Columbia River CROSSING

Memorandum

June 7, 2006

TO: Task Force

FROM: Doug Ficco, John Osborn

SUBJECT: Additional Component Screening

COPY:

Background

In the Step A screening process, the Task Force reviewed 14 transit components and 23 river crossing components for narrowing to those that will become part of the alternative packages for further evaluation. Seven transit components and nine river crossing components survived the initial Step A screening.

Several of these components, although they initially passed the Step A screening, are now being recommended for removal from further consideration. In addition, there are additional components that did not undergo Step A screening that are recommended for removal. The bases for removal of additional components are for the following reasons:

1. Based on further analysis and packaging of alternatives, it was evident that the component either should have failed Step A screening or performs so poorly against the Step A screening compared to other components that it should no longer be evaluated as part of an alternative package.
2. Special conditions exist that result in the likelihood that the component could not be implemented.

The CRC Project Team proposes the following components be considered by the Task Force for removal from further evaluation:

- RC-1, RC-2, RC-7, and RC-8 Movable Span Options
- RC-13 Supplemental Tunnel
- TR-6 Streetcar
- TR-11 Commuter Rail
- B/P-3 Bicycle/Pedestrian Path-Only Bridge
- F-3 Time of Day Freight Truck Restrictions
- F-4 Increase Truck Size

Attached are memoranda for each of the above components, including an analysis and recommendation for removal of the component from consideration as part of an alternative package.

Columbia River CROSSING

Memorandum

June 7, 2006

TO: Doug Ficco, John Osborn

FROM: CRC Engineering Team

SUBJECT: Screening of RC-1, RC-2, RC-7, and RC-8 Moveable Span Components

Overview

In the process of developing the River Crossing (RC) components and packaging them with the Roadway components, it has become apparent that those RC components that include a low-level moveable span should be removed from further consideration and not be included in alternative packaging. Issues relating to bridge openings and high maintenance and operations costs that exist with the current bridges would be perpetuated with a new low-level moveable span. Although the number of lifts would likely be reduced when compared to the existing number of openings, they would still occur and therefore would still impede interstate traffic. Moveable spans are more costly in both initial cost and maintenance and operations when compared to a fixed span.

In addition, there do not appear to be any significant advantages to constructing a moveable span bridge. A moveable span would permit a lower profile for the bridge, and thus could potentially result in different (potentially fewer) landside impacts. However, engineering studies to date indicate that the areas of potential impact would be virtually the same for the low-level, moveable span options as compared to the fixed-span (non-moveable) mid-level bridge options.

Component Description

Currently there are four low-level moveable bridge RC components that passed Step A screening as described below. A low-level RC component is defined as a bridge that provides 80 feet of vertical design clearance at the base river stage. By comparison, the mid-level fixed-span bridge design concepts will provide about 95 feet of vertical design clearance at the base river stage. Because the 80-foot clearance does not pass 100 percent of the marine vessels operating on the river, a moveable span would be needed to pass tall vessels. The moveable span could be accomplished by the use of a lift span, swing span, or draw bridge.

- RC-1 Replacement Bridge Downstream/Low-Level/Moveable: This river crossing component represents a new bridge that would be located immediately west (downstream) of the existing I-5 bridges. The existing I-5 bridges would be removed.
- RC-2 Replacement Bridge Upstream/Low-Level/Moveable: This river crossing component represents a bridge that would be located immediately east (upstream) of the existing I-5 bridges. The existing I-5 bridges would be removed.
- RC-7 Supplemental Bridge Downstream/Low-Level/Moveable: This river crossing component represents a new bridge which would be located immediately west (downstream) of the existing I-5 bridges. Either one or both of the existing I-5 bridges would remain in place as they are today. Additionally, because the existing I-5 bridges have lift spans, the opening of the new bridge would have to line up with the lift spans on the existing bridges.

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- RC-8 Supplemental Bridge Upstream/Low-Level/Moveable: This river crossing component represents a new bridge which would be located immediately east (upstream) of the existing I-5 bridges. The only difference between RC-7 and RC-8 is that RC-8 is located upstream.

Analysis

A new fixed-span bridge can be expected to be less expensive to construct, maintain, and operate, and would provide improved traffic flow and safety compared to a moveable span bridge. The higher mid-level fixed-span bridge would allow for uninterrupted passage for both the users of the bridge and marine vessels passing underneath.

A moveable span is typically only considered when the vertical clearance requirements cannot practically be met, if there are height restrictions that prohibit a higher fixed span, or if a lower profile bridge results in fewer undesirable impacts to onshore or in-water resources. Our analyses to date indicate that none of those three circumstances apply to this crossing.

The analyses are summarized in accordance with the project Purpose and Need Statement as defined in the Step A screening questions adopted as part of the Screening and Evaluation Framework.

For this analysis, the low-level moveable span bridge components were contrasted to mid-level bridges in the same location. Although the moveable span bridge components do not fail any of the Step A screening questions, the need for accommodating marine traffic through bridge openings results in poor performance for five of the six Step A screening questions when compared to higher fixed-span components.

Q1. Does the component increase vehicular capacity or decrease vehicular demand within the Bridge Influence Area?

Moveable spans require continued I-5 closures during bridge openings or continued marine restrictions when the bridge must remain closed. Bridge openings have a negative impact on increasing vehicular capacity within the Bridge Influence Area.

Q2. Does the component improve transit performance within the Bridge Influence Area?

Bridge openings have a negative impact for maintaining speed and reliability for transit that uses I-5 within the Bridge Influence Area.

Q3. Does the component improve freight mobility within the Bridge Influence Area?

Bridge openings have a negative impact for maintaining speed and reliability for freight mobility within the Bridge Influence Area. Even though bridge openings may be restricted to off-peak periods, freight traffic also relies on off-peak periods for maximum efficiency.

Q4. Does the component improve safety and decrease vulnerability within the Bridge Influence Area?

Roadway

Analysis of crash data has shown that there is a direct correlation between bridge openings and a substantially higher accident incidence. Although the number of openings may potentially be reduced compared to the existing condition, a fixed span would still provide a safer highway. An analysis was conducted to determine if the potential for a collision increases during bridge lifts and/or traffic stops. Logs obtained from ODOT’s Maintenance Unit, which maintains and operates the bridge, include information on bridge lift/traffic stop dates, times, and duration.

Using the 5-year collision database, a comparison was made between collisions that were reported to have occurred within a one-hour window of logged bridge lifts/traffic stops on weekdays between 9 a.m. and 2:30 p.m. The analysis only considered collisions that would involve vehicles approaching the bridge (i.e., northbound traffic approaching the bridge and southbound traffic approaching the bridge) as bridge lifts/traffic stops directly impact approaching traffic and may not have an effect on departing traffic.

Based on the analysis, it was determined that there is at least a three-times higher likelihood of a northbound collision when a bridge lift/traffic stop occurs than when it does not. There is over a four-times higher likelihood of a southbound collision when a bridge lift/traffic stop occurs than when it does not.

Some of these crashes may be a result of design deficiencies in the roadways north and south of the bridge, and would be eliminated if freeway improvements are constructed in conjunction with a new moveable span bridge. However, some of the crashes can be attributed to the queuing that occurs following each bridge lift, and those crashes would continue with a new moveable span bridge. By contrast, the problem can be eliminated entirely by the construction of a fixed-span bridge, thus eliminating bridge lifts.

Marine

The need for marine traffic to rely on bridge openings also increases risk to marine navigation. In meetings with barge operators, it was stated that one of the major concerns and frustrations with navigating through the Columbia River I-5 bridge channel is that of the captain's need to coordinate a lift clearance for the Interstate Bridge that is coincidental with the opening of the westerly downstream RR bridge. The required coordination between the I-5 and railroad bridges creates a potentially dangerous situation.

Aviation

Although a low-level moveable span initially appears to be a better option for aviation clearances, this is not necessarily the case. The moveable span could either be a swing span, a vertical lift, or a bascule-type span. The best case for aviation would be a swing span, but this may be impractical to construct given the potential width of the new bridge. For a vertical lift, the lift towers would encroach into Pearson's airspace. For a bascule-type span, there would be intermittent encroachments into Pearson's airspace during bridge openings. This would be the case for all four low-level moveable spans. In contrast, a fixed-span at a minimum would maintain the existing airspace encroachment condition with a supplemental bridge (one that kept the existing bridges), and with a replacement bridge it would actually serve to enhance the safety by eliminating the existing airspace encroachment.

<u>Q5. Does the component improve bicycle and pedestrian mobility within the Bridge Influence Area?</u>

A fixed span would provide better connectivity for bike and pedestrian facilities as it eliminates the potential for interrupted travel associated with low-level moveable bridges.

Other considerations

Although cost is not a Step A screening criteria, the construction cost for a moveable span is in the range of $100 million more than a fixed span with a higher vertical clearance. In addition, the maintenance cost for a moveable span versus a fixed span is much higher. The operations and maintenance for the moveable span is in the range of $400,000 more per year than a fixed span.

One of the potential concerns when comparing river crossing options is that the higher elevation options could potentially have more significant impacts at the onshore bridge approaches in Vancouver and on Hayden Island when compared to lower elevation, moveable span options. However, the design development of the low- and mid-level options has resulted in a relatively minor difference of elevation of about 15 feet at mid-span (as noted above, the low-level bridge would be at about 80 ft above the water, and the mid-level span would be at about a 95 ft. elevation). The difference in elevation would generally be progressively less as you move away from the river, resulting in relatively minor differences in elevation at the Vancouver and Hayden Island approaches.

As a result, the potential on-shore impacts can be viewed as approximately equivalent for the low- and mid-level options.

Conclusions and Recommendations

Moveable spans are warranted only when vertical clearance requirements cannot practically be met, if there are height restrictions that prohibit a higher fixed span, or if a lower profile bridge results in fewer undesirable impacts to onshore or in-water resources. In the case for the I-5 Columbia River Crossing, none of the three conditions are met. As demonstrated, the low-level moveable spans carry significant costs to mobility, safety, freight economy, and financial resources with no benefits over a fixed span. A higher mid-level fixed span can perform the same function as a low-level moveable span at lower cost and with no significant differences in impacts to the surrounding communities. For these reasons, RC-1, RC-2, RC-7, and RC-8 are not recommended for continued development.

Memorandum

June 7, 2006

TO: Doug Ficco and John Osborn

FROM: CRC Engineering Team

SUBJECT: Screening of RC-13 Supplemental I-5 Tunnel

Overview

In the process of developing the River Crossing (RC) components and packaging them with the Roadway components, it has become apparent that the RC-13 component which includes a supplemental I-5 tunnel crossing should be removed from consideration. Additional traffic analysis completed after the initial Step A screening indicates continued marginal performance in several of the criteria.

Additionally, since the existing I-5 bridges would still be needed to carry non-tunnel traffic (six lanes worth), continued safety issues remain related to the existing Interstate Bridge lift spans, alignments, vertical profiles, and shoulder widths. Also, although cost was not a specific Step A screening criteria, it is clear that RC-13 is likely to cost significantly more than any bridge River Crossing component without offering any significant performance benefit compared to the lower cost alternatives.

Other RC options would avoid some of the more severe environmental impacts associated with RC-13 tunnel construction. Development of tunnel designs has revealed unique and potentially severe impacts to aquatic habitat, archaeological and other historic resources, in addition to commercial property impacts adjacent to the portal areas on Hayden Island and downtown Vancouver.

Component Description

<u>RC-13 Tunnel to Supplement I-5</u>

This component would supplement the existing I-5 bridges with a multi-lane tunnel, with the existing I-5 bridges remaining in place. Several factors limit the possible alignment and design of a supplemental tunnel to a very narrow range of placement alternatives. In order to maintain the current bridges, match existing vertical grades of the land on each side of the River and meet freeway design standards, the tunnel would have to be configured as follows. On the Oregon side, the tunnel would surface and tie back into existing I-5 on the south end of Hayden Island. In Washington, the tunnel would connect north of SR 14 (just south of Mill Plain Boulevard). No connections would be available from the tunnel to the interchanges at Marine Drive (ramps from Marine Drive are too close to the south tunnel entrance), Hayden Island, SR 14, Mill Plain Boulevard, and SB 4th Plain Boulevard. Connections to these interchanges would be provided via existing I-5. Additionally, portions of I-5 where the tunnel resurfaces would require major reconstruction to tie back into the existing alignment.

Analysis

The analyses are summarized in accordance with the Step A criteria adopted as part of the Screening and Evaluation Framework. Also, it is worth noting that an upstream alignment was chosen for analysis so that river excavation volumes and impacts directly to downtown Vancouver could be minimized and/or avoided.

<u>Q1. Does the component increase vehicular capacity or decrease vehicular demand within the Bridge Influence Area?</u>

Although the tunnel will carry about 45 percent of the future I-5 traffic volume, the other 55 percent will continue to use the existing I-5 bridges. Since the lift span will still be in place, congestion and

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safety issues will still exist during lift periods. Also, in the areas where the tunnel surfaces and the realigned I-5 alignments tie back in, significant traffic turbulence is anticipated. Although not specifically analyzed, experience shows that merging 12 lanes into 6 is a challenging traffic scenario, with a high potential for driver confusion and numerous weaving movements.

Q3. Does the component increase freight mobility within the Bridge Influence Area?

Most of the existing interchanges within the Bridge Influence Area will not have access to the supplemental tunnel which will benefit through freight trips but restrict access to the new capacity provided by the tunnel. And, since the existing lift spans would remain in place, bridge openings will continue and be limited to off-peak hours. This would disproportionately impact freight movements, which tend to occur outside the peak periods.

Q4. Does the component improve safety and decrease vulnerability to incidents within the Bridge Influence Area?

Unless there is a complete reconstruction of the existing I-5 bridges to handle the 55 percent of traffic needing to use it, significant and continued safety concerns remain. These include seismic vulnerability, inadequate and unsafe shoulder and bike/pedestrian path widths, substandard vertical and horizontal alignments, and the remaining lift span still in place. If this reconstruction is envisioned to correct these deficiencies, than it is impractical to also build a parallel tunnel for cost reasons.

Other factors not included in Step A screening that are special conditions to consider for tunnel options:

Historic, Prehistoric, and Cultural Resources

RC-13 would likely result in severe impacts to significant archaeological and historic resources. The tunnel option would require cut-and-cover trenching up to 200 feet wide and up to 40 feet deep from the Washington shore of the Columbia River to about Evergreen Boulevard. This alignment is located in and around the Fort Vancouver Historic Preserve, which has known and undiscovered archaeological resources. Coordination to date with tribes, the National Park Service, and others suggests that there is a very high likelihood that numerous Indian burials occurred and are present in this area. Specific locations are unknown at this time. In addition, there are significant historic resources in the alignment of the proposed tunnel. Based on the existing available information and the current designs of river crossing components, the tunnel would result in the greatest amount of ground disturbance and would have the highest risk of resulting in the greatest potential impact to archaeological resources, in addition to impacts to known 4(f) resources.

Impacts to Threatened or Endangered Fish or Wildlife Habitat

This option would require dredging a trench approximately 200 feet wide and approximately 40 feet deep across the Columbia River. The in-water dredging would occur over multiple seasons and would produce over 1 million cubic yards (over 2 million for the entire tunnel) of dredge spoils. The impacts to water quality from a dredging project of this scale and duration could be significant. The potential impacts to threatened and endangered species is likely to be a significant concern to the National Marine Fisheries Service, greater than associated with the bridge options.

Cost of Construction

Although cost is not a consideration for this screening, on an order-of-magnitude comparison, the construction cost for a tunnel crossing could be in the range of twice that of a major bridge crossing. In addition, there would also be significant costs in rebuilding significant parts of I-5 in the portal areas so that the tunnel can resurface and tie back in to the existing alignment. In addition, much higher right-of-way costs on Hayden Island and downtown Vancouver would be necessary. Considering the uncertainty of project funding at this time, the magnitude of the higher costs could jeopardize funding.

Ongoing Maintenance and Operations Costs

The annual operations and maintenance costs for a tunnel of this length (5700 feet) would exceed $2 million, which is significantly more than for a major bridge crossing.

Conclusions and Recommendations

Although the tunnel provides some traffic operations benefit by splitting I-5 traffic, the tunnel option does not perform well against Step A screening criteria, especially compared to bridge options. In addition, the tunnel option would have potentially more severe impacts to some environmental resources without any unique and significant environmental advantages. It would also have greater right-of-way acquisition impacts, and overall much higher costs. For these reasons, RC-13 is not recommended for continued development.

Columbia River CROSSING

Memorandum

June 7, 2006

TO: Doug Ficco and John Osborn

FROM: CRC Transit Team

SUBJECT: Assessment of Operating Streetcars (TR-6) on Interstate MAX Tracks
Recommendation to Eliminate Streetcars from Further Consideration

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Overview

This memorandum describes the results of a separate study to determine the feasibility of operating streetcars (transit component TR-6) on the Interstate MAX tracks within and south of the Bridge Influence Area.

During the February 2006 NEPA scoping process, a comment was received by the CRC project team to evaluate streetcars as a transit modal option within the Bridge Influence Area. The general concept suggested for the streetcar was a north-south alignment from downtown Vancouver to downtown Portland. The alignment would generally run from downtown Vancouver southbound over a new river crossing, through Hayden Island, and connect to the existing Interstate MAX tracks. The streetcar would then go southbound on the existing LRT tracks to downtown Portland.

Although the TR-6 Streetcar component passed Step A screening, subsequent analysis shows that interlining a streetcar system on the Interstate MAX right-of-way has safety, travel time, and capacity problems, and is technically infeasible. Prior to this analysis, it had been determined that streetcars operating on light rail tracks have the potential to 1) increase vehicular capacity or decrease vehicular demand within the Bridge Influence Area and 2) improve transit performance within the Bridge Influence Area. This finding was predicated on the ability of streetcars to operate on the Interstate MAX tracks all the way to downtown Portland, and thus serve all of the identified 2020 transit markets. On this assumption, streetcars were recommended to advance through the Step A and B screening processes.

The results of the subsequent analysis showed that streetcars could not use the existing Interstate MAX tracks, and thus would require all passengers to transfer to the Interstate MAX line. Since no other transit mode would require a transfer onto the Interstate MAX line, streetcars would have a distinct travel speed and travel time disadvantage vis-a-vis other transit modes and would have difficulty attracting enough passengers to decrease travel demand within the Bridge Influence Area. As a result, streetcars (TR-6) fail question #1 of Step A screening. The CRC Transit Team therefore recommends that streetcars (TR-6) be eliminated from future consideration.

Streetcar Description

Streetcar transit is similar to LRT and can operate in shared vehicle lanes in city streets, in separated lanes on urban arterials, or on its own exclusive track. It uses electrically powered rail cars, and has been implemented in San Francisco, Portland, Tampa, Tacoma, and other U.S. cities. Cities with streetcars typically range in population size from one to three million people, although some smaller cities have developed short streetcar segments as historic tourist attractions. On a per-mile basis, streetcar transit typically costs between $25 million to $50 million per mile. The cost of streetcar transit typically depends on station geometrics, whether existing right-of-way is already owned by the constructing agency, and how many utilities are relocated out of the streetcar's path. Compared to light rail, streetcar transit typically has the following major differences:

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Figure 1: Typical Streetcar

Streetcars have significantly lower top operating speeds, primarily because they generally operate in shared right-of-way. Thus, streetcars are not typically used for long distance commuting, as other rail modes are better able to capitalize on long sections of track with no stops. Streetcar is typically an intra-urban mode with two- to three-block station spacing, whereas light rail is typically used as an inter-urban mode with half-mile or greater station spacing. The average vehicle speed of the Portland Streetcar is 6 MPH, while the Interstate MAX line operates at an average of 16 MPH.

Streetcars typically operate in general purpose traffic lanes, while light rail typically operates in its own exclusive right-of-way.

Streetcars usually have less passenger capacity than light rail vehicles. In Portland, each streetcar carries a maximum load of 92 passengers, compared to 133 for a loaded LRT vehicle. LRT service is usually provided by two-vehicle trains (carrying up to 266 passengers), whereas streetcars usually operate as single trains to complete tight turns in urban areas and to minimize parking reductions.

Analysis of Interlining Streetcars and the Interstate MAX

Although light rail and streetcar are both rail modes that run on tracks with the same track gauge, they are designed to serve different purposes. The light rail system is designed to serve regional trips at relatively high speeds and high passenger capacities. The streetcar system is designed to serve local trips at relatively low speeds and moderate passenger capacities. Vehicle manufacturers such as Skoda-Inekon and Siemens design their LRT and streetcar vehicles differently to optimize vehicle performance in each environment. Manufacturers also have different vehicle specifications that make them incompatible with each other. Examples of this include:

1. LRT vehicles are designed to operate up to 55 mph. Portland's Skoda-Inekon streetcar can operate only up to 31 mph.
2. Streetcars do not have the same signal and communication equipment as light rail vehicles.
3. Streetcars lack a more crash-resistant body structure with anti-climbers at the proper height to prevent one train from telescoping into the body of the other train in a crash.
4. Streetcars are narrower than light rail trains and their platforms are a half-inch higher and more than four inches wider that light rail platforms.
5. Streetcars lack couplers and train-line connectors and cannot be run in two-car trains.
6. Streetcars have 1/3 the capacity of the typical two-car LRT train but about the same operating cost per mile.

While some vehicle specifications could be modified to address some of these concerns, the cost of building such a vehicle would be significant and would not significantly address safety, travel speed, and capacity issues.

Operating streetcars on light rail tracks would also introduce significant safety hazards that could not be avoided. Streetcar chassis are more fragile and less crash-resistant than light rail vehicles, and no streetcar design is currently equipped with anti-climbers. Thus, in a collision with a light rail vehicle, the light rail vehicle would ride over the chassis of the streetcar vehicle, owing to the different vehicle types. This is an unacceptable safety risk and a fatal flaw of interlined service.

Analysis of Requiring Transfers

The analysis above found that since streetcars do not have a viable connection to downtown Portland south of the Bridge Influence Area, all passengers would be required to transfer at the Exposition LRT Station to the Interstate MAX line to reach downtown Portland. Numerous technical studies conducted in the U.S. over the last three decades have concluded that requiring a transfer between transit vehicles decreases the number and frequency of passengers that would otherwise utilize the service.

All other transit modes considered as part of the CRC project would not require a transfer to the Interstate MAX line. For example, express buses and bus rapid transit modes from Clark County would not by necessity have to terminate their operations at the Interstate MAX line and require their passengers to transfer to reach downtown Portland. Express buses and bus rapid transit modes have the option to continue to downtown Portland either on I-5 in general purpose lanes or on the City of Portland's arterial street system. They do not by necessity require building a new transit right-of-way south of the bridge influence area. The express bus, bus rapid transit, and light rail transit modes all can provide a one-seat ride from downtown Vancouver to downtown Portland.

Requiring a transfer for all passengers within the bridge influence area significantly limits a streetcar's ability to improve transit travel time performance and serve the identified 2020 transit markets. As a result, streetcars would have difficulty attracting passengers and would not decrease travel demand within the Bridge Influence Area. Streetcars (TR-6) fail question #1 of Step A screening and the CRC Transit Team recommends that streetcars (TR-6) be eliminated from future consideration.

Conclusions and Recommendations

As a result of these findings, streetcars cannot operate on the Interstate MAX tracks and therefore fails Question #1 of Step A screening: "Does the component increase vehicle capacity or decrease travel demand within the Bridge Influence Area?" The findings indicate that without a connection to downtown Portland south of the Bridge Influence Area and requiring all passengers to transfer to the Interstate MAX line, streetcars would not serve the identified 2020 transit markets, would have difficulty attracting passengers, and would not decrease travel demand within the Bridge Influence Area. As a result, streetcars (TR-6) fail question #1 of Step A screening and the CRC Transit Team recommends that streetcars (TR-6) be eliminated from future consideration.

Columbia River CROSSING

Memorandum

June 7, 2006

TO: Doug Ficco and John Osborn

FROM: CRC Transit Team

SUBJECT: **Screening of TR-11 Commuter Rail**

Overview

During NEPA scoping earlier this year, it was suggested that commuter rail operating on the existing Burlington Northern Sante Fe (BNSF) tracks could be a potential transit mode for the CRC project. This suggestion was evaluated in the Step A Screening process. The analysis concluded that, due to significant freight rail congestion, there is no excess rail capacity on the existing BNSF tracks. Commuter rail operating on the existing BNSF tracks is infeasible given this condition and would not improve transit performance within the bridge influence area. As a result, commuter rail failed question two of the Step A screening process and staff recommended that it not be advanced for further consideration.

At the May 17th CRC Task Force meeting the CRC Project team was asked to evaluate commuter rail under three operating conditions: 1) on the existing BNSF tracks; 2) on a new dual-track commuter rail alignment within the BNSF right-of-way; or, 3) on a new dual-track commuter rail alignment within the I-5 corridor. The analysis is summarized below for each of the three commuter rail operating conditions:

- **Commuter rail operating on the existing BNSF tracks is infeasible**. The project team reviewed its original Step A screening results and two previous commuter rail studies for the Portland/Vancouver area: the 1999 *RTC Commuter Rail Feasibility Study* and the 2003 *I-5 Transportation and Trade Partnership Rail Study*. These studies confirm that operating commuter rail on the existing BNSF tracks is infeasible because of insufficient capacity required to accommodate the frequency and timing of trains necessary for this type of service.
- **Commuter rail operating on a new dual-track alignment within the BNSF right-of-way is infeasible.** A new dual-track commuter rail alignment within the BNSF right-of-way to bypass the existing freight rail congestion would have significant environmental and cost impacts in comparison to the projected ridership. The CRC Transit Team has concluded that even under these assumptions a new commuter rail alignment would not serve the current and future 2030 transit markets. The BNSF right-of-way is west of the main transit markets, is dotted with freight rail crossings, threads its way through two large rail yards, and would have slower travel times due to out-of-direction travel. Based on this analysis, commuter rail operating on a new dual-track commuter rail alignment within the BNSF right-of-way is infeasible and would not improve transit performance within the bridge influence area.
- **Commuter rail operating on a new dual-track alignment within the I-5 corridor is infeasible.** A new analysis shows that building a new dual-track commuter rail alignment within the I-5 corridor would be a challenging and expensive undertaking. The analysis concludes that:
    - To serve the current and future 2030 transit markets a new 40-foot dual-track commuter rail right of way within the I-5 corridor would need to be assembled and constructed. The new right of way would need to be more than 15 miles long and connect Union Station in downtown Portland to Salmon Creek in Clark County.
    - The physical requirements of assembling and building a new 15 mile grade separated alignment within the already densely populated and urbanized I-5 corridor, could result in a large number of property acquisitions or easements, and would have significant environmental and cost impacts.

- Commuter rail requires vertical alignment grades less than 2%. The river crossing would need to be at a low level with a lift span to accommodate navigation needs, further impacting safety for river navigation.

Based on this analysis, commuter rail under its original and the two new operating conditions have been found to be infeasible and would fail question two of the Step A screening. Commuter rail is therefore recommended not to be advanced for further consideration as part of the Columbia River Crossing project. However, given that investments are anticipated to be needed in the future to serve projected growth In freight rail activity, as well as growth in inter-city passenger rail (i.e., Amtrak), it may be appropriate to re-consider the viability of commuter rail at the same time as when planning for other investments in the regional rail system.

Definition of Commuter Rail

Commuter rail train service is typically used for long distance travel between a central city, adjacent suburban areas, and other cities within a region. Commuter rail systems generally use diesel-powered locomotives with passenger rail cars and operate in existing railroad rights-of-way where excess rail capacity exists.

Commuter rail service is typically provided during morning and evening peak commuting periods. Stations are located close to major activity centers and/or served by park-and-ride lots to assure maximum ridership.

Figure 1: Typical Commuter Rail Train

Historically, commuter rail is often less expensive than other passenger rail modes because it operates on existing railroad rights-of-way where excess train capacity exists and shares tracks with freight operations. Since commuter rail typically operates in freight rail corridors, there are usually extensive negotiations with the active railroad for the privilege of sharing the right-of-way and an annual track fee is paid. **Figure 1** shows a typical commuter rail train.

Analysis

The analysis presented below describes how commuter rail under its original and the two new operating conditions were screened using the Step A process. The commuter rail options were screened against two of the six questions, which are:

Q1. *Increase vehicular capacity or decrease vehicular demand within the Bridge Influence Area?*

Q2. *Improve transit performance within the Bridge Influence Area?*

Commuter rail passed Question #1, but failed Question #2. Following is a more detailed analysis of the three operating conditions that were evaluated.

Operating Condition 1 – Commuter Rail operating on the Existing BNSF Tracks

During the Step A screening process transit component TR-11, Commuter Rail on Existing BNSF Tracks, was screened and failed question #2. To improve existing transit service in the Bridge Influence Area, commuter rail would have to be integrated with the existing bus and rail network, which is infeasible, as the technology would operate in a completely grade separated right-of-way well west of the current and future 2030 transit markets. In addition, while new commuter rail service along regional freight rail tracks could conceivably serve some transit markets in the Bridge Influence Area (e.g., North Portland), it would provide poor, out-of-direction service to some key activity centers (e.g., downtown Portland).

In 2003 there were 10 intercity Amtrak Cascades passenger trains that cross the BNSF Columbia River railroad bridge per day operating from Seattle to Portland. This compares to over 150 train movements made by BNSF and Union Pacific (UP) trains per day. In 20 years service plans anticipate 26 Amtrak Cascades passenger train crossings per day, effectively using any remaining rail capacity that exists, even without allowances for future growth in freight train activity.

The 1999 *RTC Commuter Rail Feasibility Study* evaluated new commuter rail service between Portland's Union Station and Vancouver's Amtrak Depot. From Vancouver two routes split off: one traveling north and east to Rye and one traveling east to Fisher's Landing. The need for three new stations was identified and three levels of peak-only service were selected: low, medium, and high. Under 2003 freight and intercity passenger rail conditions, the low and medium service alternatives were feasible with rail capacity improvements ranging from $36.6 million to $53.1 million (in 1998 dollars). By 2018, no commuter rail service alternatives could be mitigated to feasible delay levels.

The 2003 *I-5 Transportation and Trade Partnership Rail Study* found that there is insufficient capacity on the existing BNSF line to accommodate the frequency and timing of trains for commuter rail service. Nonetheless, the study evaluated a proposed commuter rail service on an improved freight rail system where 10 incremental projects were considered, at a cost of $170 million dollars (in 2002 dollars), to help relieve freight rail congestion. Assuming that the projects could be funded and constructed, the study still concluded that there was not enough rail capacity for a commuter rail operation. Interestingly, the study also found that even with the $170M in improvements, the average Amtrak Cascades passenger train speed would increase by only 2%.

Lastly, the 2003 *I-5 Transportation and Trade Partnership Rail Study* found that commuter rail service could only be instituted on a separated passenger rail-only network. In strongly worded policy statements it concluded that commuter rail operating on the existing tracks is an unacceptable outcome to the BNSF and the UP railroads. The previous work confirms that commuter rail operating on the existing BNSF tracks is infeasible and would not improve transit performance within the bridge influence area.

Operating Condition 2 – Commuter rail operating on a new dual-track alignment within the BNSF right-of-way

The second option for operating a commuter rail system within the Portland/Vancouver area is to add two new tracks within the BNSF right-of-way. A new track within the BNSF right-of-way would require a substantial capital investment in equipment and would require leasing the right-of-way from BNSF under a carefully crafted joint operating agreement.

The 1999 *RTC Commuter Rail Feasibility Study* found that a dedicated commuter rail alignment within the BNSF right-of-way was estimated to cost $450 to $750 million (in 1998 dollars), including property acquisition, environmental mitigation, main line reconfiguration and equipment. The *I-5 Transportation and Trade Partnership Study* estimated the cost of a separated passenger rail network within the BNSF right-of-way to be $1.5-1.7 billion dollars (in 2002 dollars), with uncertainty due to geologic and structural issues. The new tracks would require an acquisition of 35 residences, 7-12 industrial properties, and local street closures up and down the corridor. New tracks also increased the mainline footprint from 2 tracks to 4, filling in some wetlands along the way and triggering an unknown quantity of environmental restoration.

As noted in the previous section, the RTC Commuter Rail Feasibility Study found that, in 2003, the high commuter rail service alternative would require a dedicated alignment. In 2018 any level of commuter rail would need a dedicated alignment:

- **Dedicated Alignment Costs**: To increase capacity to make commuter rail feasible, the study considered a freight rail bypass above and below points of conflict with freight service between Vancouver and North Portland. Even under this scenario the dedicated alignment was estimated to cost $450 to $750 million (in 1998 dollars), including property acquisition, environmental mitigation, main line reconfiguration and equipment.

- **Operating Costs**: Approximate operating costs per train mile by service level were estimated as follows: Low - $90; Medium - $75; High - $55. This assumed a new agency would manage the commuter rail system. Cost recovery from fares and concessions would be less than 20% of operating costs; substantially less than most comparable services.

- **Columbia River BNSF Bridge**: Adding a third mainline to the Columbia River and Oregon Slough bridges would likely only push the chokepoints to where trains would merge into two tracks.

Both of the commuter rail studies concluded that commuter rail operating on a new dual-track alignment within the BNSF right of way is infeasible. Since freight rail capacity conditions have not significantly changed since the 1999 and 2002 studies, commuter rail operating on a new dual-track alignment within the BNSF right of way is infeasible and would not improve transit performance within the bridge influence area.

Operating Condition 3 – Commuter Rail on New Track within the I-5 Corridor

A third option for operating a commuter rail system to serve the transit market within the I-5 Corridor is to construct a new dual-track alignment along I-5. To construct a new track within the I-5 corridor would require a substantial commitment from both Washington and Oregon state legislatures and would surpass the Columbia River Crossing project in scope and magnitude. A successful commuter rail system would require a new 15 mile long corridor that is 40 feet wide, grade separated, with stations located every 4-5 miles. Such a system would serve the current and future 2030 transit market and provide frequent peak hour service of 30 minutes or less, and regular all day service.

Other significant findings are:

- To be consistent with City of Portland plans commuter rail service to downtown Portland would be required to go to Union Station. As such, a new dual track system to Union Station via the I-5 corridor would require two bridge crossings; one at the Columbia River and one at the Willamette River.
- A new dual-track commuter rail alignment within the I-5 corridor would need to serve the current and future 2030 transit markets, and would thus require building a new 40 foot grade separated right-of-way more than 15 miles long from Union Station in downtown Portland to Salmon Creek in Clark County.
- The physical requirements of assembling and building a new 15 mile long grade separated alignment within the already densely populated and urbanized I-5 corridor could result in a large number of property acquisitions or easements, and would have significant environmental impacts.
- Commuter rail would require an at-grade river crossing or one with a slope of 2% or less. All CRC river crossing options that had these lower slopes have been eliminated from further consideration due to unacceptable marine navigation impacts. A river crossing option that could feasibly carry commuter rail would likely result in a permanent negative impact to marine navigation.

A peer review was conducted as part of this analysis to determine how this potential commuter rail project would compare with other successful commuter rail projects around the U.S. The review included interviews with key project managers and research into four different commuter rail projects in Portland, Oregon; Nashville, Tennessee; Salt Lake City, Utah; and Seattle, Washington. Their feedback indicated that a commuter rail project built within the I-5 corridor, outside an existing rail corridor would be totally unique. These experts noted that other successful commuter rail projects have relied on three keys factors: utilizing excess rail capacity and resources, building stations that could attract thousands of passengers, and having a willing and helpful track owner.

A new commuter rail track within the I-5 corridor would also likely require other operational elements such as protected crossings, grade separated tracks; local street closures; compliance with safety regulations, regulations by the Federal Railroad Administration (FRA); compliance with existing railroad work rules and union agreements. A new track within the I-5 corridor would also require a substantial capital investment. Equipment capable of reaching speeds over 80 mph would be expensive and would require Class 1 railroad track with an in-cab signaling system.

Based on this analysis, assembling and building a new commuter rail railroad within the I-5 corridor is infeasible and would not improve transit performance within the bridge influence area.

Conclusions and Recommendations

The Step A screening process concluded, and the RTC and I-5 Transportation and Trade Partnership studies confirm, that commuter rail operating: 1) on the existing BNSF tracks; 2) on a new dual-track commuter rail alignment within the BNSF right-of-way; or, 3) on a new dual-track commuter rail alignment within the I-5 corridor fails question #2 of the Step A screening process because they are infeasible and would not improve transit performance within the Bridge Influence Area. Therefore, the CRC Transit Team recommends that commuter rail not be advanced for future consideration as part of the Columbia River Crossing project.

However, given that investments are anticipated to be needed in the future to serve projected growth In freight rail activity, as well as growth in inter-city passenger rail (i.e., Amtrak), it may be appropriate to re-consider the viability of commuter rail at the same time as when planning for other investments in the regional rail system.

Columbia River CROSSING

Memorandum

June 7, 2006

TO: Doug Ficco and John Osborn

FROM: CRC Transportation Planning Team

SUBJECT: Screening of B/P-3 Bicycle/Pedestrian Path-Only Bridge

Overview

In the process of integrating bicycle/pedestrian components into alternative packages, it has become apparent that the concept of a stand-alone bicycle/pedestrian bridge adjacent to I-5 and spanning the Columbia River should be removed from further consideration.

Component Description

Component B/P-3 is the construction of a new bridge across the Columbia River that would only provide a multi-use pathway for use by bicyclists and pedestrians. This new bridge, if constructed, would not be usable by other modes, including passenger vehicles, truck-freight, or transit.

Analysis

A stand-alone bicyclist and pedestrian bridge, without provision of added capacity on I-5 across the Columbia River for passenger vehicles, truck-freight, or transit, would not meet many of the project's Step A criteria as adopted as part of the Screening and Evaluation Framework.

All I-5 river crossing components, with the exception of tunnel options, would include a new or improved multi-use pathway as a part of their design. The proposed pathway for each of these components would meet or exceed current multi-use design standards. Thus, a stand-alone multi-use pathway would not be necessary.

For the river crossing tunnel options, a multi-use pathway would not be provided as a part of the tunnel, but could be provided on the existing Interstate Bridge under the Supplemental Tunnel component. For the Replacement Tunnel component, a stand-alone multi-use bicyclist and pedestrian bridge could provide a multi-modal connection, but such a structure may interfere with marine safety.

A stand-alone bicycle/pedestrian bridge was evaluated against some of the Step A criteria, as discussed below:

Q1. Does the component increase vehicular capacity or decrease vehicular demand within the Bridge Influence Area?

A stand-alone bicycle/pedestrian bridge, without providing added vehicular capacity or vehicular demand, will have little impact in reducing travel times and delay for passenger vehicles. There would be no discernable reduction in the number of hours of daily highway congestion in the I-5 corridor.

Q2. Does the component increase transit performance within the Bridge Influence Area?

A stand-alone bicycle/pedestrian bridge, without providing added transit capacity to I-5 within the Bridge Influence Area, would not reduce travel times and delay for transit modes.

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Q4. Does the component improve safety and decrease vulnerability to incidents within the Bridge Influence Area?

A stand-alone bicycle/pedestrian bridge, without improving key existing non-standard geometric and safety features on I-5 within the Bridge Influence Area, would not enhance vehicle or freight safety on I-5. A separate bridge will negatively impact navigation channel geometrics to accommodate ship movements considering necessary tug and barge turning maneuvers.

Q5. Does the component improve bicycle and pedestrian mobility within the Bridge Influence Area?

A stand-alone bicycle/pedestrian bridge across the Columbia River located in close proximity to touch-down existing facilities will perform well to improve bicycle and pedestrian mobility within the Bridge Influence Area.

Other Considerations

While cost is not part of the screening criteria at this time, it must be noted that a stand-alone bicycle/pedestrian bridge would be substantially more costly than integrating a bicycle/pedestrian path into a bridge constructed to also serve other purpose (e.g., highway or transit use). Also, the provision of a bicycle/pedestrian path on a multi-purpose structure would create fewer environmental impacts than would constructing a new highway/transit bridge and a separate bicycle/pedestrian bridge.

Conclusions and Recommendations

Component B/P-3, a stand-alone bicyclist and pedestrian bridge, would not meet many of the project's Step A criteria as adopted as part of the Screening and Evaluation Framework and is not recommended for continued development.

All I-5 river crossing components, with the exception of tunnel options, include a new or improved multi-use pathway as a part of their design. The proposed pathway for each of these components would meet or exceed current multi-use design standards. Thus, a stand-alone multi-use pathway would not be necessary.

For the river crossing tunnel options, a multi-use pathway would not be provided as a part of the tunnel, but could be provided on the existing Interstate Bridge under the Supplemental Tunnel component. For the Replacement Tunnel component, a stand-alone multi-use bicyclist and pedestrian bridge could provide a multi-modal connection, but such a structure may interfere with marine safety.

Memorandum

June 7, 2006

TO: Doug Ficco and John Osborn

FROM: CRC Transportation Planning Team

SUBJECT: Screening of F-3 Time of Day Freight Truck Restrictions on I-5

Overview

Freight components were not included in the initial Step A screening that focused only on River Crossing and Transit components, because the list of components was short and it was not expected that screening would significantly reduce the options that needed to be analyzed. However, in the process of integrating freight components into alternative packages, it has become apparent that the concept prohibiting truck-freight use on I-5 during peak commuting periods within the I-5 Bridge Influence Area should be removed from further consideration. It does not meet Step A criteria for improving freight mobility within the Bridge Influence Area.

Component Description

Component F-3 proposes to prohibit truck-freight use of I-5 (within the Bridge Influence Area) during peak commuting periods.

Analysis

Prohibiting truck-freight use along I-5 within the Bridge Influence Area would not meet the project's Step A criteria as adopted as part of the Screening and Evaluation Framework.

Q3. Does the component improve freight mobility within the Bridge Influence Area?

Such a restriction would significantly impact freight mobility, affect freight access to key origins and destinations, and would divert vehicle-moved freight to other routes, including other highways and arterial roadways. The prohibition of truck-freight use on I-5 within the Bridge Influence Area during peak commuting periods would result in truck trips being diverted along other highways and arterial roadways, resulting in increased travel times and added delays for vehicle-moved freight in the I-5 corridor. Peak prohibition of truck-freight would also restrict access to port, freight, and industrial facilities, many of which are located within the Bridge Influence Area.

Other factors not included in Step A screening criteria that are special conditions to consider.

The restriction of truck traffic on I-5 would be contrary to federal and state policy.

The prohibition of truck-freight use on I-5 within the Bridge Influence Area during peak commuting periods would result in truck trips along other highways and arterial roadways, thereby likely increasing the magnitude of residential properties affected by increased noise levels and potentially diminished air quality.

Conclusions and Recommendations

Component F-3, the proposal to prohibit truck-freight use of I-5 (within the Bridge Influence Area) during peak commuting periods, would not meet the project's Step A criteria as adopted as part of the Screening and Evaluation Framework and is not recommended for continued development.

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Such a restriction would significantly hinder freight mobility, affect freight access to key origins and destinations, and would divert vehicle-moved freight to other routes, including other highways and arterial roadways.

Columbia River CROSSING

Memorandum

June 7, 2006

TO: Doug Ficco and John Osborn

FROM: CRC Transportation Planning Team

SUBJECT: Screening of F-4 Increased Freight Truck Size on I-5

Overview

In the initial process of considering the integration of freight components with river crossing components, it has become apparent that the concept of allowing increased freight truck size along the I-5 corridor, including within the Bridge Influence Area, should be removed from further consideration.

Component Description

Component F-4 proposes the use of increased freight truck size along the I-5 corridor, including within the Bridge Influence Area. Component F-4 proposes the development of a policy to enable use of larger trucks on I-5.

Analysis

Allowing the use of larger semi-trailers than are currently legally allowed on I-5 in both Washington and in Oregon is beyond the scope of the Columbia River Crossing project study and would require action by both states. Enabling larger truck use on I-5, or any other highways, could result in freight mobility, safety, traffic, operational, and environmental implications that affect more than just the project study area.

Conclusions and Recommendations

Component F-4, the proposal to allow the use of increased freight truck size along the I-5 corridor, including within the Bridge Influence Area, would require policy actions by both Washington and Oregon and could result in implications that affect more than just the Columbia River Crossing study area. It is therefore recommended that this component not be developed further for this study.

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