TRIMET

# Memo

**Date:** February 2, 2009

**To:** WRBAC Members

**From:** Rob Barnard, Portland-Milwaukie Light Rail West Segment Director

**Subject:** Cost Estimate Findings for Bridge Type Alternatives

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During the December 11 Willamette River Bridge Advisory Committee (WRBAC) meeting, the committee examined two independent estimates for the cost to design and construct the wave frame bridge. The difference between these estimates was substantial. To better understand the most likely cost for both the wave frame and cable-stayed bridge types, and to ensure fair comparison between estimates for each type, the committee requested that the Portland-Milwaukie Light Rail Project team conduct additional research for the next WRBAC meeting.

Accordingly, the Project team has prepared updated estimates for the two- and four-pier cable-stayed bridges and the wave frame bridge. These estimates are based on detailed discussions with three local experts on the subject of steel supply and fabrication:

- Thomas Hickman of Oregon Iron Works;
- Ed Hepp of Hepp Steel Resources; and
- Kent Thies of EVRAZ (formerly Oregon Steel).

Additionally, TriMet's estimators, with input from marine contractors, provided additional analysis for labor and equipment costs for each of the bridge types. The following are key findings from our research:

**High Performance Steel Availability**

The Project team determined that currently, only one source could reliably provide the quantity and type of 4-inch high performance steel (HPS) required for construction of the wave frame bridge type.

- Mittal Steel in Pennsylvania is the only U.S. mill that currently rolls the 4-inch HPS required for construction of the wave frame bridge. Mittal Steel also is the only mill that meets Buy America requirements.
- The EVRAZ mill in Portland rolls up to 3-inch HPS and has not produced thicker material. EVRAZ sources its steel from Mexico and Russia.
- SSAB in Alabama rolls less than 3-inch HPS on special order. The thinner plates would have to be "built up" (welded together) into the required 4-inch thickness, thus increasing the steel's cost to prohibitive levels.

## Schedule

Local fabrication experts provided opinions on the durations necessary to create detailed fabrication drawings, order and receive material, and then fabricate the plate steel into its final configuration for the wave frame. A schedule analysis performed with the durations provided revealed that the probable time needed exceeds the cable-stayed bridges' schedules by approximately six months to one year. The costs for six months of additional duration are included as part of the differential cost line item for the wave frame bridge.

## Cost Estimates for Each Bridge Type Alternative

- **Construction:** A summary of the updated cost estimates is attached. The estimates are based on quantities of materials needed for the construction of each bridge type. The foundation construction costs for both bridge types are similar. The primary differences between construction costs are a result of steel, fabrication and delivery for the superstructure, the part of the bridge that rests on the piers. These superstructure costs are outlined below.

| Wave Frame Girder | | Cable-Stayed - 2 Pier | |
|---|---|---|---|
| **Superstructure** | | **Superstructure** | |
| Structural Steel - Upper Chords HPS 70W | $27,992,000 | Concrete - Tower | $5,319,000 |
| Structural Steel - Struts grade 50 | $9,377,000 | Reinforcing Steel - Tower - Epoxy | $2,612,000 |
| Structural Steel - I-beam grade 50 | $13,290,000 | Post-Tension - Tower Strut | $289,000 |
| Structural steel - slab cross beams grade 50 | $2,537,000 | Stay Cables | $6,633,000 |
| Concrete - Super Structure | $12,348,000 | Tower Cable Anchor Box | $3,644,000 |
| Reinforcing Steel - Super Structure | $1,733,000 | Concrete - Superstructure | $10,843,000 |
| Mobilization on Superstructure work only | $6,728,000 | Reinforcing Steel - Superstructure - Epoxy | $1,559,000 |
| | | Post-Tension - Bars (Deck) | $3,032,000 |
| | | Mobilization on Superstructure work only | $3,393,000 |
| **Total** | **$74,005,000** | **Total** | **$37,324,000** |

- **Contingencies**
  Estimated contingencies range from $13.2 to $17.4 million for the cable-stayed bridges to $23 million for the wave frame alternative. The main contingencies included in the estimates arise from the categories below. These contingencies vary by bridge type.

  - *Requirement risks* include yet-to-be designed elements, such as those needed for mitigating navigation and waterline issues.
  - *Bid market risks* are factors affecting the bidding climate for each bridge type, such as bridge complexity, bidder experience, and number of bidders available.
  - *Design development risks* take into account additional costs that will become apparent only after further details of bridge components and finishes are designed.

- **Steel Pricing**
  Steel pricing for all three estimates are based on today's market prices. Year of Expenditure costs include forecasted escalation costs. The committee should be aware

that steel prices have been extremely volatile in the past five years, and predicting future prices is an inherently high-risk proposition. The more steel that is required, the greater this risk becomes. This risk is not factored into the updated estimates.

- **Year of Expenditure (YOE)**
  Previously, the cost was presented in 2008 dollars, but Project budgets are normally described with the inflation costs. The construction cost on the attached table are described in both 2009 dollars and in year of expenditure dollars (with inflation) so the WRBAC can assess the full expected costs of each bridge type.

**Conclusion**

The updated estimates for each bridge type are based on a robust examination of quantities, relevant market and unit price data, and reasonable contingency allocations. These estimates represent TriMet's opinion of the most likely contract cost for each type. We will have an opportunity to review the estimates in depth at Thursday's WRBAC meeting.