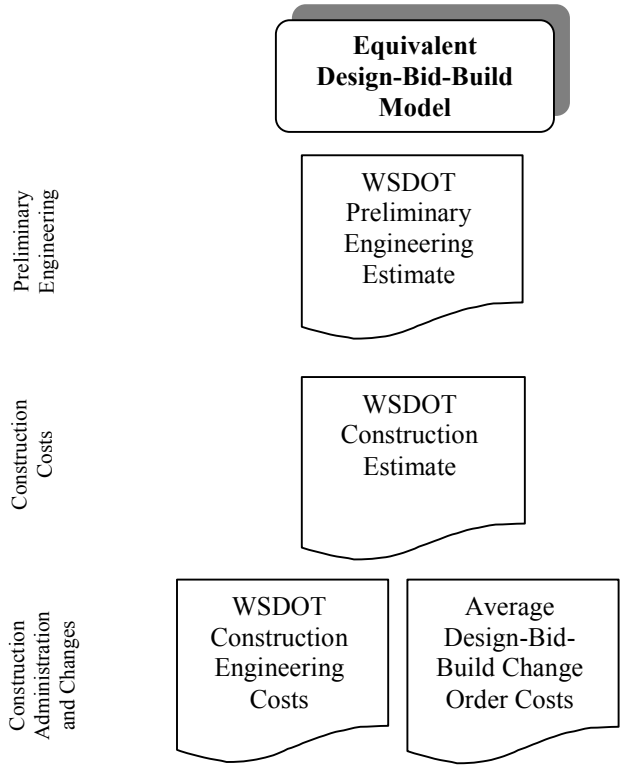



**Figure 5: Equivelent Design-Bid-Build Model Costs**

*WSDOT Preliminary Engineering Costs:* Preliminary engineering involves all costs to design the project from 0% to 100% complete plans and advertise the contract if WSDOT were to do the preliminary engineering for this project in-house. The preliminary engineering costs result from a WSDOT engineer's estimate of primarily design-related costs if the project were designed by WSDOT in-house using the design-bid-build delivery system. A cost breakdown for the preliminary engineering is provided in Appendix D.

*WSDOT Construction Estimate:* The WSDOT construction estimate results from a WSDOT engineer's estimate of the costs for construction based on a quantity take-offs and historic design-bid-build unit prices for those quantities. The quantity take-offs by the WSDOT engineer were done from the 100% plans submitted by the design-builder. The estimate was priced using standard historic data to determine unit prices. The research team discovered a small number of items that were included in the design-builder's schedule of values, but were not accounted for in the construction estimate. The cost of these items was added to the estimate below. The estimate was then adjusted for the historic error between the engineer's estimate and the bid price. Based on historic data obtained from WSDOT projects over $1,000,000 in the Southwest Region only, it was determined the engineer's estimates were lower than the bid price by an average of 3%. This factor is used to adjust the probable difference in the bid from the engineering estimate. The construction cost estimate provided by WSDOT is provided in Appendix D.

*WSDOT Construction Engineering Costs:* Construction Engineering accounts for quality control, inspection, surveying, and other field engineering tasks normally performed by WSDOT on traditional design-bid-build projects. Like the WSDOT preliminary engineering estimate, the construction engineering estimate results from a WSDOT engineer estimating the primarily construction administration and inspection costs WSDOT would expect had the project used the traditional design-bid-build system.

*Average Design-Build Change Order Costs:* Based on historic data obtained from WSDOT, it was determined that the average percentage increase from the original bid price due to change orders on projects over $15,000,000.00 in all WSDOT regions was 14%. This factor was applied to the construction estimate of the equivalent design-bid-build model.

**Table 3: Equivalent Design-Bid-Build Model Costs**

| Equivalent Design-Bid-Build Costs | |
|---|---|
| Preliminary Engineering Estimate | $1,817,856 |
| Construction Engineering Estimate | 2,036,416 |
| Construction Estimate* | 14,847,167 |
| Change Order Factor | 2,176,682 |
| **Total** | **$20,878,121** |

Note: the WSDOT construction estimate included in Appendix D has been adjusted for missing scope items and a historic factor of the difference between engineer's estimates and actual bid prices.

A number of quality control measures were taken to ensure the accuracy of the engineer's estimate. First, the estimate was completed by an engineer who was not directly on the pilot project, which adds to the objectivity of the estimate. This engineer used standard estimating procedure for the region. Second, the research team compared the estimate to the contractor's schedule of values. Finally, the project estimates were compared with three similar projects that were recently completed. All of these quality control measures are reflected in the final construction estimate price.

It should be noted that the estimate was sent to the design-builder for verification of quantities, as they were taken off by a WSDOT engineer who did not perform the design. The design-builder made no changes to the quantities in the estimate. However, the design-builder did note that the estimate of unit prices was incorrect and sent a revised estimate with adjusted unit costs that totaled the actual bid price of construction. To maintain the integrity of the equivalent design-bid-build model, the WSDOT historic pricing data was used instead of these design-builder adjusted prices. The possible implications to the analysis are discussed in the following sections. Also, the engineer's estimate was based upon the final – cost centered design – not a standard design-bid-build design.

### *Overall Project Cost Analysis*

The design-build method of project delivery cost approximately 23% more than the traditional method ($25,610,004 vs. $20,878,121), base upon comparison of the actual design-build costs with the equivalent design-bid-build modeled costs. This percentage is based primarily upon an engineer's estimate provided by WSDOT. While this difference it not reported as a range, it certainly has uncertainty related to it. An examination of WSDOT engineer's estimates vs. bid costs reveals an accuracy that ranges from 41% under the actual cost of the project to 20% over the actual for projects over $15 million throughout the state from 1991 to 2001. The difference in cost could possibly be attributed to the accuracy of the engineer's estimate. The true value of the model is found in the detailed comparison costs in the sections that follow.

A complex interaction of variables causes the difference between the actual design-build cost and the equivalent design-bid-build model cost. There is no one cause for the additional cost. Substantial cost increases have been identified in preliminary engineering and construction costs. These cost increases far outweigh the decreases that have been identified in contract administration and change order costs. There is no doubt that the novelty of the program for both WSDOT and the industry influence the price increase. Additionally, the amount of risk borne by the design-builder certainly influenced the cost of both engineering and construction, but the exact extent to which these issues drove the price is proprietary knowledge known only to the design-builder and their sub contractors. The more in-depth analysis of engineering, construction, construction administration, change order, and warranty costs, which follows, provides more detailed insights regarding where these cost differences occurred.

### *Preliminary Engineering Cost Analysis*

The engineer's preliminary engineering estimate was significantly lower than the total amount paid for engineering under the design-build contract. Table 4 summarizes the preliminary engineering costs for the actual design-build project and the modeled design-bid-build costs.

**Table 4: Preliminary Engineering Cost Analysis**

| Preliminary Engineering Cost Comparison | | | |
|---|---|---|---|
| D-B Actual Costs | | D-B-B Modeled Costs | |
| WSDOT RFP Development | $ 700,542 | PE Estimate | $1,817,856 |
| Stipend | 100,000 | | |
| Design-Builder Design | 2,942,910 | | |
| WSDOT Design-Review | W/CE* | | |
| Total | $3,743,452 | | $1,817,856 |

* Design-review after the design-build contract is awarded is accounted under construction engineering costs in design-build, because design reviews are done after the contract is awarded.

The total preliminary engineering estimate was $1,817,856 and this is the amount that WSDOT would have expected to pay for engineering had the project been done using the traditional design-bid-build method. The actual cost paid for engineering under the design-build method is the sum of the WSDOT RFP development costs and the stipend costs as previously noted, plus the design-builder design costs as taken from the schedule of values. The final total for project engineering was $3,743,452, a difference of $1,925,596 or and increase of 106% over what would traditionally be expected.

It should be noted that the Florida DOT design-build study, the Colorado DOT design-build study, and the Oregon DOT design-build study did not note significant increases in design costs under their design-build processes (Ellis, et al 1991, CDOT 1998, Rogge 2001). These studies involved projects of similar sizes but the design-build selection and design-review process were much more streamlined.

There are numerous possible reasons why the actual design-builder engineering cost are higher than estimated by WSDOT. It is impossible to pinpoint the exact cost impact for each of these possible reasons, but they are noted for consideration on future design-build projects. These issues cited below stem from interviews with project participants and an analysis of the Florida, Colorado, and Oregon DOT design-build studies.

- The design-builder is required to assume a much higher level of risk for errors and omissions in plans under the design-build method. This higher risk may have increased cost in the following ways.
  - The engineer of record and their sub consultants may have chosen to re-design what was already completed by WSDOT in the RFP to ensure that it was done correctly and that they could comfortably assume the risk for the complete design. This would in essence require WSDOT to pay for a 30% design twice – once in the RFP and then again from the design-builder in the contract.
  - WSDOT required a *project* errors and omissions policy, which is in excess of the standard *designer* errors and omissions policy. This increased cost is reflected in the design-build project total. This policy may not be required on all future projects.

- Since the design-builder is paid for design before it is paid for construction, the design-builder quite possibly "front-end-loaded" some of the overhead and profit into the design cost on the schedule of values. In this manner, the design-builder will collect their overhead and profit early in the project to increase their initial project cash flow. Since this was the first WSDOT design-build project and its first experience with a lump-sum contract of this size, it is quite possible that this front-end-loading of the payment schedule occurred.
- It is also possible that the design was forced to bid excessive "overtime" into the bid as the timelines demanded by a design-builder as much more aggressive and the risk cost for any delays can be daunting. Realistically, far higher designer costs on a design/build project might be expected, but hopefully anticipate a lower than normal construction cost end product. WSDOT team members noted this on the project in practice, but did not realize it in the cost. There is a distinct possibility that design-builder will price construction more aggressively on future design-build projects to offset this design cost.
- Much of the design-bid-build preliminary engineering estimate is based on the engineer's construction estimate as a percentage of cost. Since the engineer's construction estimate is lower than the bid construction costs, the preliminary engineering estimate will be low as well. It is also very possible that the design-builder based their design costs on a percentage of the construction bid.
- It was also commented that consultant design-bid-build design costs in the in the WSDOT Southwest Region are usually higher than those designs performed in-house.

There is no doubt that engineering cost more on this design-build pilot project than on a traditional Southwest Region in-house design. Project size, either substantially larger or substantially smaller, may influence on the variability of engineering costs. Also, future projects may not see such large variability in design costs, particularly if they are done in regions where the outsourcing of design to consultants is standard practice.

### *Construction Cost Analysis*

The adjusted engineer's estimate for construction of in the equivalent design-bid-build model was $14,847,167 and the price for construction actually proposed by the design-builder was $18,690,092, a difference of 26%. The actual contract construction costs were determined from the schedule of values submitted by the design-build for payment. Those items can be compared to WSDOT's engineer's construction estimate. The engineer's estimate and the design-builders schedule of values are provided in Appendix D. The 4 largest items of difference by dollar amount are listed in Table 5.

**Table 5: Construction Cost Analysis**

| Comparison of Engineer's Construction Cost Estimate with Design-Builders Schedule of Values | | | | |
|---|---|---|---|---|
| Item | WSDOT EE | D-B SOV | $ Difference | % Difference |
| Mobilization | $1,157,000 | $2,150,700 | $ 993,700 | 86% |
| Grading | 2,283,695 | 4,025,280 | 1,741,585 | 76% |
| Structure | 2,617,044 | 3,326,052 | 709,008 | 27% |
| Asphalt Concrete Pavement | 1,546,350 | 2,496,500 | 950,151 | 61% |

Traditionally, if there is not an error in an estimated quantity or item of scope, differences between construction costs estimates and contractor bids can be attributed to market conditions. The design-build process contains an additional potential source of error in the unknown nature of the work quantities at the proposal stage. The design-builder bares a risk due to unknown quantities at the time of the proposal, because the design is not complete and the contractor is being asked to submit a lump sum bid rather than a unit price bid. In this case, the engineer's construction estimate for the equivalent design-bid-build model was performed after the quantities were known and the engineer had the benefit of exact quantities, but the design-builder did not have this information at the time of bid.

Market conditions could very well account for the differences in structures and asphalt concrete paving as these quantities were fairly well defined at the proposal stage. The grading quantities were not well known and the design-builder builder may have bid a significantly larger scope than what was actually designed and priced in the engineer's estimate. Construction staging was also a very large challenge. If the design-builder had known that an entire ramp could be constructed in a given window; they could have bid it accordingly. However, WSDOT's schedule was so prohibitive that the design-builder was forced to work piecemeal.

Another factor in the asphalt paving discrepancy is risk for potential maintenance and resurfacing that may be required due to the contract warranty provisions. Although WSDOT's position is that a quality designed and built pavement should last for the duration of the five-year warranty, the contractor stated that the asphalt subcontractor did price some additional maintenance work due to the stringent specifications included in the warranty. The contractor stated that WSDOT would be inspecting the pavement annually and requiring any fixes on the pavement each year. However, the contractor did not state if they priced a full overlay of the pavement at the end of the warranty to cover this risk or if they were relying on the quality of construction and normal traffic volumes to control the risk.

The reason for the 85% cost discrepancy in mobilization is difficult to determine. The design-builder had to fully mobilize onto the site for a number of months and wait for the design to be completed. This effort consumed large resources and was not needed in the

design-builder's viewpoint, but it was required in the contract. The research team was only provided one number for mobilization from both the design-builder and WSDOT. WSDOT prices mobilization as a percentage of construction cost in its estimate. The previously mentioned items would account for a portion of the difference, but not the entire difference, as the overall construction costs are 26% higher in the design-builders bid.

One additional factor, which likely permeates throughout the construction costs, is the risk that the design-builder may have priced into their costs due to the novelty of both the design-build process and the warranty. If this design-builder did include a substantial sum for this risk factor, they would likely attempt to recover this cost early in the project, and it could very well be reflected in the increased costs of mobilization and grading as these costs are billed early in the project. The design-builder took a risk in working with WSDOT on its first design-build project and they likely included some amount of money for unknown costs associated with the process. Due to the proprietary nature of this information, the design-builder would not share it directly with the researchers. However, the design-builder did state that they asked all of their subcontractors to remove contingency pricing from their bids. They in turn carried an overall contingency for the project to negate compounding of risk contingency pricing. Whether all of the subcontractors followed this direction is impossible to determine. If they did not, this risk factor could be inflated.

### *Change Order Cost Analysis*

Cost growth due to change orders was extremely low on this project. Change orders amounted to $228,216, which is only a 1.0% increase from the design-build bid and a 1.2% increase from the construction costs of the design-build. These percentages are compared with an average increase of 14% of WSDOT projects over $15,000,000 using the design-bid-build system. Change orders can be generically classified into three primary categories: 1) errors and omissions in drawings, 2) unforeseen conditions; and, 3) owner initiated scope revisions. A discussion of each of three categories of changes is in order.

From WSDOT's perspective, changes due to errors and omissions in the drawings are eliminated. Because the engineer and contractor are on the same design-build team, they assume the risk for any errors and omissions in the plans. The design-build team noted a number of design/construction issues that they worked out internally, which would have resulted in change orders on a traditional design-bid-build project. However, WSDOT likely paid for these errors and omissions through a contingency added to the design bid costs. This cost is likely reflected in the higher cost of design, but it is impossible to tell the exact amount from the information supplied by the design-builder.

WSDOT prepared a comprehensive investigation and preliminary design for the RFP. This is reflected in the low number of change orders due to unforeseen conditions and owner initiated scope changes. While this effort resulted in low change order cost, it also resulted in higher preliminary engineering costs as previously noted.

Finally, the quality of the project team played a role in the low cost of change orders. The project had excellent team members on both sides of the contract. WSDOT was committed to the project and the Kelso Office Administrator, spent a large amount of time on the project. The quality of the design-builder was also ensured through the competitive RFQ/RFP process. All team members on both sides of the project noted that the quality of the project team was a vital component of the project's success.

### *WSDOT Management Cost Analysis*

Contrary to preliminary engineering costs, the actual design-build costs for construction administration, inspection, and testing were less than the engineer's estimate for WSDOT to perform those duties. The actual cost, $1,509,109, is a combination of the design-builder's QA/QC costs and WSDOT's actual construction engineering costs. The construction engineering estimate for the equivalent design-bid-build model was $2,036,416. The difference between the two is $527,307 or 26%. Therefore the design-build delivery system was cost efficient for this project when compared to design-bid-build.

WSDOT used less administrative personnel on this project because many of the administrative duties were assumed by the design-builder. An aggregate of the WSDOT team member comments reveal that less than one-half of the FTEs and administrative support staff were required for construction engineering when compared to a traditional a design-bid-build project of similar size. However, the project did require more senior staff. A large number of WSDOT employees who did spend time on the project were higher-level managers and engineers. More experience owner personnel are required on a design-build project due to the nature of the decisions being made and the urgency of these decisions in a fast-track environment.

### *Cost of Warranty*

This was the first experience with an asphalt pavement warranty for WSDOT and the northwest paving industry on either a design-build or design-bid-build project. WSDOT decided early in the process to require an asphalt warranty to mitigate the risk of not performing the final pavement design in-house. WSDOT undoubtedly paid additional money for requiring a five-year pavement warranty on this project, however, the final cost is extremely difficult to determine due to the proprietary nature of the pricing for the warranty. Although personnel interviewed from WSDOT stated that the warranty was intended to ensure the quality of standard design and construction practices, the design-builder interviewee's stated that the warranty requirements were in excess of standard practice. The design-builder stated that the warranty added both design and construction liability, and they in turn priced this liability into their bid. Although it was not clear how the design-builder bid the warranty, one of the unsuccessful proposers stated that they bid a complete asphalt overlay at the end of the five-year warranty to protect themselves from the liability. This pavement overlay would certainly not be expected on a non-warranty

project. The reason for this excessive bid cost is a combination of WSDOT specifications and apprehension from the industry on this new contract method.

One easily identifiable cost associated with the warranty is the warranty bond, which WSDOT required. The design-builder included $50,000 for the product warranties in the schedule of values. WSDOT requried that a bond be supplied by the design-builder for the duration of the warranty period to pay for the associated warranty repair costs if the design-builder was not financially able to pay for the repairs under the terms of the warranty.

Asphalt pavement warranties are relatively new on a national scale. The Wisconsin DOT has obtained excellent results and cost performance with their program (WisDOT 1997) while the Colorado DOT has realized only equal performance with slightly increased costs (CDOT 2001). WSDOT will need to make a decision about the future use of asphalt pavement warranties and measure its performance on a long-term basis before any substantial conclusions can be made.

## Time Analysis

### *Project Delivery Time*

The project was completed within the contractually mandated time and the research team estimates that the design-build process saved at least 5 months, or 16%, of the comparable design-bid-build process. All project stakeholders interviewed considered the project to be a success in terms of schedule. However, some of the potential schedule benefits anticipated from the design-build process were not realized. Specific analysis of the overall project delivery time, design time, and construction time follow.

A primary motive for choosing design-build is the opportunity to decrease project delivery time. The design-build delivery system allows overlapping of design and construction. Other design-build evaluation studies have shown significant potential for time saving with some reporting savings in excess of 30% for project delivery time (Bennett et al 1996; Construction Industry Institute 1998; Ellis 1991; Warne and Downs 1999). Figure 6 presents a comparative design-build vs. equivalent design-bid-build model schedules.

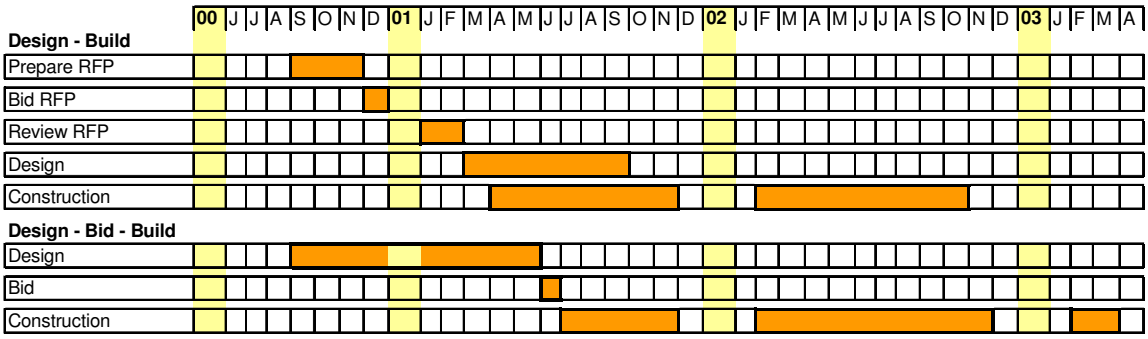



**Figure 6: Schedule Analysis**

A five-month time savings (16%) may have been realized on the project because of the overlap of design and construction as depicted in Figure 6.. The SR 500 Thurston Way project could not completely benefit from the overlap of design and construction due to the tight time constraint on the project due to the proximity to the Vancouver Shopping Mall. Because this project was submitted to the constraint of having to sojourn from work during the holiday period, the time savings may not have been fully realized.

The project team noted that the overlap of design and construction provided flexibility for the project to start before all of the environmental permitting was obtain. This would not have been possible on a design-bid-build project. WSDOT was able to obtain an environmental permit while the design-builder was performing work on other areas of the project. If the project were performed using the design-bid-build delivery system, the time to obtain the permit prior to commencement of construction may have caused significant schedule delays.

Additional time savings may have been realized through the use of the design-build process, but has not been modeled due to the uncertainty associated with the events associated to the time savings. Items that may have extended the design-bid-build project duration, but are not modeled above include:

- *Delays due to the construction window:* A design-bid-build process may have necessitated waiting to start work until after the 2001-2002 construction closure window, which may have resulted in five additional months.
- *Permitting delays:* The permitting delay described above is not modeled in the schedule comparison, but would have likely caused a delay in the bid of a traditional design-bid-build schedule.
- *Right-of-way issues:* There was a right-of-way issue with the entrance to the adjacent Chevy's restaurant that was resolved concurrently with the design-build contract. This issue may have caused a delay in the bid of a traditional design-bid-build schedule.

All of the individuals interviewed after project completion agreed the design-build's greatest benefit is the potential to reduce project delivery time. Design-build should be used in the future when there are evident time constraints.

### *Design Time*

WSDOT realized a significant savings in preliminary engineering time. Had the project been let traditionally with 100% plans, specifications, and engineering, there would have been approximately a four-month delay in the contract award. This could be a critical factor on future projects when there is a fixed completion date that cannot be reached through the traditional design-bid-build delivery system, if there are large user delay costs are involved with the project, or if making a contract award early in the process is essential to secure project funding.

### *Construction Time*

Final construction of the project was completed on schedule and was considered a success by all project team members and the public. One of the reasons for WSDOT developing the design-build program was to increase construction innovation from the industry. This innovation might appear in the form of construction schedule compression. The research team looked for specific areas of construction schedule compression that resulted from the design-build process, but the project team members noted none. The project team members noted that the design in the RFP was too prescriptive and the time windows too constrained for any significant construction time savings to be realized from the design-build process.

### *Change Order Time Extensions*

No change order time extensions were required on this project. The project team noted that problems encountered with design during construction were quickly resolved due to the fact that the engineer and contractor were on the same team. The team also noted that some of these problems would have surely resulted in time extension requests on traditional design-bid-build projects, but none was required on this project. Again, the design-builder likely had to add cost to their bid for baring this risk of time extensions due to errors and omissions in the plans. Refer to the change order cost analysis section for further explanation.

## Quality Analysis

### *Overall Project Quality*

Stakeholders closely involved with this project felt its quality was equal or better to the quality that design-bid-build would have facilitated. There is no doubt that the project team was of superior quality. From WSDOT's perspective, the RFP development team had the attention of more senior department members than traditional projects of its size. The contract administration team had the involvement and undivided attention of the region's upper management. This was a project of interest within the DOT and it commanded the WSDOT Team's best effort. From the professional community's perspective, the rigorous RFQ/RFP process necessitated the formation of the highest

quality teams to win the project. The design-build process also focuses the attention on the *team* because of the shared risk and profit potential for the project. All of these factors resulted in a high quality end product.

### *Design QA/QC*

An analysis of quality assurance/quality control (QA/QC) for design-build involves both design and construction. WSDOT took advantage of the opportunity to compete design QA/QC plans during the RFP phase. This forced the design-builders to submit their QA/QC plans for design in their proposal, which then became part of the design-build contract. Had there been any problems with the design quality in the project, WSDOT could have contractually held the design-builder to the quality standard set forth in the proposal. However, the WSDOT project team stated that they were satisfied with the design quality of the design submittals and the final plans. Even though the design time was compressed more than the design-build engineer wished, the level of quality was acceptable.

A WSDOT issue of concern at the beginning of the RFP stage was whether the quality of the final plans and as-builts would be up to the standards of traditional design-bid-build projects. The WSDOT team stated that the final plans and as-builts are of acceptable quality. The contract did require that the final plans be in accordance with the WSDOT plans manual. The only negative comment that was received was that the design-builder did not submit quantities of materials for pay items with the final drawings. Although these are required in the plans manual, they were really not needed by the design-builder or WSDOT because the contract was done under a lump-sum contract. These quantities would have been very useful for the equivalent design-bid-build model engineer's estimate, but the design-builder refused to supply them.

The RFP described an over-the-shoulder review of the design-builder's design work. However, the proposed co-location plan for a common engineering, construction, DOT project office never materialized due to excessive costs. Therefore, design reviews were accomplished through a more traditional design submittal process. Comments on the submittals were very helpful to the design-builder, but both the design-builder and WSDOT noted that these reviews were more stringent and frequent than absolutely required. While the WSDOT project administration team was careful to only comment on, and not direct the design, they could have taken on more of an audit role and still been protected by the design-build contract. Because this was the first WSDOT design-build project, the team wanted a certain level of comfort with the procedures. In the future, the design submittal reviews may not need to be as frequent. However, given the large cost savings in construction administration, which is where the design reviews were accounted for, there is not a real financial motivation to decrease the amount of design-review involvement on the part of WSDOT.

### *Construction QA/QC*

All of the project team members stated that the QA/QC program for construction ensured a high quality construction project, but the sense of both the design-builder and WSDOT was that given the contractual obligations of the design-builder, the state played too large a role in the process. The responsibility of the overall construction QA/QC program resides with the design-builder. The process outlined in the contract and followed during the project was very conservative due to the first time use of the design-build process. The statistical evaluation process is new and should be analyzed for continuous improvement. The testing responsibilities and frequency should be better focused on areas of concern and eliminate redundancy. WSDOT should re-examine the margin of variance allowed between testing samples taken by the design-build and those taken by WSDOT to verify quality. Both the design-builder and the WSDOT team stated that the QA/QC plan as outline in the RFP was excessively redundant and much too stringent given the nature of the liability placed upon the design-builder for final construction quality.

The role of the sub-contractors is another area to be assessed on future projects. Some sub-contractors perform their own quality control and therefore clear expectations need to be made apparent from the beginning to ensure their quality control is in conformance with expectations of the overall project. Material testing measures should be addressed to conform to the guidelines, but eliminate redundancy caused by excessive testing. Time is the issue associated with excessive re-testing and this seems to be one area where improvement can be achieved.

One recurring problem was how “field fit” solutions occurred. Technically, these field-engineering designs belong to the designer, but the timeliness required for a formal design incorporation by the designer of record would have negated the time savings of design-build delivery. This was essentially solved through WSDOT allowing the QC/QA inspector to review these solutions. This system requires that a competent QC/QA inspector be employed on the project. The system employed on this project may not work as standard practice on future projects.

Similar to design QA/QC, the project team thought that too much effort was spent on construction QA/QC, but the costs were not excessive. Relaxing the frequency of QA/QC involvement by the state may result in a more smoothly run contract administration process, but it is not likely to yield any large cost savings.

### *Impacts on Safety*

The issue of construction safety and traffic control is of great concern to a public project and the design-build process should not alter the attitude towards safety in any way. Traffic control is the primary concern in any transportation rehabilitation project where public safety is the issue. The design-build process with the SR 500 Thurston Way Interchange consists of paying for safety measures using a lump-sum approach versus the traditional unit cost method. Since the Department cannot request additional traffic control as easily and the design-builder is not reimbursed on a per-item basis, there is the

perception that the design-builder may try to save money by supplying inadequate or marginal traffic control. All stakeholders interviewed on the project agreed that the traffic control safety was sufficient and no concerns existed. Individually, safety items (barriers, signage, state troopers, etc.) may not be as numerous as on a typical WSDOT administered project, but the overall traffic control system is ensuring safety adequately. If the safety plan was not part of the contract or if an unqualified contractor was selected to perform the design-build contract, this might become an issue of concern.

One cost related to safety that was not clear in the contract documents was the cost of Washington State Patrol officers used for traffic control. In the traditional process, this cost is billed directly to WSDOT. It was WSDOT's intent to have this cost paid for by the design-builder on this project, but the contract documents were not clear on that point. At the time of this evaluation report, WSDOT was planning to reimburse the design-builder for this cost.

### *Quality Impacts of Warranties*

Given the stringent QA/QC plan for pavements, the project team did not believe that the warranty provisions improved the quality of the pavement. If a warranty is used in the future, WSDOT should rely on the warranty to provide the quality assurance and not require such stringent QA/QC measures. It is also suggested that WSDOT clarify the point at which the warranty period begins in the contract.

## Management Analysis

### *Work Investments and Work Leveling*

The design-build process creates a new management paradigm for WSDOT. Many of the traditional department functions for both preliminary and construction engineering are contractually provided by the design-builder. While this allows a smaller number of staff to manage the project from WSDOT's perspective, a more experienced staff is required due to the conceptual nature of preliminary engineering during the proposal stage and the fast-track nature of engineering decisions during contract administration. The research team has made the following observations after reviewing WSDOT employee time records and conducting interviews of key staff members:

- *Experience of WSDOT RFP preliminary engineering and evaluation team:* The design-build process as outlined in the WSDOT DB Guidebook awards a project at a very low level of design. This requires a high level of experience in the WSDOT team members who develop and evaluate the RFP. During the RFP development, the team members must be able to work with designs and performance criteria that are very conceptual in nature. They must also be able to foresee potential problems with design-builder proposals at a very conceptual level. WSDOT employees are not given the luxury of time to explore all of the potential design solutions, but rather, they must have the right experience to

conceptually design and evaluation a project through a minimal set of performance specifications.

- *Massing of evaluation team members:* In its current form, the WSDOT design-build RFP evaluation process requires the undivided attention of a large number of employees for one to fourteen days. There were at least 20 individuals who devoted one week or more to reviewing the RFPs on the SR 500 Thurston Way project. They had to "drop" their ongoing tasks on other projects to complete this review. This owner massing is critical for project success as it is the RFP and the design-build proposal that form the basis for the contract in the design-build process (see Figure 1 and the adjacent discussion for a more detail).
- *Continuity of project team:* The design-build process awards a lump sum contract for the design and construction of a project while it is at the conceptual stage of preliminary engineering. At that conceptual stage, there is a lot of "design intent" that is not specifically shown on the drawings and in the performance specifications. Additionally, the construction engineering phase involves the review of design as it is completed. Continuity of the team during the RFP development, RFP evaluation, and construction administration is essential to the success of the project. Some reorganization of the traditional WSDOT job descriptions may be required to ensure this continuity.
- *Staffing of construction administration team:* As stated in the management cost analysis, less but more experienced team members are needed during the construction administration of the project. Additionally, these team members must be comfortable working with external consultants who will be taking responsibility for design, QA/QC, and other administrative tasks that have traditionally been done by WSDOT.

### *Education and Training*

To successfully implement a design-build program, WSDOT must change its culture appropriately. Education and training is essential to make this change in culture. Dr. Keith Molenaar of the University of Colorado, Douglas Gransberg of the University of Oklahoma, and Jeff Carpenter, the WSDOT Alternative Project Delivery Manager, developed a design-build education program for the Department in 2001-2002. A combination of lectures, practical exercises, and case studies were used as tools to deliver this information. The following is an outline of the training that was developed and delivered.

**Module 1 - Design-Build Project Definition**

- Design-Build: The What and Why
- Design-Build Project Candidates
- Organizational, Technical, Cost, and Schedule Criteria
- Project Description Process
- Functional Analysis Systems Technique
- Preparing Requests for Proposals (RFP)
- Risk Analysis and Allocation
- Design-Content in the RFP
- Defining the Designer of Record
- Writing Performance Requirements
- Preparing Proposals: The Design-Builder's Perspective

**Module 2 - Evaluation Planning and Final Selection**

- PEB and TET Team Selection
- Writing the Evaluation Plan
- Defining Best Value
- Worth Assessment
- Award Methods
- Establishing the Competitive Range
- Discussions and Final Selection
- Debriefing

**Module 3 - Design-Build Project Administration**

- Contract Award Procedures
- Corrections to the Proposal
- Partnering
- Pre-Work Conferences
- Initial Design-Conference
- Pre-Construction Conference
- Design Administration
- Reviewing for Compliance
- Design Submittals
- Design QA/QC
- Construction Administration
- Construction QA/QC
- Construction Inspections
- Construction Scheduling
- Progress Payments
- Contract Close-Out

WSDOT should continue to implement this training for future design-build teams. It should also incorporate the many lessons learned on this pilot project into the educational program. During the educational sessions, WSDOT participants from the SR 500 Thurston Way pilot project attended and contributed to the classes. This was very effective and is encouraged in any future training sessions.

### *Dispute Resolution Process*

The dispute resolution board (DRB) was employed once on this pilot study project. A dispute could not initially be resolved in the field and it was escalated to the DRB. WSDOT used a standard design-bid-build DRB for this design-build project. A summary of the dispute as presented to the board follows.

> The conflict centered on the design of a ramp weave section. WSDOT made design review comments based upon the design-builders 75% design submittal. The design-builder did not agree with the comments but, after discussion, made changes to the design as a result of the comments. Several months later, the design-builder claimed that WSDOT had directed the design change and was liable. The design-builder argued that: 1) the 75% design was correct and WSDOT was in error; 2) WSDOT ordered the design-builder to make the change; and 3) they did protest (albeit verbally) to the direction. WSDOT argued that: 1) there was no direction of any sort and the comment was just that – a comment to be addressed; 2) no formal disapproval of the design was made; 3) there was no protest lodged (in accordance with the contract); and 4) the comment itself was valid (though WSDOT argued that this was an irrelevant point).
>
> The DRB board was asked by WSDOT to rule on a contractual issue: Was there the possibility for entitlement given that the design-builder did not register a formal protest the comment but instead incorporated it without formal protest as required by the contract?

Before the DRB rendered its decision, a resolution was reached mutually between the parties. However, the nature of the dispute described above is cogent to this evaluation. The dispute centered on entitlement. However, the nature of the problem and the presentation before the DRB definitely contains both design and construction elements. On this DRB, as is the case for standard design-bid-build DRBs, the members primary experience was in construction and construction administration. However, the design-build process administers design under the very same contract as administration (refer again to Figure 1). For a DRB to be ultimately effective, there must be representatives with both design and construction experience. Ideally, the DRB should have design-build experience, but WSDOT will likely have to go outside of its current DRB member (likely even out of state) to find people with this type of experience.

# Lessons Learned & Recommendations

Throughout the course of the pilot project, the evaluation team documented a number of lessons learned and recommendations. These were derived from both the analytical performance evaluation and interviews with project stakeholders. Each stakeholder group provided valuable input about what was beneficial, as well as areas of the process that can be improved. Although the majority of the stakeholders expressed that they believe design-build has a place in the public transportation sector and that WSDOT should participate in design-build projects, several issues concerning the RFQ/RFP evaluation and contract administration processes were discovered. These are presented in chronological order beginning with the RFQ process and continuing through contract administration.

## RFQ Lessons Learned and Recommendations

The following is this evaluation team's assessment of the areas in the final RFP selection process that require improvements. In conducting the interviews with the TET, several key issues were mentioned consistently. The concerns most often mentioned were: RFQ clarity and interpretation, WSDOT/design-builder interface during the RFQ process; RFQ point weighting and scales; RFQ QA/QC requirements; financial statement requirements; design-builder past performance; and scoring team experience.

### *RFQ Clarity and Interpretation*

The majority of the survey respondents that chose not to submit an RFQ addressed RFQ clarity as the main issue that deterred them from participating in this project. Respondents consistently questioned exactly what WSDOT wanted in the POQ submittal. RFQ clarity also proved to be the biggest problem for the submitting teams not short-listed. Misunderstandings about subject matter and length were both problem areas that the teams felt adversely affected their score. These respondents also expressed that the RFQ document could have been more definitive in how each section was scored, not just the number of points available. An example of this misunderstanding is in the safety program portion of the RFQ. One design-build team outlined their company's safety program and safety record, where the RFQ scoring was based on the design-builder's safety program for this specific project.

- Focus on RFQ clarity, length, and point weighting so that its requirements are more definitive. This will improve initial design builder participation, while also increasing the quality of POQ submittals.

### *WSDOT/Design Builder-Interface During the RFQ Process*

An issue that the submitting teams felt strongly about is the lack of interface between WSDOT and the submitting design-builder. They felt that many of the issues of confusion could have been clarified if they were allowed to ask more questions.

- More information should be provided to design-builders regarding a point of contact within WSDOT that they can contact with questions. This should remain a single point of contact within WSDOT so that any new information can be communicated to all design-build teams equitably.

### *RFQ Point Weighting and Scales*

WSDOT team members consistently mentioned concern over the weighting of points in specific portions of the POQ scoring. An example of this is the weight given to the *project understanding* portion of the RFQ. Most members agreed that this type of information is not as pertinent as each design-builder's past performance and/or team organization during the pre-qualification process.

The majority of the scoring team members also expressed concern over the lack of an accepted average score for each section and what types of requirements would be accepted as average or minimum. This was also an issue during the final short-listing, when a consensus on the scores was needed to decide which teams would continue on the project. An accepted scoring average would provide a basis from which the scores could be compared.

- In order for the scoring system to be truly effective, the scoring of the submitted POQs needs to be systematic in nature and homogeneous across all sub-criteria. Re-evaluate the pre-qualification criteria point weightings and revise them to clearly convey and achieve project goals. To achieve a more consistent and comparable scoring range during the POQ evaluation, a scoring minimum and/or average should be established and communicated to each individual WSDOT evaluation team member. Prior to review, team meetings should be held to establish which criteria make up this minimum score, and which should be rewarded more points.

### *RFQ QA/QC Requirements*

Most of the non-participating teams had problems finding or selecting firms to do QA/QC. Some firms cited the stringent requirements, while others simply could not find QA/QC firms that were interested in the project. The actual design-build QA/QC firm of record stated that they did not have much serious competition for the job. This is an area that may need to evolve more in the Washington private transportation sector for both design-build and design-bid-build.

- WSDOT must clearly and concisely state the QA/QC requirements in the RFQ. If more design-build firms are desired, more flexible RFQ QA/QC requirements could increase initial participation. Responsibility for QA/QC monitoring has shifted substantially from WSDOT to the design-build teams, thus creating a need for new internal and external QA/QC activities on behalf of the design-builders. With increased design-build activity in the public transportation sector, these new QA/QC roles will become more commonplace, but for the first few design-build projects,

WSDOT should solicit feedback from the regional contractors, designers and QA/QC firms on each project to ensure that they are achieving full participation.

### *Financial Statement Requirements*

Financial statements also caused considerable concern among a few of the non-participating firms. One firm in particular found the amount of time given to submit the POQ inadequate in order to prepare such an in-depth financial statement. Others agreed that only large firms have financial statements done regularly and therefore it is unreasonable to make such a request on a smaller firm to submit this type of information over such a short period.

- More flexible financial statement requirements could increase design-builder participation by decreasing the detail required from proposers, thus allowing smaller "up and coming" firms to participate. It should also be required that larger firms who have subsidiaries in the region in which the work is to be performed need to submit that particular offices' financial statements, and not the firms national/international financial information. Longer RFQ advertisement periods will allow proposers more time to prepare such statements.

### *Design-Builder Past Performance*

During the scoring process it appeared that each team member explored the past performance of the submitting teams to a different degree. Some members took an active role in calling references and researching the teams past performances in WSDOT records, while others relied more on their personal experiences with the teams. It was reported by the design-builders that WSDOT evaluation team members' past experience or knowledge of the design-build teams may have biased their individual opinion. Such discrepancy in the research of past performance led to similar discrepancies in scoring.

- WSDOT should create a centralized, design-build specific experience database to objectively and consistently evaluate relevant experience. Until that database is created, a third party, perhaps another region within WSDOT, should conduct past performance research and report to the scoring team on their findings, thus each evaluator can make a judgment based on the same information.

### *Scoring Team Experience*

Another issue mentioned frequently from the WSDOT POQ scoring teams was the individual experiences and expertise of each team member. While the scoring team was diverse in backgrounds ranging from construction to design, concern was expressed over the ability of some individuals with little or no experience in a particular field to score a submitting team accurately in that area.

- In order to more effectively evaluate the POQs, the scoring teams should be organized to obtain a higher correlation between the individual evaluator's professional specialty and the area of the POQ that they are scoring. In addition, pre-scoring training as to what types of solutions would be scored higher by an expert in the field could be beneficial to the POQ scoring.

## RFP Lessons Learned & Recommendations

The following is this evaluation team's assessment of the areas in the final RFP selection process that require improvements. In conducting the interviews with the TET, the design-builder, and in the quantitative analysis, several key issues were mentioned consistently. The concerns most often mentioned were: prescriptive nature of the RFP, point distribution concerns, insufficient education and training of the TET and PEB, amount of stipend, use of warranties, TET scheduling, and WSDOT/design-builder interface.

### *Overly Prescriptive RFP*

The high cost of design and lack of innovations proposed by the design-builder is a result of the prescriptive nature of design in the RFP. Members of the TET, PEB, and proposing design-builders also noted that there was a relatively high level of prescriptive design in the RFP. Due to either the extended RFP preparation period created by the delay in funding or the existing WSDOT culture, the RFP contained a large amount of prescriptive design. A primary advantage of the design-build process is the opportunity for competing design-builders to propose constructable and innovative solutions that can save time, save money, or add long-term value to the project. The SR 500 Thurston Way Interchange was originally chosen as a pilot project because of its potential to exploit innovative design solutions to the logistical transportation concerns of the area, but in the end, the project team noted few innovations as a result of the process.

- Decreasing the amount and prescriptive nature of design in the RFP could result in more creative and effective designs and construction methods. WSDOT will also see less cost in RFP preparation. By utilizing more performance-oriented criteria in the RFP, WSDOT will increase the chances of owning a more innovative and efficient design solution.

### *Point Distribution and Impact of Scoring Differential*

A consistent area of trouble within the RFP selection phase was the confusion as to how the submittals should be scored. More specifically, what constituted a minimum score for meeting the minimum requirements set forth in the RFP and how much should have been added when those minimums were exceeded. Along with this, many of the TET members conveyed a lack of understanding regarding the value of a single point when scoring the BAFPs. For example, one single point, given an average score of 500 out of 1000 points, represented approximately $30,000. Therefore, to counteract this one point technical scoring differential, a competing design-builder would need to bid $30,000 less than the company who was awarded the additional point. In essence, one technical point

was worth approximately $30,000. This lack of understanding originally led to some rather extreme deviations in scoring. The PEB asked the TET to justify their original point differentials and some of the TETs modified their initial scores given this knowledge of point value.

- The point distribution should be provided to TET members and design-builders at a greater level of detail. This will let all stakeholders understand the goals of the project as defined through the value given to the individual technical sections. Second, as previously stated, the TET members should assist in drafting the RFP. This will enhance the point allocation and scoring process. Finally, TET education prior to the start of the evaluation should be enhanced.
- WSDOT did not make use of pass/fail scoring for evaluation criteria. Pass/fail scoring should be considered when criterion can be expressed as minimum or threshold values. Direct point scoring should be considered only when measurable value can be added to the project through the criteria being scored.

### *TET and PEB Education and Training*

One of the most potentially detrimental issues that this evaluation team encountered was the insufficiency of TET and PEB training. The training sessions were held several weeks prior to the evaluation of the BAFPs, and the relative level of interest in the training subject matter was low. Since this is the first time through the design-build process, this lack of training is understandable.

- First, and most importantly, stress the importance of the training sessions, and heavily encourage participation regardless of experience. Second, hold the training sessions closer to the actual time of evaluation, as many members felt the time elapsed since the training had affected the amount of material they remembered. Finally, hold a separate training session for scoring alone. It would be beneficial to provide sample evaluations of fictitious projects for practice evaluations. As WSDOT gains more experience with design-build, these sample evaluations and training can be derived from real projects.

### *Amount of Stipend*

A critical area of concern from the proposing design-builders was the amount of the stipend. Initially, the stipend was set at $75,000. After the project was put on hold, then reinstated, the stipend was decreased to $50,000. The design-builders were very concerned about this decrease. They felt that the amount awarded for the submitted BAFPs was insufficient.

- The evaluators of this report feel that offering an appropriate stipend increases the overall competition of submittals. In ad hoc discussions with the design-build community, the consensus seems to be that in a two-phase process with 3-5 offerors, the stipend should equal approximately one-third (1/3) of the design effort. In fact, stipends can be offered as a reimbursement at one-third (1/3) of the offerors auditable

design hours. This level will offset the designers actual costs without decreasing competition. WSDOT should be cautious of simply applying a set percent (i.e. 0.2% of the project cost) because the amount of design effort varies from proposal to proposal. An estimate of actual design effort is the most equitable way to accurately determine stipends.

### *Use of Warranties*

Another area of concern relates to the use of warranties. In the Thurston Way Interchange pilot project, feedback from the proposing design-builders indicates that the 5-year pavement warranty outlined in the RFP was achieved by at least one of the design-builders through including the cost of an overlay at the end of 5 years. This is very expensive for WSDOT as the design-builders had to assume a cost of asphalt in five years and bid the overlay whether it will be required or not.

- WSDOT should reconsider the use of warranties in conjunction with design-build. It is the evaluation team's recommendation that WSDOT experiment with warranties separately. Once WSDOT is satisfied with the use of warranties on their own merit, only then should they consider combining this practice with the design-build process.

### *TET Scheduling*

The TET members were effectively required to stop working on their current projects entirely, and focus solely on evaluating the BAFPs. This immediate drop of their regular work schedules was seen as burdensome and cumbersome. While many of the members of the TETs were satisfied with the amount of time allocated to complete the evaluations, they felt that dropping everything for a week was difficult. The biggest problem came with those TET members that have customers outside of WSDOT.

- It is imperative that the evaluation period does not change so the evaluation teams can properly plan their work. Taking care to arrange the evaluators' schedules so that their workload allows them to integrate the evaluation of the BAFPs into their regular work rhythm would be less burdensome on the evaluators.

### *WSDOT/Design-Builder Interface*

One of the most consistently mentioned issues was the communication barrier that existed between the proposing design-builders and WSDOT. Many individuals on both sides of the spectrum would like to have seen more communication available. There was consistent mention on behalf of the design-builders concerning the lack of crucial design information. They noted that allowing more questions to be asked only serves to enhance the outcome of the project. Considering the liability issues involved with completely opening the lines of communication between the design-builders and WSDOT, a more effective medium may be reached.

- This evaluation team feels that allowing more clarifications for the design-builders only helps the project reach its long-term goal: to obtain the best project. Owner resources must be massed during the proposal stage to quickly and accurately answer questions. Also, the enhanced use of a single point of contact overseeing all questions and answers will ensure the integrity of the process.

### *Teamwork*

Employing the use of teams when performing the technical evaluations of the BAFPs was seen as one of the strong points in the final selection process. The majority of the TET and PEB team members felt that using a group of professionals to evaluate each section helped in the selection of the best proposal. The diverse backgrounds of the individuals provided unique and alternative perspectives. Beyond the separate technical teams, the use of a more global teamwork approach to the overall evaluation process helped as well. By holding a meeting of all the team members at the end of the first evaluation day, they were able to gain more understanding as to how the evaluation process should work and they were able to adjust scoring methods to achieve better consistency. The interviewees saw this collaboration as a valuable learning experience.

Although the teamwork was excellent, the cost and time involved with including such a large number of individuals created undue burden on WSDOT. Future evaluation team could be smaller. Key individuals may be able to cover more than one technical review area – creating a more streamline review process while keeping the team review intact. Other DOTs (most notably Arizona and Florida) have completed larger projects successfully with only five to seven team members reviewing the RFP. The size of WSDOT's review team was that seen on corridor level design-build projects like the Utah I-15 and Colorado I-25 projects.

### *TET Review Schedule*

WSDOT chose to designate an entire workweek for evaluation of the BAFPs. While having to accommodate this into their schedules, the TET felt that the time allocated for review was sufficient. Some groups used the entire week to complete their evaluations, while some only needed a few days. Regardless, it was seen as a benefit to the selection process to allow adequate time to complete the evaluations in a careful and thorough manner. Had WSDOT not allowed enough time and pushed the TET members to perform these evaluations in less time, the selection process may have been put in jeopardy.

## Construction Administration Lessons Learned & Recommendations

This final lesson learned section is the evaluation team's assessment of the contract administration areas that need improvement. In conducting the interviews with the WSDOT contract administration team, the design-builder, and in the quantitative analysis, several key issues were noted. The issues most often observed were:

clarification of the proposal, design development/design review, co-location of project team, QA/QC, partnering, and communication.

### *Clarification of the Proposal - Betterments and Deficiencies*

Given the conceptual nature of both the Request for Best and Final Proposal generated by WSDOT and the resulting proposal generated by the design-builder of record, clarifications to the proposal will certainly be encountered. These clarifications generally for all into two major categories: *betterments* and *deficiencies*. Betterments are defined as elements of the proposal that exceed WSDOT requirements. Betterments may help the design-builder to win the best value proposal by adding points to their proposal Deficiencies are elements that do not meet WSDOT requirements. WSDOT requires that deficiencies be corrected before the final contract award, but due to the conceptual nature of the project at time of award and the relatively short proposal review period, there are certainly some deficiencies after award and during the project design process.

When the RFP for the Thurston Way Interchange was created, about 30%-50% of the design was completed. With the nature of the design-build process and its incorporation of performance specifications, instances will certainly occur where a design element is in excess of or does not completely meet design requirements. These instances, if not dealt with fairly in the spirit of partnering, can result in an adversarial relationship, which is in contrast to the fiduciary organization sought by the design-build team and owner. The difficulty arises in identifying which elements are betterments and which are deficiencies without 100% design. The earlier these elements are identified, the better they can be addressed in fairness to all party's involved. Some cases may occur in which the betterments and deficiencies cannot be clearly identified until they have already been incorporated into the project. In this case, each side should discuss a solution to the problem that best benefits the project and all involved. If a mutual solution cannot be found, there very well could be legal grounds for a contract change. A spirit of partnering and a unified project focus could help to guide how these conflicts could be consistently resolved (quality, schedule, cost, etc.)

- Make every attempt to clarify the proposal and identify betterments and deficiencies when the final contract is being negotiated. Make a list of items that fall in either category and discuss how each should be dealt with to benefit all entities involved. For the owner to keep all betterments and refuse to pay for any changes needed to correct deficiencies is a formula that may result in adversarial relationships with the possibility of litigation resulting in expense for all parties. The owner should identify any betterments they wish to keep in the project at execution of the contract, especially if these betterments resulted in best-value points that helped the design-builder to be awarded the project. WSDOT must also consider compensating the design-builder by paying for some of the deficiencies that must be corrected to meet requirements. A fiduciary attitude will be fair to all involved and result in a successful project. By placing the requirement that the design-builder bears all risk for errors in the initial proposal WSDOT will ultimately pay additional money for the added risk placed on the design-builders.

***Design Development and Design Review***

The design development and review process encounters similar issues as the process of proposal clarification as described above. WSDOT and the design-builder must be in constant communication to ensure that the design is developed within the project requirements and the design intent of the RFP. Information gathered from the interviews revealed that design review using the "over-the shoulder" review process is an area that could see improvement in future design-build projects. It seems everyone agrees with the "over-the-shoulder" review process as described in the WSDOT Design-Build Guidebook but that the SR 500 Thurston Way Interchange project did not fully apply the process due to the relatively small size of the and dispersed location of the parties involved in the process and the isolated nature of the project. One of the reasons was attributed to not having all key personnel being co-located.

The design-build process offers the innovative opportunity to begin the construction of the project without the design being completed. For this to be accomplished, WSDOT must turn over many of the design details to the design-builder. Although the referenced standards and design guidelines ensure that the design will be done in accordance with accepted engineering practice, the review process results in a very non-traditional and often uncomfortable role for the department. As the construction moves forward, so will the design until 100% design is complete. During this design development phase, WSDOT has the responsibility of conducting review for design compliance with the RFP and proposal. This type of compliance review can most efficiently be accomplished via an "over-the-shoulder" review consisting of an examination the project concurrently with its design and development.

When differences are noted, WSDOT should recognize the gap in the contract language and make a management decision. Should the design-criteria gap be widened or should WSDOT revise the way it approaches this particular problem? Each difference will need to be evaluated on its own merits. Documentation will be a key to the success of the project design and administration.

As stated in the request for BAFP, *"Review by WSDOT does not include detailed review or checking of design of major components and related details or the accuracy with which such designs are depicted on the plans."* By awarding the design-build contract, WSDOT is transferring ownership of the design details to the design-builder. The approval of the final design is not always done until final project acceptance. This brings in the issue of design review pertaining to ***compliance versus acceptance***. In a design-build process, the review should check for compliance with the performance criteria outlined in the request for proposal. This takes a whole new way of thinking for WSDOT with the difficulty of separating design preference from interpretation of the guidelines. The WSDOT Design-Build Guidebook state, *"If the proposed design meets the requirements of the contract documents, no significant changes can be made without a corresponding contract change order."* WSDOT is responsible for only making comments related to non-conforming design elements per the contract documents. Any

other preferential comments may be made but only for the design-builder's consideration. The design-builder then may make the decision to incorporate preferences of WSDOT, but a change order could be the result.

Another aspect of the design review process that was mentioned in the interview process was the issue of having 100% design completed on design package submittal before construction can begin. Due to the fast-track nature of design-build, the design-builder will invariably submit numerous design packages to facilitate phased construction. The current WSDOT policy states that these design packages must be 100% complete before construction can commence. This concept seems to be too owner-controlled for the design-builder and too cumbersome for WSDOT. The design-builder is finding it difficult to submit the 100% design before construction is ready to start. The design-build should be able to begin construction before 100% design is submitted at their own risk provided there is no exposure to either public risk (traveling public) or environmental impact (non-permitted area). Under the current design-build methodology, WSDOT should not be taking responsibility of 100% design approval until the entire project design is completed.

- Continuously ensure that the design review process is for *compliance* to the contract documents and referenced design manuals versus the professional *preference* of WSDOT individuals. It is important to incorporate a new way of thinking in the design review process because traditional design review practices could result in costly change orders and scope growth. The design-builder will certainly not design exactly the same project that WSDOT would have design through the design-bid-build process, but the design-builder is contractually, professionally, and ethically responsible for designing a project that meets all State, Federal and Local requirements. By making preferential changes in the project design, WSDOT may be increasing cost through change orders and retaining the risk for design details that are intended to be re-assigned to the design-builder through the new contract process. WSDOT must take a audit role rather than that of a full reviewer.

- Consider allowing the design-builder to begin construction on any particular design package before 100% completion at their own risk. 100% design approval by the owner should not take place until the entire project design is completed.

### *Co-Location of Project Team*

Co-location is the concept that deals with having representatives from each entity involved in the design-build process located at the project site, particularly the owner review staff and the designers. The benefit of co-location is the availability of involved individuals to expedite decisions on questions directly associated with the project. Although co-location was originally proposed by the design-builder, it was agreed upon by the project team early in the project that co-location of the designer, builder, and WSDOT members could not be achieved with the Thurston Way project due to project size and geographic limitations. Alternatively, the team agreed to conduct one-on-one meetings at common intervals. However it was mentioned by almost all team members

that the incorporation of co-location could further benefit the communication process and the project in general.

Design development after award is directly associated with the benefits sought in the design-build method and co-location greatly enhances the opportunity to reach the goals. Often, communication via phone or email is not sufficient in reaching a clear and viable solution to a project question that everyone readily understands. Granted, many projects do not suit co-location well depending on the size of the project from a cost standpoint or the frequency critical questions will occur that may affect any single entity involved. Co-location has been seen as a benefit in the design build process. Each individual entity's input throughout the contract administration process is invaluable from a constructability standpoint and bodes well for the fast-track concept that is clearly one of the prime benefits of delivering a project with the design-build method.

- Exhaust every attempt possible to have representatives from each entity involved in the process located on site regardless of the size of the project. As the project size increases, the necessity of co-location becomes more critical to the success of the project. The people involved in co-location must have the authority and expertise to address questions that may arise concerning the party they represent. The benefit of providing on-site individuals from each contributing party is speed in decision making, which will translate to quicker production and less changes.

***QA/QC***

QA/QC is one of the fundamental issues when delivering a design-build project. The WSDOT Design-Build Guidebook states, *"The QA/QC Program is a critical component of the design and construction of the project. It partly represents assurance to the Department that the Design-Builder is executing in accordance with the contract. WSDOT will provide the quality assurance and independent testing, but the established QA/QC Program is the backbone for which Department will gauge compliance."* An audit process rather than an inspection is needed and requires a new way of thinking by WSDOT to administer a design-build project. The audit process should be an activity occurring during the project with very little disruption to the design and construction sequence. This should include regular reviews of the QA process documentation to constantly ensure compliance with the design-builder's proposal. With reduced hands on inspection by WSDOT, there needs to be a much greater reliance on statistical analysis and reports to address long-term quality concerns. Offering an optional maintenance service to be provided by the design-builder is one avenue to better ensure long-term quality. The Thurston Way project has the benefit of utilizing strong team members from the owner and design-builder, which seems to have eliminated any long-term quality concerns.

The responsibility of the overall QA/QC program resides with the design-builder. The process outlined in the contract was followed very conservatively on the Thurston Way project due to the first time use of the design-build process. The statistical evaluation process is new and should be analyzed for continuous improvement. The role of the sub-contractors is another area to be assessed. Time is the issue associated with excessive re-

testing and this seems to be one area where improvement can be realized. Clear interpretation of problems by WSDOT accompanied by a viable solution is also critical to benefit the QA/QC process.

- The Thurston Way project has benefited from top personnel from the owner and design-builder. Every attempt should be made to continue this theme in future design-build projects to ensure the effectiveness of a new project delivery method such as design-build. The testing responsibilities and frequency should be better focused on areas of concern and eliminate redundancy in areas that do not call for it. Constant reference to the guidelines and contract documents is recommended to address all QA/QC concerns. If traditional QA/QC roles are taken in design-build, there will be too much redundancy in the process resulting in additional time, additional cost, and the possibility of the Department taking risk that has contractually been assigned to the design-builder.
- Technically, "field-fit" engineering designs belong to the designer, but the timeliness required for formal design incorporation by the designer of record would have negated the time savings of design-build delivery. This was essentially solved through WSDOT allowing the QC/QA inspector to review these solutions. This system requires that a competent QC/QA inspector be employed on the project. The system employed on this project may not work as standard practice on future projects.
- In future design-build projects, the Department's role must change from QA/QC to that of QA/audit/verification. The design-build contract is written to transfer the responsibility of design details to the design-builder. The department must make this change in roles if this transfer of responsibility is to be realized in practice.

### *Partnering*

Partnering is critical to the success of a design-build project. The design-builder is an extension of the Department. The relationship between the Department and the design-builder is similar to that of a design consultant, rather than a low-bid contractor. All of the issues mentioned above require the presence of partnering to realize the benefits of design-build. Clarifying the proposal with respect to betterments and deficiencies must incorporate the partnering structure. Design review and changes will be in the best interest of the project when partnering is active throughout the project. The concept of partnering is much more important in design-build than traditional projects and open communication with a fiduciary way of thinking will help to ensure that the project is a success for all parties involved. Open communication is the key to the partnering philosophy and should always be apparent in the perception of all parties.

- Always communicate openly with all parties involved and seek to utilize the fiduciary relationship needed to result in an effective project administered design-build. The partnering charter should be revisited at critical milestones throughout the project, such as midpoint of design and start of construction so all parties can be involved as the project progresses. Even without the benefit of co-location on

the Thurston Way project, all key personnel need to be available through some type of medium to address issues when called upon.

### *Communication*

Communication was regarded as good between the design-build team and WSDOT. WSDOT personnel found that the communication was strong because of the individuals compromising the design-build team. Turn around times for questions posed by the design-build to WSDOT were much faster in this project than a design-bid-build project. Weekly meetings were held between the design-build team and WSDOT. The design-build communicated a two-week look ahead schedule so that WSDOT was informed on the project's progress.

# Conclusions

The design-build process developed by WSDOT and applied on the SR 500 Thurston Way interchange delivered a high quality product, which was on time and had minimal cost growth after award, but the value of the project was diminished by the excessive project costs when compared to the traditional delivery method and undue administrative burden placed on the Department. Both the design-builder and WSDOT teams were comprised of top management personnel with strong leadership skills. The quality of the team had much to do with the successful aspects of the project.

Much of the original WSDOT design-build process was based upon lessons learned from other states that were working on very large projects. This system was then applied to a relatively small project in a somewhat rural environment. The complex process designed by WSDOT placed an undue amount of risk on the design-builder and the subcontractors for a project of this size. Additionally, the overly prescriptive design in the Request for Proposal (RFP) and contractually mandated schedule gave the design-builder little opportunity to innovate. There were many lessons learned on this pilot study and there is a potential for WSDOT to realize expedited delivery and lowered administrative burden, but the Department will need to consider applying design-build to different types of projects or making some radical changes to their current process.

The following is a summary list of recommendations from lessons learned throughout this pilot project evaluation.

- Design-build has the potential to greatly reduce project delivery time for the Washington State DOT and the majority of stakeholders closely involved with the pilot project stated that design-build has a place in the delivery process. However, fundamental changes to the current process must be made to reduce costs. Additionally, should only consider projects for design-build when they can readily employ performance criteria for design and significantly benefit from the compressed schedule.
- WSDOT should continue to work closely with the professional community to allocate risk appropriately to the party that can best control them on future projects.
- Internal and external training and education must continue if there is to be a true cultural shift towards design-build.
- A comprehensive set of performance specifications needs to be developed to allow for more innovation in design and construction while ensuring quality and safety to the traveling public.
- The best-value selection process should tested and refined on future projects to ensure that it is not overly burdensome for the industry or too costly for the state. The amount of stipends should be considered individually on each project on the basis of the amount of design required in the proposal.
- WSDOT should reconsider the use of warranties in conjunction with design-build. It is the evaluation team's recommendation that WSDOT should experiment with

warranties separately. Once WSDOT is satisfied with the use of warranties on their own merit, only then should they consider combining this practice with the design-build process.

- Co-location and over-the-shoulder design reviews should be attempted again in future projects that are larger in size. The full potential of these design development tools was not realized on this project. If co-location of designers and WSDOT reviewers is not possible, the design QC plan in the design-build manual should be revised to specifically state the review and audit process desired. WSDOT must take an audit role in this design QC process if they truly wish to benefit from the design-build schedule advantages.
- The testing responsibilities and frequency of the construction QA/QC system should be revisited on future projects. Although the costs were not excessive, the system should focus more on areas of concern and eliminate redundancy in areas that are under the contractual obligation of the design-builder.

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# Appendix A: Data Collection Questionnaires

POQ Evaluation Questions – Non-Respondent Questionnaire
POQ Evaluation Questions – Design-Builder Questionnaire
POQ Evaluation Questions – WSDOT Evaluation Team
BAFP Evaluation Questions – Design-Builder Questionnaire
BAFP Evaluation Questions – WSDOT Evaluation Team
Final Evaluation Questions – WSDOT Evaluation Team

# WSDOT Design-Build Program Evaluation

## Stakeholder Questionnaire

The Washington State Department of Transportation has contracted the University of Colorado to perform an independent evaluation of the WSDOT Design-Build Pilot Process. The attached questionnaire will facilitate the evaluation of the design-build process.

You have been chosen to participate because your firm showed an interest in the Design-Build process initially, but did not submit a Proposal of Qualifications.

Please take a few minutes to complete this questionnaire, as your comments are critical to the effective evaluation of this Design-Build Pilot Program.

Your responses to this questionnaire will be kept confidential. At no time will your responses be linked to your firm's name. The results of this study will be made available to you upon completion of the analysis. Thank you for your assistance.

## Section I: Non-Design-Build Issues

1. Did your company decided not to participate for non-Design-Build related issues, such as:
   - Large backlog of work
   - Projects not in your geographic region
   - Projects outside of your expertise

   ❑ Yes ❑ No

Please explain:

_____

_____

_____

_____

If the answer to question 1 was "Yes", skip to Section IV.

## Section II: WSDOT Design-Build Issues

1. Did your firm have enough **time to respond** to the RFQ?

   Non-Issue — Needed More Time

   1 2 3 4 5 6

2. Did you anticipate the **organization of the WSDOT Design-Build Program** would not lead to a successful project?

   Non-Issue — Too Disorganized

   1 2 3 4 5 6

3. Did your firm feel that the **inexperience of the WSDOT Design-Build Program** would lead to problems with the project?

   Non-Issue — Too New

   1 2 3 4 5 6

4. Was the Design-Build process **clearly explained**?

   Non-Issue — Confusing

   1 2 3 4 5 6

## Section III: Company Design-Build Issues

1. Would the Design-Build process shift too much **project risk** onto your company?

   Non-Issue — Too Much Risk

   1 2 3 4 5 6

2. Did your company feel a Design-Build project has a small **potential for profit**?

   Non-Issue — Not Profitable

   1 2 3 4 5 6

3. Did your firm have **difficulty finding a partner** to complement your services for a Design-Build project?

   Non-Issue — No Partner

   1 2 3 4 5 6

4. Would the **conversion to Design-Build operations** be too difficult/costly for your company at this time?

   Non-Issue — Too Difficult

   1 2 3 4 5 6

5. Would your company provide Design-Build services for future projects?

   ❑ Yes ❑ No ❑ Maybe

Please explain_____

6. Other:

   Non-Issue — Significant Factor

   1 2 3 4 5 6

## SECTION IV. AREAS OF IMPROVEMENT

Please identify areas where your experience indicates improvement is needed. For example:

- What would have allowed your company to participate in the Design-Build process?
- Explain the changes necessary for your company to participate in future Design-Build Projects.
- Does your company believe WSDOT should engage in Design-Build?
- Why or why not?

_____

_____

_____

_____

_____

_____

_____

_____

## SECTION V. CORPORATE INFORMATION

*Please complete this section so that we may forward the results of this survey.*

_____
Your Name

_____
Position/Title

_____
Agency or Company

_____
Department

_____ _____
Street Address or PO Box Suite #

_____ _____ _____
City State Zip Code

_____ _____ _____
Telephone Number Fax Number E-mail Address

Annual Company Construction Volume $ _____

What type of agency or company are you employed by?

- ❒ Design-Build
- ❒ Architecture/Engineering
- ❒ General Contracting
- ❒ Construction Management
- ❒ Other

## POQ Evaluation Questions – Design-Builders

1. Did your firm have enough time to respond to the RFQ?
2. Describe the formation/organization of your team, who took the lead?
3. How much time did you spend preparing the POQ?
4. How reasonable were the following POQ evaluation factors?
   - Project Understanding & Approach
   - Design Builder's project team, key personnel and processes
   - Design Builder's past performance
   - Quality control program
   - Safety program
5. Please describe the aspects of the pre-qualification process you found to be most beneficial.
6. How can the pre-qualification process be improved?
7. Does your company believe that WSDOT should engage in design-build, are they prepared to?
8. What types of changes will make your company more competitive?
9. Please provide any additional comments.

## POQ Evaluation Questions – WSDOT Evaluation Team

1. How many POQ's did you review?
2. How many POQ's did you personally reject as non-responsive?
3. Please describe any trends associated with the POQ's you rejected, i.e. was there an area that was consistently non-responsive?
4. Please rate the amount of time allocated for training.
5. Please rate the security of the POQ evaluation.
6. Please rate the amount of time allocated for review.
7. How reasonable or appropriate were the following evaluation factors (Areas to be evaluated as listed in the RFQ):
   - Project understanding and approach
   - Design-Builder's project team, key personnel and processes
   - Design-Builder's past performance
   - Quality control program
   - Safety program
8. Was the Proposal Evaluation Team able to reach consensus on POQ scores?
9. Please consider the amount of time you spent preparing for the POQ evaluation including time spent reading the RFQ, attending training sessions, reading outside material, etc. How many hours did you spend preparing for the POQ evaluation?
10. Would you want to review another set of POQ's?
11. Would you want to review another set of POQ's using the same procedures?
12. Please describe what worked best in the review process.
13. Now that you have completed a POQ review how can the process be improved?
14. Please provide any additional comments.

## BAFP Evaluation Questions – Design-Builders

***Section I – General Questions***

1. Describe the formation/organization of your team, who took the lead?
2. Did your firm have enough time to respond to the RFP?
3. How much time did you spend preparing the RFP?
4. How reasonable was the stipend?

***Section II – Component Specific Questions***

These same three questions were asked for each of the technical sections below.

a. Please comment on the clarity of the RFP in this section?
b. (If unclear): How could this section be clarified?
c. Do you feel the number of points assigned to this section was appropriate?

1.0 Management and Organization (100 Points)
2.0 Schedule (100 Points)
3.0 Technical Solutions (800 Points)
- 3.1 Geotechnical and Earthwork (100 Points)
- 3.2 Pavement (100 Points)
- 3.3 Environmental (30 Points)
- 3.4 Roadway Design (160 Points)
- 3.5 Structures (100 Points)
- 3.6 Drainage (50 Points)
- 3.7 Construction Work Zone Traffic Control (120 Points)
- 3.8 Survey (40 Points)

***Section III – Final Questions***

1. Will your firm pursue another WSDOT design-build project?
2. If your company plans on bidding more design-build projects, what types of changes do you see your company making to be more successful in the future?
3. Please describe the aspects of the RFP process you found to be most beneficial?
4. In what ways can the RFP process be improved?
5. Do you think that the point distribution spread was appropriate? If you could have seen any change in the distribution, what would that be?
6. Do you have any additional comments?

## BAFP Evaluation Questions – WSDOT Evaluation Team

***Section I – General Questions***

1. Please rate/discuss the amount of time allocated for training.
2. Please rate/discuss the amount of time allocated for BAFP review.
3. Please comment on any security issues in the BAFP process.
4. Please rate/discuss the usefulness of the oral interviews.

***Section II – Component Specific Questions***

1. What specific (technical or PEB) component did you review?
2. How reasonable or appropriate were the evaluation factors?
3. Please describe any trends associated with the proposals that you reviewed, i.e. was there an area that was consistently non-responsive?
4. Was your (TET/PEB) team able to reach consensus on the final scores?

***Section III – Final Questions***

1. Please consider the amount of time you spent preparing for the BAFP evaluation including time spent reading the RFP, attending training sessions, reading outside material, etc. How many hours did you spend preparing for the BAFP evaluation?
2. Would you want to review another set of BAFPs?
3. Would you want to review another set of BAFPs using the same procedures?
4. Please describe what worked best in the review process.
5. Now that you have completed a BAFP review how can the process be improved?
6. Please provide any additional comments.

## Construction Administration Evaluation Questions

1. The communication process was previously reported as being strong from the project initiation. Is this still the case or have other communication issues become apparent?
2. Do you feel the regular meeting process has been beneficial in determining and resolving project issues?
3. Explain your understanding of the design submittal process (time & process) from the beginning of the project. Has your perception of the process changed? What changes would you make and what things would you keep?
4. What is your perspective about the value of the "over-the-shoulder review" process by WSDOT?
5. With respect to betterments and deficiencies, how should they be identified and treated fairly for all parties in the process?
6. With respect to the QA/QC process, are you currently following the process outlined in the contract or do you find yourself altering the process? What changes do you feel would be beneficial in future projects?
7. (For Owner) Do you have any long-term quality concerns as an owner with your reduced role as an inspector?
8. An issue mentioned in earlier interviews centered on WSDOT requiring a higher testing frequency than experienced on previous design-bid-build projects administered by WSDOT. Have the request for testing changed in the second quarter of the project?
9. In your opinion, how has safety changed in the design-build process versus design-bid-build process? What is you opinion on the lump sum concept for traffic control versus using unit cost?
10. (For Owner) The design-build process requires the owner to give up some control over the project, which areas do you feel there is a loss of control?
11. How has the design-build process affected, in either a positive or negative fashion, constructability issues?
12. With the high risk associated with a project like this, how has scheduling been affected? Have you experienced any major hurdles with respect to scheduling and do you attribute these difficulties to the design-build process?
13. The design-build project delivery method is a new process for Washington. After being exposed to the process, would you recommend using it again?
14. The construction documentation process was noted as being too cumbersome and frustrating before. How do you feel about it now?
15. What is your opinion of the dispute resolution process for this project? Do you support DRB?
16. What are your feelings on how the risk for this project has been allocated? Any idea on how risk should have been allocated differently (all to design-builder, shared risk areas, etc.)?
17. Positive aspects of the project?
18. Negative aspects of the project?
19. General comments?

## Final Evaluation Questions – WSDOT Evaluation Team

***Design***

1. *Overall design:* Was the quality of the completed design equivalent to a typical WSDOT project?
2. *General design criteria:* Overall did you feel the design criteria given for the project to the design-build team was satisfactory?
3. *Restrictive design criteria:* Please give an example of a design criterion that was overly restrictive for this project or hampered innovation.
4. *Insufficient design criteria:* Please give an example of a design criterion that was not sufficient. For example, did a particular criterion allow for a design that was outside of WSDOT standards? Did a particular design criteria result in a change order do to inadequate information being supplied to the design-builder?
5. *Design criteria improvements:* What improvements, if any, would you suggest with regard to the design criteria provided?
6. *A*s built drawings: Describe the quality of the as built drawings as compared to a similar design-bid-build project.

***Schedule***

7. *Design schedule:* How did design-build affect the design schedule?
8. *Construction schedule:* How did design-build affect the construction schedule?
9. *Owner's schedule:* On this project did you feel the schedule provided by the owner was reasonable? Why or why not?
10. *Overall Schedule:* Do you believe the overall time of the project would be different if it had been done design-bid-build?

***Communication***

11. Communication: An attempt to collocate parties throughout the project was not realized. Please describe the final communication structure between entities.
12. *Effectiveness of communication structure:* Did you feel it was an effective structure of communication? Why or why not? Would the communication have been different if the project was executed design-bid-build?

***Change Orders***

13. *Change orders:* We have a list of change orders on the project. Which change orders do you think were directly caused by the design-build process? Do you feel that any change orders were avoided through the design-build process?

***Quality***

14. *Quality system:* As planned, the design-build QA/QC system was intended to be quite different from the traditional design-bid-build process. In practice, how did the final design-build QA/QC system for both design and construction differ from the traditional design-bid-build QA/QC system?
15. *Product quality:* Can you note any product quality issues that were directly attributable to the design-build process? Can you note any traditional product quality issues that may have been alleviated by the design-build Process?

16. *General quality:* Do you feel the project outcome is of high quality? Why or Why not? And do you believe quality would be different if the project was executed design-bid-build?

***Safety***

17. *Safety*: Do you feel the project operations were run safely? Why or why not? And do you believe safety would be different if the project was design-bid-build?

***Dispute Resolution Process***

18. *Dispute resolution process:* What is your opinion of the dispute resolution process for this project? Does a design-build dispute resolution process need to be different from a design-bid-build process?
19. *Cause of disputes:* Do you feel the disputes during this project were a result of using design-build?
20. *Outcome of disputes:* Do you feel the outcome of the disputes would have been different if design-bid-build had been used on this project?

***Risk***

21. *General risk:* What are your feelings on how the risk for this project has been allocated? Any ideas on how risk should have been allocated differently (all to design-builder, shared risk areas, etc.)?

***Work Leveling***

22. *Project staffing:* Did you feel the entities involved were properly staffed to facilitate design-build?
23. *Design-Build Program:* Over a five-year period, what percentage of your total work could be done using the design-build process? (10%, 25%, 50% or 100%)

# Appendix B: Interview Participants

## Design-Build Teams at Request for Proposal Stage

**Teams not Short-Listed**

1. Atkinson Construction & Berger/Abam Engineers
   *Ken Dickson & Bob Adams* Phone: (425) 255-7551

2. Hamilton Construction Company & URS Corporation
   *Dave Place* Phone: (541) 746-2426

3. Scarsella Brothers, Inc. & Harding ESE, Inc
   *Bob Scarsella* Phone: (253) 872-7173

**Teams Short-Listed**

1. Kiewit Construction Company & Sverdrup Civil, Inc
   *Gordon Schwiesow* Phone: (360) 693-1478

2. F.E. Ward & David Evans and Associates
   *Ted Adlan* Phone: (360) 573-8929

3. Kuney Construction Company & Entranco Engineers
   *Max Kuney* Phone: (509) 535-0651

## WSDOT Proposal Evaluation Board Members

Alternative Project Delivery Manager
*Jeff Carpenter* Phone: (360) 705-7804

Southwest Region Design Engineer
*Bart Gernhart* Phone: (360) 905-2012

Southwest Region Construction Engineer
*Doug Ficco* Phone: (360) 905-2023

Project Manager
*Amy Revis* Phone: (360) 577-2230

Federal Highway Administration Representative
*Michael Kulbacki* Phone: (360) 753-9556

## WSDOT Technical Evaluation Team Members

| | |
|---|---|
| Construction Administration<br>*Wayne Hoppen* | Phone: (360) 905-2015 |
| Environmental<br>*Becky Michaliszyn* | Phone (360) 905-2174 |
| Schedule<br>*Amy Revis* | Phone: (360) 577-2230 |
| Construction Traffic<br>*Stan Markuson* | Phone: (360) 905-2241 |
| Geotechnical<br>*Tony Allen* | Phone: (360) 709-5450 |
| Structures<br>*Munindra Talukdar* | Phone: (360) 705-7752 |
| Design Admin.<br>*Chris Christopher* | Phone: (360) 577-2230 |
| Maintainability<br>*Steve Canter* | Phone: (360) 905-2130 |
| Surveying<br>*Neil Fancis* | Phone: (360) 905-2070 |
| Roadway Design<br>*Dave Bellinger* | Phone: (360) 905-2190 |
| Materials/Pavement<br>*Linda Pierce* | Phone: (360) 709-5470 |
| Traffic Design<br>*Stan Markuson* | Phone: (360) 905-2241 |
| Drainage/Stormwater<br>*Chad Hancock* | Phone: (360) 750-7091 |
| Public Relations<br>*Linda Mullen* | Phone: (206) 440-4704 |
| Utilities<br>*Tom Swafford* | Phone: (360) 905-2299 |

## Construction Administration Team

SW Region Head
*Amy Revis* Phone: (360) 577-2230

Transportation Engineer
*Craig Yasuda* Phone: (360) 901-3071

Alternative Project Delivery Manager
*Jeff Carpenter* Phone: (360) 705-7804

## Design-Builder Team

**CONSTRUCTION PROJECT MANAGER, MAX J. KUNEY CONSTRUCTION**

*Gregory T. Waugh* Phone: (509) 535-0651

**DESIGN-TEAM LEADER, ENTRANCO ENGINEERS**

*James Buss* Phone: (425) 454-5600

**CONSTRUCTION QA/QC MANAGER, KRISTEN BETTY & ASSOCIATES, INC.**

*John L. Aspaas, P.E.* Phone: (360) 574-5171

# Appendix C: BAFP Final Evaluation Scoring Matrix

## Technical Evaluation

| Evaluation Section | F.E. Ward | Kiewit | Kuney |
|---|---|---|---|
| Environmental (Possible = 30) | 19 | 7 | 15 |
| Survey (Possible = 40) | 21.6 | 20.7 | 19.1 |
| Structures (Possible = 100) | 46 | 54 | 49 |
| Geotech (Possible = 100) | 55.5 | 70 | 58.5 |
| Staging (Possible = 120) | 74 | 65.5 | 59 |
| Traffic (Possible = 100) | 50 | 43.5 | 44.5 |
| Roadway Design (Possible = 160) | 79.5 | 76 | 93 |
| Management & Organization (Possible = 100) | 53.1 | 49.5 | 50.8 |
| Drainage (Possible = 50) | 29.75 | 22.3 | 30.9 |
| Pavement (Possible = 100) | 51 | 41 | 51 |
| Schedule (Possible = 100) | 52.6 | 44.5 | 49.5 |
| | 532.05 | 494.00 | 520.30 |

## Best Value Score

| Component | F.E. Ward | Kiewit | **Kuney** |
|---|---|---|---|
| Technical Score | 532.05 | 494.00 | **520.30** |
| Lump Sum Bid Price | $24,232,197 | $22,731,000 | **$22,725,000** |
| Best Value Score<br>*(Technical Score x 10,000,000)*<br>*(Lump Sum Bid Price)* | 219.56 | 217.32 | **228.95** |

# Appendix D: Cost Data

1. Preliminary Engineering Estimate
2. Construction Engineering Estimate
3. WSDOT Engineer's Construction Estimate
4. Items Not Accounted For in Engineer's Construction Estimate
5. D-B Schedule of Values – Design and Construction

## 1. Preliminary Engineering Estimate

| Work Op Code | Work Op Code Name | THURSTON WAY |
|---|---|---|
| 0101 | GENERAL PROJECT MANAGEMENT | 290,043 |
| 0102 | TRAVEL TO/FROM OFFICE-JOBSITE | 2,544 |
| 0103 | TRAINING | 40,708 |
| 0104 | PROJECT DEFINITION/SCOPING | 16,538 |
| 0105 | EARLY ENVIR. SCOPING | 2,544 |
| 0106 | TRAFFIC & ACCIDENT DATA | 13,993 |
| 0110 | PREPARE ENVIRONMENTAL DOCUMENT | 16,538 |
| 0112 | BASE MAP PREP/PHOTOGRAMMETRY | 25,442 |
| 0114 | DESIGN REPORT | 292,587 |
| 0115 | VALUE ENGINEERING | 6,361 |
| 0118 | PAVEMENT/MATERIALS INVESTIGATE | 16,538 |
| 0120 | DESIGN HEARING | 1,272 |
| 0126 | FINAL ENVIRONMENTAL DOCUMENT | 1,272 |
| 0128 | DEPT APPROVAL-CORRIDOR/DESIGN | 1,272 |
| 0130 | BRIDGE/STRUCTURE SITE DATA | 1,272 |
| 0132 | PRELIMINARY STRUCTURE | 16,538 |
| 0134 | FNDTN INVEST/DESIGN,DETAIL STR | 296,404 |
| 0135 | CONSULT/LOCAL STRUCT PS&E REVW | 16,538 |
| 0140 | DEVELOP BASE MAP, R/W PLANS | 24,170 |
| 0142 | EARTHWORK / DRAINAGE | 10,177 |
| 0146 | APPROVE RIGHT OF WAY PLANS | 5,088 |
| 0148 | OTHER AGENCY PERMITS | 2,544 |
| 0150 | PREPARE P S & E | 326,935 |
| 0152 | SIGNING,ILLUM,SIGNALIZATION | 80,144 |
| 0154 | LANDSCAPING | 34,347 |
| 0156 | SURVEYING | 90,320 |
| 0160 | COMPILE P S & E | 5,088 |
| 0162 | REGIONAL P S & E REVIEW | 5,088 |
| 0164 | PRE-AD REVIEW | 1,272 |
| 0166 | CONSULT/LOCAL PS&E REVIEW | 1,271 |
| 0193 | AGREEMENTS | 157,743 |
| 0199 | BID PERIOD | 15,265 |
| **TOTAL** | | 1,817,856 |

## 2. Construction Engineering Estimate

| Work Op Code | Work Op Code Name | THURSTON WAY |
|---|---|---|
| 0301 | GENERAL PROJECT MANAGEMENT | 600,758 |
| 0302 | TRAVEL TO/FROM OFFICE/JOBSITE | 45,372 |
| 0303 | TRAINING | 27,223 |
| 0304 | EQUAL EMPLYMT OPP/MIN BUS ENTP | 2,903 |
| 0309 | GENERAL CLERICAL FUNCTIONS | 802 |
| 0310 | SURVEYING(ALIGNMT,ELEV,X-SEC) | 86,487 |
| 0311 | SURVEYING(GRADE CONTROL,PAVE) | 41,206 |
| 0312 | SURVEYING(STRUCTURES) | 8,352 |
| 0313 | SURVEYING(DRAINAGE INSTAL,SWR) | 15,809 |
| 0314 | SURVEYING (GENERAL) | 30,916 |
| 0320 | WORK DRAWS,PLAN CHK,DATA PREP | 98,394 |
| 0321 | PROGRESS/FINAL ESTIMATES,RECDS | 198,359 |
| 0322 | PREPARATION OF CHANGE ORDERS | 20,629 |
| 0330 | INSPECTION(SURFACE & PAVE) | 122,562 |
| 0331 | INSPECTION(STRUCTURES) | 117,978 |
| 0332 | INSPECTION(GENERAL) | 98,052 |
| 0334 | INSPECTION(GENERAL) | 271,067 |
| 0333 | ENVIRONMENTAL(INSPEC & SURVEY) | 24,516 |
| 0340 | TESTING (ROADWAY MATERIALS) | 109,133 |
| 0341 | TESTING(STRUCTURES) | 12,256 |
| 0342 | TESTING(EARTHWORK,DRAIN,MISC) | 72,990 |
| 0350 | WEIGHING,DISPATCHING,RECEIVING | 13,697 |
| 0351 | FIELD MEASUREMENT-PROGRESS/FIN | 3,128 |
| 0352 | FORCE ACCOUNT | 3,943 |
| 0361 | AGREEMENTS - (CE) | 9,884 |
| **TOTAL** | | **$2,036,416** |

# 3. Engineer's Estimate for Construction

| Item | Description | Meas. | Quant. | Price | Amount |
|---|---|---|---|---|---|
| | **Preparation** | | | | |
| 0001 | MOBILIZATION | L.S. | 1 | $951,000.00 | $1,157,000.00 |
| 0002 | CLEARING AND GRUBBING | ACRE | 4 | $5,000.00 | $18,800.00 |
| | Removing Asphalt Concrete Pavement | S.F | 43,750 | $2.30 | $100,625.00 |
| | Removing Curb | L.F. | 755 | $3.70 | $2,793.50 |
| | Removing Guardrail | L.F. | 521 | $2.00 | $1,042.00 |
| | Remove Cantilever Sign Structure | Each | 1 | $4,000.00 | $4,000.00 |
| | Remove Existing Fence | L.F. | 560 | $3.05 | $1,708.00 |
| | Removing Culvert | Each | 1 | $500.00 | $500.00 |
| | Removing Extruded Curb | L.F. | 90 | $3.00 | $270.00 |
| | Removing Sidewalk | L.F. | 1,400 | $8.00 | $11,200.00 |
| | **Grading** | | | | |
| 0006 | ROADWAY EXCAVATION INCL. HAUL | C.Y. | 2,869 | $6.00 | $17,214.00 |
| 0007 | PAVEMENT REPAIR EXCAVATION INCL. HAUL | S.Y. | 55 | $20.00 | $1,100.00 |
| 0008 | UNSUITABLE FOUNDATION EXCAVATION INCL. HAUL | C.Y. | 40,376 | $4.00 | $161,504.00 |
| 0009 | WETLAND EXCAVATION INCL. HAUL | C.Y. | 9,478 | $5.50 | $52,129.00 |
| 0011 | BORROW EXCAVATION INCL. HAUL | C.Y. | 317,696 | $5.00 | $1,588,480.00 |
| 0012 | EMBANKMENT COMPACTION | C.Y. | 200,000 | $1.00 | $200,000.00 |
| | Stone Column Ground Enhancement | S.Y. | 3,708 | $71.00 | $263,268.00 |
| | **Drainage** | | | | |
| 0015 | GRATE INLET TYPE 1 OR 2 | EACH | 6 | $1,650.00 | $9,900.00 |
| 0017 | QUARRY SPALLS (139 C.Y.) | TON | 139 | $38.00 | $5,282.00 |
| | Trench Drain | L.F. | 105 | $55.00 | $5,775.00 |
| | **Storm Sewer** | | | | |
| 0021 | CATCH BASIN TYPE 1 | EACH | 34 | $775.00 | $26,350.00 |
| 0022 | CATCH BASIN TYPE 2 48 IN. DIAM. | EACH | 9 | $1,585.00 | $14,265.00 |
| 0024 | CATCH BASIN TYPE 2 WITH FLOW RESTRICTOR/OIL SEPARATOR | EACH | 1 | $4,000.00 | $4,000.00 |
| 0025 | TESTING STORM SEWER PIPE | L.F. | 7,372 | $1.50 | $11,058.00 |
| 0026 | PLAIN CONC. STORM SEWER PIPE 12 IN. DIAM. | L.F. | 3,570 | $26.00 | $92,820.00 |
| 0027 | PLAIN CONC. STORM SEWER PIPE 18 IN. DIAM. | L.F. | 1,376 | $32.00 | $44,032.00 |
| 0028 | PLAIN CONC. STORM SEWER PIPE 24 IN. DIAM. | L.F. | 1,414 | $40.00 | $56,560.00 |
| 0029 | TR. 5 ST. STORM SEWER PIPE 0.064 IN. TH. 30 IN. DIAM. | L.F. | 20 | $44.00 | $880.00 |
| 0030 | TR. 5 ST. STORM SEWER PIPE 0.064 IN. TH. 42 IN. DIAM. | L.F. | 992 | $70.00 | $69,440.00 |
| | **Structure** | | | | |
| 0031 | STRUCTURE EXCAVATION CLASS A INCL. HAUL | C.Y. | 866 | $18.00 | $15,588.00 |
| 0032 | SHORING OR EXTRA EXCAVATION CL. A | L.S. | 1 | $20,000.00 | $20,000.00 |
| 0033 | GRAVEL BACKFILL FOR WALL | C.Y. | 564 | $24.00 | $13,536.00 |
| 0034 | EPOXY-COATED ST. REINF. BAR FOR BRIDGE | LB. | 321 | $1.00 | $321.00 |
| 0035 | ST. REINF. BAR FOR BRIDGE | LB. | 119,892 | $0.40 | $47,956.80 |
| 0039 | CONC. CLASS 4000 FOR BRIDGE | C.Y. | 1,026 | $300.00 | $307,800.00 |
| 0040 | DEFICIENT STRENGTH CONC. PRICE ADJUSTMENT | CALC | 1 | -$3,400.00 | -$3,400.00 |

## 3. Engineer's Estimate for Construction (Continued)

| | | | | | |
|---|---|---|---|---|---|
| 0040 | DEFICIENT STRENGTH CONC. PRICE ADJUSTMENT | CALC | 1 | -$3,400.00 | -$3,400.00 |
| 0041 | SLUMP AND AIR PRICE ADJUSTMENT | CALC | 1 | $60.00 | $60.00 |
| 0042 | SUPERSTRUCTURE - Thurston Way I/C O'xing | L.S. | 1 | $900,000.00 | $900,000.00 |
| 0043 | ELECTRICAL CONDUIT | L.F. | 550 | $12.00 | $6,600.00 |
| 0044 | TRAFFIC BARRIER | L.F. | 550 | $70.00 | $38,500.00 |
| | M.S.E. Wall NW-1 | S.F. | 2,396 | $14.00 | $33,544.00 |
| | M.S.E. Wall NW-2 | S.F. | 13,288 | $14.00 | $186,032.00 |
| | M.S.E. Wall WS-1 | S.F. | 832 | $14.00 | $11,648.00 |
| | M.S.E. Wall WS-2 | S.F. | 9,516 | $14.00 | $133,224.00 |
| | M.S.E. Wall SE-1 | S.F. | 2,526 | $14.00 | $35,364.00 |
| | M.S.E. Wall SE-2 | S.F. | 551 | $14.00 | $7,714.00 |
| | M.S.E. Wall SE-3 | S.F. | 6,607 | $14.00 | $92,498.00 |
| | M.S.E. Wall SE-4 | S.F. | 1,612 | $14.00 | $22,568.00 |
| | M.S.E. Wall EN-1 | S.F. | 4,145 | $14.00 | $58,030.00 |
| | M.S.E. Wall EN-2 | S.F. | 15,517 | $14.00 | $217,238.00 |
| | Keystone Wall T-1 | S.F. | 876 | $22.00 | $19,272.00 |
| | Pedestrian Railing | L.F. | 209 | $64.00 | $13,344.00 |
| | Lock-Block Wall T-2 | S.F. | 1,007 | $22.00 | $22,154.00 |
| | Lock-Block Wall NW-3 | S.F. | 119 | $22.00 | $2,618.00 |
| | Lock-Block Wall SE-6 | S.F. | 238 | $22.00 | $5,236.00 |
| | Geosythetic Wall SE | S.F. | 10,938 | $7.00 | $76,566.00 |
| | Geosythetic Wall WS | S.F. | 17,713 | $7.00 | $123,991.00 |
| | Geosythetic Wall EN | S.F. | 12,413 | $7.00 | $86,891.00 |
| | Geosythetic Wall NW | S.F. | 17,450 | $7.00 | $122,150.00 |
| | **Surfacing** | | | | |
| 0045 | CRUSHED SURFACING Base COURSE | TON | 13,841 | $8.20 | $113,496.20 |
| | **Liquid Asphalt** | | | | |
| 0047 | ANTI-STRIPPING ADDITIVE | EST. | 1 | $44,000.00 | $44,000.00 |
| | **Cement Concrete Pavement** | | | | |
| 0048 | CONC. CLASS 4000 FOR BRIDGE APPROACH SLAB | C.Y. | 184 | $175.00 | $32,200.00 |
| 0049 | BRIDGE APPROACH SLAB ANCHOR | EACH | 92 | $39.00 | $3,588.00 |
| 0050 | ST. REINF. BAR FOR BRIDGE APPROACH SLAB | LB. | 33,426 | $0.50 | $16,713.00 |
| 0051 | EPOXY-COATED ST. REINF. BAR FOR BRIDGE APPROACH SLAB | LB. | 13,181 | $0.70 | $9,226.70 |
| | **Asphalt Concrete Pavement** | | | | |
| 0052 | PLANING BITUMINOUS PAVEMENT | S.Y. | 33,386 | $2.00 | $66,772.00 |
| 0053 | ASPHALT CONC. PAVEMENT CL. A FOR PAVEMENT REPAIR | TON | 20 | $70.00 | $1,403.50 |
| 0054 | ASPHALT CONC. PAVEMENT CL. A | TON | 24,551 | $34.00 | $834,734.00 |
| 0055 | ASPHALT CONC. PAVEMENT CL. E | TON | 20,120 | $32.00 | $643,840.00 |
| 0056 | JOB MIX COMPLIANCE PRICE ADJUSTMENT | CALC | 1 | $6,000.00 | $6,000.00 |
| 0057 | COMPACTION PRICE ADJUSTMENT | CALC | 1 | -$6,400.00 | -$6,400.00 |
| | **Irrigation and Water Distribution** | | | | |
| 0059 | DOUBLE CHECK VALVE ASSEMBLY 2 IN. | EACH | 1 | $400.00 | $400.00 |
| 0060 | BALL VALVE-2 IN. | EACH | 18 | $150.00 | $2,700.00 |

## 3. Engineer's Estimate for Construction (Continued)

| | | | | | |
|---|---|---|---|---|---|
| | Cantilver Sign Structure No. 3 | L.S. | 1 | $30,000.00 | $30,000.00 |
| 0146 | ILLUMINATION SYSTEM | L.S. | 1 | $315,000.00 | $315,000.00 |
| 0147 | TEMPORARY SIGNAL SYSTEM NO.1 | L.S. | 1 | $630,000.00 | $630,000.00 |
| 0149 | TRAFFIC SIGNAL DISPLAY AND DETECTION SYSTEM | L.S. | 1 | $151,000.00 | $151,000.00 |
| 0150 | TRAFFIC SIGNAL CONTROL SYSTEM | L.S. | 1 | $17,000.00 | $17,000.00 |
| 0151 | TRAFFIC SAFETY DRUM | EACH | 380 | $56.00 | $21,280.00 |
| 0152 | SEQUENTIAL ARROW SIGN | HOUR | 650 | $20.00 | $13,000.00 |
| 0155 | TRAFFIC CONTROL LABOR | HOUR | 8,000 | $36.00 | $288,000.00 |
| | Traffic Control Vehicle | Day | 240 | $50.00 | $12,000.00 |
| | Traffic Control Supervisor | Hour | 2,000 | $35.00 | $70,000.00 |
| 0157 | CONSTRUCTION SIGNS CLASS A | S.F. | 1,787 | $150.00 | $268,050.00 |
| | Portable Changeable Message Sign | Each | 2 | $4,000.00 | $8,000.00 |
| | Operation of Portable Changeable Message Sign | Hour | 18,000 | $5.00 | $90,000.00 |
| | Mountable Concrete Curb and Gutter | L.F. | 2,044 | $7.70 | $15,738.80 |
| | Cement Concrete Curb and Gutter | L.F. | 1,188 | $13.00 | $15,444.00 |
| | ITS (SC & DI) System | L.S. | 1 | $500,000.00 | $500,000.00 |

**Other Items**

| | | | | | |
|---|---|---|---|---|---|
| 0161 | STRUCTURE EXCAVATION CLASS B INCL. HAUL | C.Y. | 12,479 | $1.00 | $12,479.00 |
| 0162 | SHORING OR EXTRA EXCAVATION CLASS B | S.F. | 54,948 | $6.00 | $329,688.00 |
| 0163 | GRAVEL BACKFILL FOR PIPE BEDDING | C.Y. | 995 | $10.00 | $9,950.00 |
| 0165 | SURVEYING FOR SUBGRADE, SURFACING, AND PAVING | L.S. | 1 | $35,000.00 | $35,000.00 |
| 0166 | SURVEYING FOR BRIDGE AND WALLS | L.S. | 1 | $25,000.00 | $25,000.00 |
| 0167 | MONUMENT CASE, COVER, AND PIPE | EACH | 15 | $200.00 | $3,000.00 |
| 0169 | CEMENT CONC. SIDEWALK | S.Y. | 1,056 | $24.00 | $25,344.00 |
| 0170 | CONCRETE PAVING STONE AREA | S.Y. | 787 | $54.00 | $42,498.00 |
| 0172 | MANHOLE 12 FT. TO 20 FT. 48 IN. DIAM. TYPE 1 | EACH | 19 | $3,000.00 | $57,000.00 |
| 0175 | TRAINING | HOUR | 2,000 | $3.00 | $6,000.00 |
| 0176 | ROADSIDE CLEANUP | EST. | 1 | $36,000.00 | $36,000.00 |
| 0179 | CONSTRUCTION GEOTEXTILE FOR SILT FENCE | L.F. | 7,200 | $4.00 | $28,800.00 |
| | Remove and Reset Existing Fence | L.F. | 4,005 | $9.00 | $36,045.00 |
| | SPCC Plan | L.S. | 1 | $1,500.00 | $1,500.00 |
| | **Subtotal** | | | | $12,721,192.83 |
| | **Sales Tax @7.7%** | | | | $979,531.85 |
| | **Total** | | | | **$13,700,724.68** |

## 4. Items Unaccounted for in Engineer's Construction Estimate

| Unaccounted for in EE | $ Amount |
|---|---|
| TRAFFIC - PERM. ATTENTUATORS | 98,120.00 |
| TRAFFIC CONT - TMA'S | 49,000.00 |
| TRAFFIC CONT - CL B DEVICES | 67,800.00 |
| STRUCTURES - PAINTING | 49,000.00 |
| PRODUCT WARRANTIES | 50,000.00 |
| ESCROWED BID DOCUMENTS | 8,500.00 |
| PAYMENT/PERFORMACE/E&O BONDS | 95,000.00 |
| DISPUTES REVIEW BOARD | 8,000.00 |
| SAN SEWER CONSTRUCTION | 60,000.00 |
| PAVEMENT PRESERVATION | 250,000.00 |
| **TOTAL** | **735,420.00** |

## 5. Design-Builder Schedule of Values

Item Description UNIT PRICE

SR500/THURSTON WAY INTERCHANGE (#6027)
LUMP SUM BREAKDOWNS

1 DESIGN:

| | |
|---|---|
| BAFP Design Costs-Entranco | 324,000.00 |
| BAFP Design Costs-MJK | 95,000.00 |
| BAFP Design Costs-KBA | 53,250.00 |
| BAFP Design Costs-Elcon | 12,500.00 |
| BAFP Design Costs-KLB | 16,450.00 |
| BAFP Design Costs-AMEC | 17,900.00 |
| BAFP Design Costs-Carter Burgess | 12,250.00 |
| BAFP Design Costs-Parametrix | 3,000.00 |
| BAFP Design Costs-Lakeside | 4,600.00 |
| BAFP Design Costs-Apply A Line | 2,250.00 |
| BAFP Design Costs-John Ostrowski | 2,915.00 |
| Final Design-Roadway | 485,750.00 |
| Final Design-Bridges | 345,000.00 |
| Final Design-Signals | 45,000.00 |
| Final Design-SC&DI | 57,000.00 |
| Final Design-Illumination | 52,450.00 |
| Final Design-Drainage | 125,750.00 |
| Final Design-Planting & Seeding | 22,000.00 |
| Final Design-Irrigation System | 25,000.00 |
| Final Design-Permanent Signs | 38,600.00 |
| Final Design-Channelization | 52,500.00 |
| Final Design-Stage 1 Channelization | 38,000.00 |
| Final Design-Stage 1A & 2 Channeliz | 27,250.00 |
| Final Design-Stage 1/2 Signals | 15,000.00 |
| Final Design-Permits & Environmental | 25,900.00 |
| Final Design- KBA (QA/QC) | 119,300.00 |
| Final Design- AMEC (Geotech) | 185,875.00 |
| Final Design-WhiteShield(Survey) | 55,125.00 |
| Final Design-Cartr&Burg(Proc. Del.) | 36,800.00 |
| Final Design-Nichols Eng.(Pavement) | 28,900.00 |
| Final Design-John Ostrow(Agency Rel) | 15,470.00 |
| Design Administration | 597,125.00 |
| SAN SEWER | 5,000.00 |
| **Total Design** | **2,942,910.00** |

## 5. Design-Builder Schedule of Values (Continued)

1A CONSTRUCTION:

| | |
|---|---|
| Mobilization | 2,150,700.00 |
| QA/QC & Testing | 1,092,000.00 |
| Public Relations-Signs | 5,000.00 |
| Public Relations-Media Contact | 9,000.00 |
| Public Relations-Speakers Bureau | 13,000.00 |
| Public Relations-Business Interaction | 20,000.00 |
| Public Relations-Mass Mailings | 26,450.00 |
| Public Relations-Hotline | 22,500.00 |
| Public Relations-Open House/Meetings | 24,200.00 |
| Public Relations-Company Database | 10,000.00 |
| Utility Costs & Agreements | 46,800.00 |
| Site Preparation(Asphalt Removal) | 137,500.00 |
| Site Preparation (ACP Pulverization) | 26,320.00 |
| Site Preparation (Sidewalk Removal) | 6,200.00 |
| Site Preparation (Curb&Gutter Remvl) | 9,900.00 |
| Grading (Clear & Grub) | 21,000.00 |
| Grading (Roadway Excavation) | 46,340.00 |
| Grading (Embankment) | 3,707,700.00 |
| Grading (MSE Wall Complete) | 1,044,335.00 |
| Grading (RECO Wire Wall @ P-1/P-2) | 88,170.00 |
| Grading (Drain Blanket for Wick Sys) | 45,480.00 |
| Grading (Perforated Piping) | 44,950.00 |
| Grading (Pillow Walls) | 127,500.00 |
| Drainage (Pond Excavation) | 214,000.00 |
| Drainage (Pond Liner) | 57,240.00 |
| Drainage (12" RCP Pipe) | 141,600.00 |
| Drainage (18" RCP Pipe) | 125,500.00 |
| Drainage (24" RCP Pipe) | 315,800.00 |
| Drainage (Concrete Manholes) | 175,800.00 |
| Structures (Bridge Str. Exc Cl. "A") | 12,500.00 |
| Surfacing (CSTC) | 175,000.00 |
| TESC (Silt Fence) | 98,150.00 |
| TESC (Straw Bales) | 17,900.00 |
| TESC (Inlet Protection) | 14,750.00 |
| TESC (Clear Plastic Covering) | 38,720.00 |
| TESC (Construction Entrances) | 42,460.00 |
| TESC (Slope Prot - Tack/Mulch/Mat) | 37,850.00 |
| Roadway Survey (Clear & Grub) | 12,900.00 |
| Roadway Survey (TESC Items) | 10,500.00 |
| Roadway Survey (Slope Stake) | 39,900.00 |
| Roadway Survey (Blue Tops) | 12,280.00 |
| Roadway Survey (Red Tops) | 14,380.00 |
| Drainage Survey (Pond) | 11,595.00 |
| Drainage Survey (U.G.) | 11,830.00 |
| Rdwy Survey (SE Walls) | 9,765.00 |
| Rdwy Survey (WS Walls) | 6,500.00 |

## 5. Design-Builder Schedule of Values (Continued)

| | |
|---|---|
| Rdwy Survey (EN Walls) | 9,200.00 |
| Rdwy Survey (NW Walls) | 11,260.00 |
| Rdwy Survey (Retaining Walls) | 5,450.00 |
| Rdwy Survey (Sign Structures) | 7,300.00 |
| Rdwy Survey (Illumination) | 12,790.00 |
| Rdwy Survey (Signals-Temp&Final) | 8,600.00 |
| Rdwy Survey (SC&DI) | 12,790.00 |
| Rdwy Survey (Guardrail) | 5,170.00 |
| Rdwy Survey (Permanent Signs) | 12,640.00 |
| Rdwy Survey (Staging Chann) | 22,230.00 |
| Rdwy Survey (Final Channelization) | 13,500.00 |
| Rdwy Survey (Curb/Gutter & Sidewalk) | 5,330.00 |
| Bridge Str. Survey (Piling & Ftgs) | 6,780.00 |
| Bridge Str. Survey (Abut. Walls) | 17,700.00 |
| Bridge Str. Survey (Superstructure) | 23,850.00 |
| ACP Roadway | 2,496,500.00 |
| Cement Conc Pavement @ Appr. Slabs | 35,900.00 |
| Planting & Seeding | 37,500.00 |
| Irrigation System | 43,270.00 |
| Topsoil "A"/"B" | 152,480.00 |
| Traffic (Curb & Gutter) | 88,240.00 |
| Traffic (Guardrail) | 94,000.00 |
| Traffic (Permanent Barrier @ Median) | 49,410.00 |
| Traffic (Temp. Barrier) | 286,075.00 |
| Traffic (Reset Temp Barrier) | 138,525.00 |
| Traffic (Perm.Attentuators) | 98,120.00 |
| Traffic (Temp. Attentuators) | 37,000.00 |
| Traffic (ACP Extruded Curb) | 18,400.00 |
| Traffic (Thermo Gore) | 8,000.00 |
| Traffic (Temp Paint Crosswalk) | 1,780.00 |
| Traffic (Temp Paint Gore) | 750.00 |
| Traffic (Paint Stripe) | 11,240.00 |
| Traffic (Temp Paint Stripe) | 32,560.00 |
| Traffic (Remove Paint Stripe) | 44,860.00 |
| Traffic (Thermo Crosswalk) | 2,100.00 |
| Traffic (Thermo Stop Bar) | 3,200.00 |
| Traffic (Paint Arrow) | 1,800.00 |
| Traffic (Thermo Arrow) | 3,100.00 |
| Traffic (Remove RPM's) | 7,260.00 |
| Traffic (Profile Plastic Skip Stripe) | 59,900.00 |
| Electrical (Sign Structures) | 590,000.00 |
| Electrical (Illumination Systems) | 805,000.00 |
| Electrical (Traff Signal Sys - Temp) | 114,700.00 |
| Electrical (Traff Signal Sys.- Perm) | 217,500.00 |
| Electrical (SC&DI Systems) | 624,400.00 |
| Electrical (Permanent Signing) | 62,600.00 |
| Traffic Control (Class "A" Signs) | 64,500.00 |
| Traffic Control (TMA's) | 49,000.00 |
| Traffic Control (VMS) | 42,000.00 |
| Traffic Control (Class "B"; Devices) | 67,800.00 |
| Bridge (Piles & Footing) | 228,176.00 |
| Bridge (Abut Walls) | 150,000.00 |

## 5. Design-Builder Schedule of Values (Continued)

| | |
|---|---|
| Bridge (Girders) | 645,800.00 |
| Bridge (Bridge Deck) | 545,000.00 |
| Bridge (Barrier) | 87,876.00 |
| Wall (Noise Wall SE-2) | 210,855.00 |
| Wall (Retaining Wall @ Chevy's) | 95,410.00 |
| Structures (Painting) | 49,000.00 |
| Other (Fencing) | 39,000.00 |
| Other (Bike Path) | 48,800.00 |
| Other (Misc. Drainage) | 40,000.00 |
| Construction Administration | 205,550.00 |
| Design Final Records & Doc | 45,000.00 |
| QA/QC Final Records & Doc | 34,100.00 |
| Product Warranties | 50,000.00 |
| Escrowed Bid Documents | 8,500.00 |
| Payment/Performance/E&O Bonds | 95,000.00 |
| Disputes Review Board | 8,000.00 |
| SAN SEWER MAIN CONSTRUCTION | 60,000.00 |
| PAVEMENT PRESERVATION | 250,000.00 |
| **Total Construction** | **19,782,092.00** |

| | |
|---|---|
| **Total Construction** | **19,782,092.00** |
| **Total Design** | **2,942,910.00** |
| **Total D-B** | **22,725,002.00** |