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CITY OF TRAIL
MEMORANDUM

DATE: March 24, 2011 **FILE NO. 5400-02**

TO: DAVID PEREHUDOFF, CHIEF ADMINISTRATIVE OFFICER

FROM: WARREN PROULX, ENGINEERING TECHNICIAN

SUBJECT: **OLD TRAIL BRIDGE**

With the interest from our citizens and numerous questions on the state of the Old Bridge and cost breakdown for new bridge options being raised, the following additional information is provided.

CURRENT CONDITION

The major problem with the Old Trail Bridge is the deterioration of the river piers and the connecting piece between the piers called a strut. The strut holds the two piers in place and without the strut, the piers would fall over. The strut is the major reason why the bridge is closed. The steel from the strut is badly corroded and the concrete inside the strut has been reduced to loose gravel. The strength of the strut is no longer there. There are also problems with the piers as they also show signs of deterioration of the steel and loss of concrete inside the steel.

This is not the only problem with the bridge as the chord is also in need of repair. The chord is a long structure of steel that extends from pier to pier and sits on top of the piers. The chord is the support for the entire bridge deck starting with the steel floor beams and several layers of wood components up to the deck level. The steel chord is the section of the bridge we have repaired on several occasions over the last 10 years. The poor condition of the chord was the main reason why the bridge was closed back in 1999 and when repaired, the bridge reopened. This steel chord has deteriorated considerably over the last 10 years and was scheduled for major repair in 2010 but the repairs were cancelled upon receiving the news on the condition of the piers which resulted in the closure of the bridge last fall. Several pictures are attached showing the condition of the piers and strut and a picture identifying the bridge structure.

REHABILITATING THE EXISTING BRIDGE FOR VEHICULAR TRAFFIC

It is difficult to estimate the costs and life expectancy if the existing bridge were to be rehabilitated. As discussed, the existing piers are substandard and it is unlikely that they can be strengthened in a reliable fashion. Our engineers do not recommend considering repairing the existing piers.

It may be possible to construct new piers around the old piers, then partially demolish the existing piers and support the trusses on these new piers. The remaining life expectancy for the existing trusses would need to be considered in deciding the structure system for the new piers. For example, it is not cost efficient to build new concrete piers, which would outlast the existing trusses.

New piers could be entirely of steel construction. The construction would be challenging as the pile driving equipment would need to work under the existing trusses and around the existing piers. The truss load transfer from old piers to new piers would also be challenging. This option would be a 10 to 15 year solution. The existing piers would be left in place with some measures taken to prevent damage to the new piers in case the existing piers were to exert forces on the new piers. We estimate this option would probably cost in the order of $3 million to $5 million from design to completion.

If the trusses were to be repaired further (as we were planning to do) and maintained property (painted etc.), then it can probably be made to last another 10 to 15 years. The timber roadway deck probably needs replacing in 10 or 15 years. Some of the steel floor beams may need replacing or repairs as well. Assuming that one would try to get another 10 to 15 years out of the bridge, the cost of repairs and maintenance of the bridge superstructure over 10 to 15 years is estimated to be in the order of $3 million to $5 million.

To summarize, the costs in order to get another 10 to 15 years out of the existing rehabilitated trusses and new steel piers are estimated in the order of $6 million to $10 million.

Buckland and Taylor do not recommend rehabilitating the existing bridge as they do not think this is a cost effective solution for the City in the long run.

REHABILITATING THE EXISTING BRIDGE FOR PEDESTRIANS ONLY

There would be very little savings by rehabilitating the existing bridge for pedestrian loads only compared to rehabilitating it for vehicular traffic. The piers would need to be dealt with similarly for both options. The trusses would also need to be maintained in a similar fashion. The trusses and piers need to carry the self weight, wind and stream loads in addition to the live loads. The live load reduction for a pedestrian only option is not significant.

COST BREAKDOWN OF THE ESTIMATE TO REHABILITATE THE EXISTING BRIDGE

➢ Construct new piers:	$5.0 million
➢ Rehabilitation of steel chord/trusses:	$1.0 million
➢ Replacement of floor beams:	$1.0 million
➢ Replacement/repairs of timber deck:	$0.5 million
➢ Engineering:	$1.0 million
➢ Contingency:	$1.5 million
TOTAL:	$10 million

Total cost of rehabilitation of the existing bridge estimated at $10 million for an anticipated life of 15 years would have an annual depreciation of $666,667 per year.

COST BREAKDOWN OF THE ESTIMATES ON THE TWO BRIDGE OPTIONS

Option 1: Full Replacement Bridge including two lane roadway

The budgetary cost estimate was based on a unit deck area cost typically used in the bridge industry for construction of this type of bridge.

The following is an order of magnitude breakdown based on our engineer's qualitative assessment:

➢ Abutments:	$3 million
➢ River Foundations and Piers:	$6 million
➢ Superstructure:	$7 million
➢ Engineering:	$1 million
➢ Contingency:	$3 million
TOTAL:	$20 million

Total cost of a full replacement bridge including two lane roadway estimated at $20 million for an anticipated life of 75 years would have an annual depreciation of $226,667 per year.

Option 2: Pedestrian Suspension Bridge

The budgetary cost estimate provided by our engineers was based on the following:

- estimating the weight of the superstructure, weight of the pipelines and the pedestrian loading;
- estimating the size of the main cables and hangers for these loads;
- estimating the size of the wind cables and wind stays;
- contacting a cable supplier to provide the costs per unit length of the mentioned cables and hardware related to them;
- estimating the size of the towers;
- estimating the tower fabrication costs based on cost per unit weight;
- estimating the cost of superstructure based on cost per unit weight for the materials that would be used to construct the superstructure;
- contacting a contractor who had recently demolished a suspension in the Castlegar area and obtaining an estimate for the construction costs.

The following is an order of magnitude breakdown provided by our engineer's based on the component and construction costs given above:

- Towers and cable anchors: $1.9 million
- Superstructure: $3.3 million
- Engineering: $0.5 million
- Contingency: $0.8 million

TOTAL: $6.5 million

Total cost of a pedestrian suspension bridge estimated at $6.5 million for an anticipated life of 75 years would have an annual depreciation of $86,667 per year.

EARTH BRIDGE

A suggestion from one of our citizens is to construct an earth bridge. The basis for this suggestion is to use the excess materials (dirt, rock etc.) from the Waneta Dam project. The materials may be provided at little or no cost. Our engineers have indicated that constructing an earth dam/bridge would involve very detailed engineering studies including environmental, fisheries and geotechnical etc. The flow of water would be changed and a small dam upstream of the bridge would be created. Governments have stopped the practice of allowing the public to use dams for public roads. There are liability issues with vehicle explosions due to accidents on the top of a dam. The results of accidents could affect dam safety and potentially cause a catastrophe downstream with flooding. Local authorities across North America and around the world have closed roads on top of dams.

Please advise if you require any further information at this time.

RESPECTFULLY SUBMITTED:

Warren Proulx
Engineering Technician

cc: Larry Abenante, Public Works Manager

Photo 11: Typical Condition of the Bearings (Pier 1 downstream side shown)

Photo 12: General Condition of the Steelwork (Underside of Spans 3 and 4 shown)