Memo

Stantec

To:	Joe Mactutis Reno Office	From:	Gary Oberling Denver Office
File:	180101098	Date:	August 29, 2008

Reference: SE Connector, Truckee River Crossing Conceptual Design

Based on the information you provided to us I have developed updated design layouts and costs for the SE Connector, Truckee River Bridge. I prepared estimates for two bridge lengths: a 1,235' long bridge from Sta. 275+40 to Sta. 287+75 and a 525' long bridge from Sta. 282+50 to Sta. 287+75. The design criteria included a 180' long span over the Truckee River channel (Sta. 285+95 to Sta. 287+75), a minimum low chord elevation of 4401.30 to provide 4' of freeboard, and a maximum elevation at centerline of 4414.76. It was also mentioned that the 180' channel span could possibly be reduced to 160' if necessary.

Layout and Span Configuration

The 180' span over the channel dictated using a steel girder for at least that span, and possibly for the entire bridge. A precast concrete bulb-T girder, similar to the section used on the USA Parkway Over Truckee River project, has a maximum span capacity of about 150'. Therefore even if the span over the channel was reduced to 160', the concrete bulb T girders would not be an option. And in our phone conversation it was mentioned that scaffolding and forms would probably not be allowed over the river channel. Therefore a cast in place post tensioned concrete box girder is not an option there either. For each of the 2 bridge lengths mentioned above I developed 2 span configurations. One used all steel plate girders and the other was a combination of a steel girder over the channel only with precast concrete bulb-T girders for the remainder. The span arrangements are as follows:

- 1,235' Steel Bridge: 180' – 175' – 175' – 175' – 175' – 175' - 180'
- 1,235' Steel/PC Concrete: 180' Steel span and 8 spans @ 132' each PC Concrete
- 525' Steel Bridge: 180' – 172.50' – 172.50' (or 180'-170'-175')
- 525' Steel/PC Concrete: 180' Steel span and 3 spans @ 115' each PC Concrete

The combination of steel and concrete girders may be a problem at the pier where the two girders meet. The steel girder is 7' (84") deep while the concrete bulb T's are 6' deep. That means the pier cap would have to be stepped to provide bearing seats at

different elevations for the two girder types. It also means there would be a joint in the deck at that pier, since the different girder types and sizes would not be made continuous there. It is preferable to make girders continuous from span to span and minimize the number of joints in the bridge. A continuous girder is more efficient structurally, and fewer joints means less opportunity for water to get down to the girders, bearings, and piers. I have prepared designs similar to this in the past, where it makes sense to mix girder types. But Nevada DOT or the RTC may not approve of such an arrangement. It is probably something that would be worth asking them about.

Horizontal Curvature

The steel plate girders were laid out to follow the horizontal curve of the alignment. The resulting curved girders provide a smooth, continuous line all along the bridge, with a uniform overhang at the edge of deck. The precast concrete bulb T girders can not follow the curve and need to be laid out on chords from pier to pier. This results in a varying overhang at the edge of deck, and "kinks" in the girders at each pier. The girder lengths vary also, getting longer from the inside to the outside of the curve. This minimizes some of the economy of scale since the fabricator has to make so many different girders instead of making them all the same. This is not a fatal flaw, but is something to consider if aesthetics is a concern.

Substructure Quantities and Costs

The substructure costs were estimated by using the plans from the USA Parkway project. Those plans contained quantity lists for concrete and reinforcing steel for the various substructure and superstructure elements (deck, abutments, approach slabs, pier caps, etc.). For this concept layout I assumed that the abutments, piers and foundations would have the same size and shape. Quantities for concrete and rebar were adjusted proportionately for each element. For the abutments I assumed a 105' wide bridge at the south end (Sta. 275+40 or 282+50) and a 141' wide section at the north end (Sta. 287+75). The piers were proportioned in a similar fashion, using 3 different section widths: 141' for the pier at the south bank of the Truckee River (Sta. 285+95), 120' for a pier in the taper section and 105' for piers toward the south end of the alignment. The pier cap was assumed at a constant 6' depth to match the section in the USA Parkway plans. The pier column lengths were adjusted to fit the profile shown for the USACE proposed Truckee River benching. The column and drilled shaft sizes and spacing were assumed to be adequate as shown. The longer steel girder spans (175-180 feet, vs.150 feet) may result in a modification to these, but without further detailed foundation design it is not worth trying to refine the estimate at this point. The drilled shafts were all assumed to be 84" diameter by 75' long, similar to those at the

USA Parkway location. The Parkway project used 48" diameter shafts at the abutments, but it also had end spans that were only 75' long.

The cost data was taken from the Unit Price Comparison (NDOT & BIDS) that was provided to us. I generally used the mean of high and low bids for the costs as follows:

- Class AA Concrete (substructure) = $1,000 / CY
- Class EA Concrete (superstructure) = $800 / CY
- Reinforcing Steel = $1.25 / LB
- Reinforcing Steel Epoxy Coated = $1.50 / LB
- Drilled Shaft Foundation, 84" Diameter = $1,600 / Lin Ft
- Precast Concrete Girders = $350 / Lin Ft
- Structural Steel Girders = $2.50 / Lb (includes bracing, stiffeners, etc)

I did not estimate quantities or costs for earthwork, strip seal joints, bearings or other miscellaneous items. I have added a contingency of 10% to account for these items instead. The Structural Steel unit price was not taken from the Cost Data provided and is a "best guess" at this time. My estimate was based on prices we have seen in the Denver area. A steel bridge with similar size girders and 1.4 million pounds of steel total was bid here in 2006 for $0.85 / lb. The other projects in that year had steel prices around $2.00 / lb. This project has 5.8M lb. for the 1,235' bridge, 2.8M lb. for the 525' bridge, and 1.1M lb. for the 180' single span. Steel prices have fluctuated dramatically in recent years, but I would still expect to see similar savings due to the economy of scale involved. I used $2.50 / lb. since there are so many unknowns (when is construction to take place, where would the girders come from, etc) but it could be less, hopefully not more. A $0.50/lb drop in the price would result in about $2.9M in savings for the full 1,235' bridge.

Bridge Costs

The bridge costs are as follows (including the 10% for misc. items):

- 1,235' steel girder bridge = **$33,204,600.00**
- 1,235' steel / concrete bridge = **$28,458,100.00**
- 525' steel bridge = **$15,992,900.00**

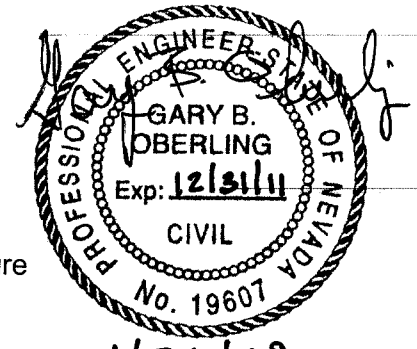
Reference: SE Connector, Truckee River Crossing Conceptual Design

- 525' steel / concrete bridge = **$14,806,000.00**

The cost estimates are included as an attachment for your review.

If you have any questions or comments on this information, or if you need more detail on the estimates, please call. And thank you for the opportunity to help out on this project.

STANTEC CONSULTING INC.



1/26/09

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Bridge Element Costs

South Abutment and Wingwalls	$875,000.00
South Approach Slab	$103,000.00
North Abutment and Wingwalls	$1,040,000.00
North Approach Slab	$140,000.00
141' Wide Pier at Truckee River	$1,570,000.00
120' Wide Pier at Taper	$1,370,000.00
105' Wide Pier Typical	$1,280,000.00
Deck for 1230' Long Bridge	$5,070,000.00
Deck for 525' Long Bridge	$2,390,000.00
1230' All Steel Girders (at $2.50/Lb)	$14,530,000.00
525' All Steel Girders (at $2.50/Lb)	$6,890,000.00
180' Single Span Steel Girders (at $2.50/Lb)	$2,760,000.00
PC Concrete Girders (BT-72) :	
8 spans in a 1230' bridge	$4,805,000.00
3 spans in a 525' bridge	$1,771,000.00
Bridge Rails for 1230' Bridge	$368,000.00
Bridge Rails for 525' Bridge	$161,000.00

1235' Long, 7 span Steel Plate Girder Bridge

South Abutment and Wingwalls	$875,000.00
South Approach Slab	$103,000.00
North Abutment and Wingwalls	$1,040,000.00
North Approach Slab	$140,000.00
141' Wide Pier at Truckee River	$1,570,000.00
120' Wide Pier at Taper	$1,370,000.00
105' Wide Pier Typical	$1,280,000.00
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105' Wide Pier Typical	$1,280,000.00
Deck for 1230' Long Bridge	$5,070,000.00
Bridge Rails for 1230' Bridge	$368,000.00
1230' All Steel Girders (at $2.50/Lb)	$14,530,000.00
Subtotal =	**$30,186,000.00**
10% Contingency for Misc. Items	**$3,018,600.00**
Total Construction Cost =	**$33,204,600.00**
Deck Area =	136,740.00 sq. ft.
Unit Cost =	$242.83 /sq. ft.

1235' Long, 9 span Steel Pl. and PC Concrete Girder Bridge

South Abutment and Wingwalls	$875,000.00
South Approach Slab	$103,000.00
North Abutment and Wingwalls	$1,040,000.00
North Approach Slab	$140,000.00
141' Wide Pier at Truckee River	$1,570,000.00
120' Wide Pier at Taper	$1,370,000.00
120' Wide Pier at Taper	$1,370,000.00
105' Wide Pier Typical	$1,280,000.00
105' Wide Pier Typical	$1,280,000.00
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105' Wide Pier Typical	$1,280,000.00
Deck for 1230' Long Bridge	$5,070,000.00
Bridge Rails for 1230' Bridge	$368,000.00
180' Single Span Steel Girders (at $2.50/Lb)	$2,760,000.00
PC Concrete Girders (BT-72) :	
8 spans in a 1230' bridge	$4,805,000.00
Subtotal =	**$25,871,000.00**
10% Contingency for Misc. Items	**$2,587,100.00**
Total Construction Cost =	**$28,458,100.00**
Deck Area =	136,740.00 sq. ft.
Unit Cost =	$208.12 /sq. ft.

525' Long, 3 span Steel Plate Girder Bridge

South Abutment and Wingwalls	$875,000.00
South Approach Slab	$103,000.00
North Abutment and Wingwalls	$1,040,000.00
North Approach Slab	$140,000.00
141' Wide Pier at Truckee River	$1,570,000.00
120' Wide Pier at Taper	$1,370,000.00
	sq. ft.
Deck for 525' Long Bridge	$2,390,000.00 /sq. ft.
Bridge Rails for 525' Bridge	$161,000.00
525' All Steel Girders (at $2.50/Lb)	$6,890,000.00
Subtotal =	**$14,539,000.00**
10% Contingency for Misc. Items	**$1,453,900.00**
Total Construction Cost =	**$15,992,900.00**
Deck Area =	64,830.00 sq. ft.
Unit Cost =	$246.69 /sq. ft.

525' Long, 4 span Steel Pl. and PC Concrete Girder Bridge

South Abutment and Wingwalls	$875,000.00
South Approach Slab	$103,000.00
North Abutment and Wingwalls	$1,040,000.00
North Approach Slab	$140,000.00
141' Wide Pier at Truckee River	$1,570,000.00
120' Wide Pier at Taper	$1,370,000.00
105' Wide Pier Typical	$1,280,000.00
Deck for 525' Long Bridge	$2,390,000.00
Bridge Rails for 525' Bridge	$161,000.00
PC Concrete Girders (BT-72) :	
3 spans in a 525' bridge	$1,771,000.00
180' Single Span Steel Girders (at $2.50/Lb)	$2,760,000.00
Subtotal =	**$13,460,000.00**
10% Contingency for Misc. Items	**$1,346,000.00**
Total Construction Cost =	**$14,806,000.00**
Deck Area =	64,830.00 sq. ft.
Unit Cost =	$228.38 /sq. ft.

Memo

Stantec

To:	Garth Oksol	From:	Todd Leonard
	RTC		Stantec - Reno
File:	180101098	Date:	November 10, 2008

Reference: Mercury in Steamboat Creek

Pursuant to a request by the Regional Transportation Commission Board, Stantec reviewed existing literature regarding the presence of methyl mercury within the SouthEast Connector project site. Please note that site specific investigations regarding the extent of methyl mercury content within the site were not included in the project scope. Further investigations may be required during preliminary design to evaluate the impact of this topic.

The literature reviewed for the presence of methyl mercury and the impact to the SouthEast Connector project include:

- Stamenkovic, J, et al. 2004. *Distribution of Total and Methyl Mercury in Sediments Along Steamboat Creek (Nevada, USA).* Science of the Total Environment. 322(2004) 167-177.
- Stamenkovic, J, et al. 2005. *Net Methyl Mercury Production Versus Water Quality Improvement in Constructed Wetlands: Trade-offs in Pollution Control.* WETLANDS. Vol 25, No.3, 748-757.
- USEPA, 2007. Current National Recommended Water Quality Criteria http://www.epa.gov/waterscience/criteria/wqcriteria.html
- Nevada's 2004 303(d) Impaired Water List http://ndep.nv.gov/BWQP/file/2004_303d-list_final_epa-approved_nov05.doc

The following statements are based on a review of the cited literature:

- The methyl mercury concentration measured in the cited studies in Steamboat Creek equated to 0.7% of the total mercury concentration measured. The reported high mercury concentration reported in Steamboat is 419 ng/L. Therefore, the maximum methyl mercury concentration in the Creek would be approximately 2.9 ng/L. This value is less than the USEPA recommended water quality criteria of is 770 ng/L for chronic exposure and 1,400 µg/L for acute exposure.
- The former total mercury limit in Steamboat Creek established by the Nevada Division of Environmental Protection (NDEP) was 12 ng/L for a 96 hour sample. This value was recently increased to 770 ng/L (see discussion below.).
- Approximately 84% of the mercury in the Creek is bound to sediment.
- Although wetlands are a source of methylation and could increase the methyl mercury load to the Truckee River, they are also a sink for total mercury. It is estimated that 72 to 82% of the total mercury in the Creek would be deposited in the wetlands. Therefore, the amount of total mercury available for methylation downstream of Steamboat Creek would likely decrease. The wetlands would also improve water quality in the Creek and River through nutrient and sediment removal.

- Excavated material will contain methyl mercury. Such material can be used as fill material and then encapsulated in the embankment by a compacted soil layer with low hydraulic conductivity.
- Additional useful sampling data from the Steamboat Creek area that was collected as part of the research of the papers referenced above may be available from the University of Nevada Reno.

The results of our review indicate that:

- The NDEP has determined that the mercury concentrations measured in the Steamboat Creek are below regulatory standards and that engineering controls such as best management practices (BMPs) will be required during construction to limit the amount of particulate-bound mercury from entering the creek.
- Compliance monitoring will be required during construction and additional soil and sediment testing may be necessary to ensure the creek isn't located to an area with higher mercury concentrations.
- The Steamboat Creek was shown in 2004 as being on the 303(d) Impaired Water list for mercury, arsenic, boron, iron, zinc and total phosphorous. No total maximum daily load (TMDL) limits had been developed for the creek as is typically done for listed waterways and therefore, the standards for compliance are concentration based. This can be relevant because during high water events an increased load to the Creek (and to the Truckee River) could exceed TMDLs; however, the concentrations are often diluted to below standards.
- The Nevada water quality standards for the Steamboat Creek for mercury in 2004 were 2,000 ng/L for a one-hour sample (essentially a grab sample) and 12 ng/L for a 96-hour sample. The Creek was listed for mercury because the maximum grab sample concentration (419 ng/L per the publications cited above) exceeded the 96-hour standard and therefore would likely exceed the standard if an actual 96-hour test was performed.
- The Nevada Division of Environmental Protection's (NDEP's) point of contact for the list, Randy Pahl was consulted, and Stantec was informed that the NDEP determined that the 96-hour standard for mercury was too restrictive and it had therefore been changed to 770 ng/L in the draft 2006 303(d) list. Based on this information, the mercury concentrations in Steamboat Creek are less than the standard and the creek was removed from the 303(d) list for mercury in the 2006 Draft List. Currently, only the 2002 and 2004 303(d) lists are available on the NDEP's website. The 2006 303(d) list is currently awaiting approval by the EPA.
- The creek is currently listed for arsenic, boron, iron and zinc, although it is believed that these are naturally occurring and entering the creek from the hot springs. NDEP has states that this has not been verified due to time and money constraints. Phosphorous was not mentioned as being included in the 2006 303(d) list in the interview with NDEP.

It should be noted that Stantec has collected no samples from Steamboat Creek. Additionally, the 2006 303(d) list for Nevada is awaiting approval by the USEPA and is therefore not currently available to the public and has not been reviewed by Stantec.

Should you have any questions or concerns, please do not hesitate to contact me at your earliest convenience.

Sincerely,

STANTEC CONSULTING INC.

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Senior Scientist
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