MARINE DRIVE INTERCHANGE
ALIGNMENT RECOMMENDATION PROCESS

FINAL SUMMARY REPORT AND STAKEHOLDER RECOMMENDATION

BACKGROUND

Project Background

The Columbia River Crossing (CRC) project, a joint project of the Oregon and Washington State departments of transportation, released a Draft Environmental Impact Statement (DEIS) in May 2008 for the five-mile project area, including seven interchanges. The DEIS proposes three alignment options for reconstruction of the Marine Drive interchange. There are many views among interested parties about which of the three alternatives is the best. Interested parties include nearby property owners, the City of Portland, the Oregon Department of Transportation (ODOT), Metro, TriMet, the Port of Portland, the adjacent neighborhoods, and environmental advocacy groups. As the CRC Project advances towards preparation of a Final EIS, it is necessary to select a preferred interchange design to include in the Final EIS.

To evaluate the options and develop a preferred alignment among the different interests, the CRC created a decision-making process that included the formation of a Stakeholder Group and a Technical Study Group.

This report summarizes the process, technical findings, and conclusions reached by the Stakeholder Group.

Alignment Recommendation Process

The Marine Drive Interchange Alignment Recommendation Process is one component of the CRC Project. CRC and local project partners convened the Technical Study Group (TSG) and the Stakeholder Group (SG). The TSG includes entities with technical expertise—ODOT, City of Portland, Port of Portland, and the Metropolitan Exposition Recreation Commission MERC—and focused on evaluating technical information. The SG includes nearby property owners, neighborhood representatives, government representatives, and advocates for environmental issues and urban design. Not every interested or affected party is a member of the SG. The SG group membership represents parties that may be directly affected from a redesign of the Marine Drive interchange as well as stakeholders that will not be directly affected by the interchange, but will rely on the larger local circulation system for multimodal connections. In this context, the SG is charged with recommending a Marine Drive Interchange alignment that best serves both direct I-5 access while also providing local connectivity for the entire surrounding area.

The Marine Drive Interchange Design Recommendation Process was led by CRC. Staff facilitated the meetings, regularly communicated with the stakeholders, and conducted technical analysis. The TSG and SG provided input throughout the process, including identifying potential design modifications and in some cases new interchange designs that met the needs and desires of the groups they represented. CRC staff evaluated all of these proposals to ensure they were technically feasible. In most cases, this input resulted in modifications to existing designs, although several new interchange designs and local circulation plans were also developed to address the TSG and SG needs. The result of this iterative process is the four alignments being considered in this process. The TSG and SG reviewed technical findings and considered

competing interests. Their design recommendation will be forwarded to the Sponsor Agency Senior Staff (SASS).

Stakeholder Group Charge

The Stakeholder Group was asked to work to help identify an alternative that best accommodates the needs and interests of multiple private and public agency stakeholders. The Marine Drive Interchange serves a diverse range of users including local residents, Expo visitors and Delta Park/Portland International Raceway users and spectators during events, and a significant amount of the Port of Portland's freight traffic from facilities located in the corridor. The SG reviewed work and recommendations forwarded by the TSG and provided comments back to the TSG. Identifying the best alignment has required detailed analysis of traffic characteristics, exploration of land use opportunities, and identification of other potential benefits and challenges for each alignment option.

SUMMARY OF ALTERNATIVES

Marine Drive and the current interchange are located adjacent to the North Portland Harbor. The SG evaluated eight alternatives (Standard, Diagonal, Southern (1), Southern (2), Central, and Central Modified, including three refinements to existing alternatives (Option 12 and Option 12 Modified, which are refinement to the Standard Modified; and Option 14, a refinement to the Standard), including the three identified in the CRC DEIS, that offer various options for aligning the Marine Drive interchange and for addressing the land use and transportation benefits of the project.

Alignments Under Consideration

At the January 28, 2009 SG meeting, the SG agreed to carry forward the Standard and Standard Modified alignments for further consideration with the caveat that CRC continue to work on a refinement to the Standard Modified Alignment to minimize the impact to the existing light rail station. CRC agreed to refine the Standard Modified Alignment as well as provide a refinement to the Standard Alignment, producing two new design options (Option 12 and 14). These were presented at a work session on February 4th at DEA.

The **Standard Alignment** (Exhibit 1) places the improvements in the same general location as the existing facility. The Standard Alignment was developed with input from the freight community, whose members are interested in having the interchange function for freight movement. However, Marine Drive in its current alignment separates vacant and potentially redevelopable land uses from a waterfront amenity. The standard alignment has less support from parties interested in providing more potential for connecting to the river and from businesses that would be affected by its construction.

The **Standard Modified Alignment** (Exhibit 2) was developed as a compromise between trucking interests that require an efficient interchange for freight, MERC's interest in minimizing impacts to its property and the light rail station, and the City of Portland's interest in providing space for potential future connections to the river and recreational amenities along the Multnomah Harbor. Access for local waterfront businesses is also improved under this option, providing one right in/right out access from Marine Drive to Ross Island Sand and Gravel. Both Ross Island Sand and Gravel and Diversified Marine would each have one full access to the local road system.

As described above, CRC developed two refined alternatives for the Standard and Standard Modified alignments. **Option 12** (Exhibit 3) is a refined Standard Modified Alignment that moves Marine Drive and the ramps slightly to the east of the light rail station (it still crosses approximately 50 feet of the northern corner of the station) and keeps Marine Drive on the south side of the existing overcrossing. Access to waterfront businesses would be the same as described under the Standard Modified Alignment.

Option 14 (Exhibit 4) is a modification to the Standard Alignment and keeps Marine Drive north of the existing interchange but moves Marine Drive slightly to the south of the existing Standard Alignment to provide better accessibility to Ross Island Sand and Gravel and Diversified Marine. Access to waterfront businesses would be the same as described under the Standard Modified Alignment.

At a Marine Drive Stakeholders meeting held in March 2009, the group came to somewhat of an impasse between selecting Option 12 or Option 14 as the preferred alternative. The Marine Stakeholder group recommended to CRC to take a more in-depth look at impacts to the light rail station under Option 12 and identify potential design treatments to mitigate for a portion of the station being under the overpass. Alternatively, CRC was also asked about the possibility of developing an option that does not place the ramp over the station.

CRC met with several stakeholders to identify their critical issues and develop design concepts. This included a half-day design session with those parties and expanded somewhat from just looking at the light rail station to developing a larger connectivity concept for the entire area, including Portland International Raceway, existing and future local street connections on the east and west sides of I-5, and the regional trail system. CRC staff were also developing a new alternative that could alleviate the impact to the light rail station by shifting the alignment slightly south on the east side of the interchange, which allowed the west side to shift further north and miss the light rail station entirely. The result is **Option 12 Modified** (Exhibit 5). This option:

- Is located north of the Expo light rail station;
- Provides open space for potential future water related and recreation activities in the vicinity of the interchange;
- Provides similar freight and traffic capacity as Options 12 and 14; and
- Provides local street connectivity.

Alignments Evaluated but Removed From Consideration

There were four options that were considered but have been removed consideration because of one or more of the following issue(s):

- Potential impacts to area businesses;
- Potential impacts to habitat in the Vanport wetlands; and/or
- Geometric design concerns that could affect traffic operations and safety of the interchange

The **Diagonal Alignment** was one of the three alignments included the CRC DEIS. This option was removed from consideration because of the impacts to Expo Center.

Two options for a more southerly alignment would place Marine Drive to the South of the Expo Center and north of the Vanport wetlands. **Southern Alignments 1 and 2** locate the interchange south of the major land uses. These alternatives were viewed less favorably by freight and environmental interests because of the extra curves, slower speeds, and proximity to the wetlands. However, the southern alignments allow better access potential to the North Portland Harbor and perhaps some additional developable land on the east side of the existing light rail station. The southern alignments are attractive to those who see an opportunity to change the urban form of the area over the long term. These options were removed from consideration primarily because of their impacts to the Vanport Wetlands, impacts to existing Expo Center access, and impacts to the Harsch and Expo Center properties.

The **Central Alignment** is an attempt to provide both freight and land use benefits. It would move a portion of the interchange away from the North Portland Harbor to the same location as the southern alignments and could provide some development opportunities east of the existing light rail station; however, the Expo Center site would be bisected by an elevated freeway ramp, which would make the site less attractive for future redevelopment. The northeast corner of the Expo

site, coupled with the ODOT parcel, could create a transit-oriented development node, but the site would be surrounded by the freeway interchange ramps. This option was removed from consideration because of its impacts to the Expo Center.

FINDINGS

The following are the key findings identified in the transportation, land use, and environmental analysis. An evaluation matrix that compares all of the options is included as Exhibit 6.

Geometry

- All of the alignments both provide similar levels of improvement, although the Standard Modified and Option 12 provide a less skewed interchange.
- All of the alignments provide a similar level of improvements with respect to design speed.
- The merge/weave distance on the collector/distributor roads between Hayden Island and Marine Drive is improved with the Standard Modified, Option 12 and Option 12 Modified.

Transportation

- Travel time differences and vehicle/truck delay between the alignments are not substantial on a per trip basis, but they are considerable when measured cumulatively (for AM and PM peak hours). Some local trips from area businesses would also experience longer travel times because of out-of-direction travel on the local road system.
- The Standard Alignment and Option 14 are the fastest of the alignments, followed by the Standard Modified Alignment, Option 12 and Option 12 Modified.[1]
- The Standard Alignment and Option 14 are the fastest for trucks, followed by the Standard Modified Alignment, Option 12 and Option 12 Modified, which were slightly slower for trucks (between 1 and 10 seconds slower, depending on direction of travel).

Multimodal

- There are no significant differences between the alignments in regard to transit, pedestrian, or bicycle accessibility, although the Standard Modified, Option 12, and Option 12 Modified may perform better for pedestrians and bicyclists because of the lower elevation and longer ramps that may improve access.
- An at-grade or grade-separated crossing of the light-rail line adjacent to the Portland Harbor will be will be provided under all of the design options to provide a direct east/west connection for the Bridgeton Trail.

Access

The access locations and types for this process were assumed by the CRC and evaluated based on ODOT's access control standards. Access will also be discussed further in ODOT's Interchange Access Management Plan (IAMP) process.

- All of the alignments will affect access for Diversified Marine and Ross Island Sand and Gravel, particularly the Standard Alignment. Some access to Diversified Marine and Ross Island Sand and Gravel would be provided under all of the options.
- All alignments meet ODOT access control standards for the Force Avenue full intersection.

[1] The Standard Modified Alignment and Option 12 have similar characteristics as the Central alignment and are assumed to function in a similar fashion as that option.

- All options, except for the Standard Alignment, provide one access point from the local road system to Ross Island Sand and Gravel. None of the build options meet ODOT access spacing standards for providing direct access to Marine Drive for Ross Island Sand and Gravel. The ability of Ross Island Sand and Gravel to maintain direct access to Marine Drive will be determined through the Marine Drive Interchange Management Plan process.
- Under all of the build options, Diversified Marine would have a single access point from the local street system with no direct access to Marine Drive.

Land Uses

- The land west of I-5 is zoned IG-2, a heavy industrial zone that allows only limited local service retail uses. Office uses are limited to those needed to support the primary industrial activity on the site.
- The City of Portland's representatives confirm that they are not considering any change in zoning from IG-2.
- The area is designated as regionally significant industrial land, which signifies Metro's intention that it should remain as an industrial use.
- There is a MAX station located at the eastern end of the Expo Center ownership. The Metro 2040 Growth Concept identifies the area around the MAX station as a station area community.
- ODOT owns 1.6 acres not occupied by freeway right-of-way. This land is currently leased to Diversified Marine, which uses the property for storage. Diversified Marine has said that this parcel, or replacement land for storage, is critical for its operations.
- The Standard Modified Alignment, Option 12, and Option 12 Modified would be located between the existing interchange and the light rail station. Vacant ODOT-owned land has been identified as an area that may have value as a development or open space area. CRC has also considered using this site for storm water management purposes.
- Metro owns approximately 60 acres in the interchange area. It operates under a conditional use master plan that was last updated in 2001 and must be updated every 10 years. MERC is currently working on updating its master plan. The preliminary plans propose a much more intense development pattern than currently exists; the plans have been shared with the City of Portland Bureau of Planning and were shared with the SG on December 16, 2008.

Development Potential

- The area in the vicinity of the Expo Center light rail station is designated as Station Community in Metro's 2040 Concept Plan, however, the surrounding IG-2 zoning would not permit many of the uses (small shops, retail, housing) typically associated with a Station Community.
- All of the alignments include a local road system to provide local connectivity between the Bridgeton and Kenton neighborhoods. Improved local connectivity would also benefit local property owners, although Diversified Marine does not consider the direct 40-mile loop connection an improvement to their access.
- Any development would have to be consistent, either permitted outright or as a conditional use, with the IG-2 zoning district.
- The Standard Modified Alignment and Option 12 place ramps over the light rail station, which could affect the environment around the station and future development opportunities. The Standard Modified Alignment would locate the Marine Drive ramps in

Expo Center parking lot between the existing buildings and the light rail station, covering the southern portion of the light rail station. Option 12 would have less impact to Expo property by placing the ramps to the east of the light rail station, but would still place the ramps over the northern corner of the light rail station.

- The Standard Modified Alignment would affect a portion of the existing parking area, some of which may be maintained under the ramp. Neither the Standard Modified Alignment nor Option 12 creates large, irregular parcels, but they would place the interchange ramps immediately adjacent or over the existing light rail station.
- Option 12 Modified would place the interchange ramps to the northeast of the existing light rails station and would not locate them over the existing platform.
- All of the options under consideration would use land on the east of the light rail station for the interchange and potentially for storm water retention/treatment. There does not appear to be a significant development opportunity in the area that would be made available by moving the interchange ramps to the south as proposed under the Standard Modified Alignment, Option 12, or Option 12 Modified because ODOT owns this property and would need to sell it for it to be developable (ODOT has not indicated that it would do so). This area is more likely to be used as a storm water retention/treatment area under all alignments.
- The City of Portland has expressed an interest in developing the area north of the interchange as open space and providing direct access to the Portland Harbor for small watercraft. Option 12, Option 12 Modified, and the Standard Modified alignments provide the largest amount of open land north of the interchange; The Standard Alignment and Option 14 provide the least amount of open land.
- Expo Center would likely orient its future development towards the Vanport wetlands and light rail station and have a private urban street grid under any of the options, consistent with MERC's proposed new master plan, which the City of Portland would review as a conditional use within the IG-2 zone. Option 12, Option 12 Modified, and the Standard Modified alignments may require them to revise their plans for the northeast corner of their property.
- Existing development along the river and the levee could make it less attractive to develop with a focus towards the river.

Property Acquisition

- Option 12 Modified would require the least property acquisition (2.9 acres) followed by Standard Alignment and Option 14, (3.0 acres), Option 12 (3.2 acres). The Standard Modified Alignment would require the most property acquisition (3.8 acres).

Environmental Impacts

- There are no listed threatened and endangered species in the interchange area.
- All of the ramps would be elevated in the vicinity of the Vanport wetlands, potentially increasing noise and light emissions in the area.
- Option 12 Modified would locate the interchange ramps furthest away from the Vanport wetlands (approximately 210 feet) of any option. The Standard Alignment and Option 14 would locate the interchange ramps the closest to the Vanport wetlands (Approximately 60 feet). The Standard Modified and Option 12 would locate the ramps between 80 and 130 feet from the Vanport wetlands.
- Option 12 and Option 12 Modified would have no direct impact to wetland L/M near the existing interchange, but would still cross the combined Vanport wetlands/wetland L/M buffer area.

- The Standard Alignment, Option 14, and the Standard Modified Alignment would affect wetland L/M near the existing interchange area. Option 12 would not affect this wetland. None of the options would be located within the Vanport wetland boundary, although all of the options would have some impact to the Vanport Wetland buffer.
- Noise and air quality impacts would likely be similar for all of the options.
- Impacts to the Portland Harbor are not significantly different between the options. Storm water retention/treatment proposed for any of the options could benefit water quality.

Cost

- The cost is roughly equal between the options given the level of design being evaluated.

APPLICABLE POLICIES

Any time a new road, bridge, or transit facility is being considered, it is important to confirm that the proposed facility is consistent with and will support the land uses envisioned by the Regional Framework plan, the relevant city's comprehensive plan, and any other applicable policy documents. The existing policies that apply in this area include the following:

Oregon Highway Plan (1999, with amendments)

The Oregon Highway Plan (OHP) establishes policies and investment strategies for Oregon's state highway system over a 20-year period and refines the goals and policies found in the Oregon Transportation Plan. Policies in the OHP emphasize the efficient management of the highway system to increase safety and to extend highway capacity, partnerships with other agencies and local governments, and the use of new techniques to improve road safety and capacity. These policies also link land use and transportation, set standards for highway performance and access management, and emphasize the relationship between state highways and local road, bicycle, pedestrian, transit, rail, and air systems.

The policies applicable to planning for interchange and corridor improvements are described below.

Goal 1: System Definition:

- Policy 1A (State Highway Classification System), which states the management objective of Statewide Highways, is to provide safe and efficient, high-speed, continuous-flow operation with minimal interruptions to traffic flow in urban areas; Marine Drive is also classified as an Inter-modal Connector, which typically links airports, ports, rail terminal and other passenger and freight facilities to the Interstate and Statewide Highways;

- Policy 1B (Land Use and Transportation), which recognizes the need for coordination between state and local jurisdictions;

- Policy 1C (State Highway Freight System), which states the need to balance the movement of goods and services with other uses;

- Policy 1F (Highway Mobility Standards), which sets mobility standards for ensuring a reliable and acceptable level of mobility on the highway system by identifying necessary improvements that would allow the interchange and corridor area to function in a manner consistent with OHP mobility standards; and

- Policy 1G (Major Improvements), which requires maintaining performance and improving safety by improving efficiency and management before adding capacity.

Goal 2: System Management:

- Policy 2B (Off–System Improvements), which helps local jurisdictions adopt land use and access management policies; and
- Policy 2F (Traffic Safety), which improves the safety of the highway system.

Goal 3: Access Management:

- Policy 3A: (Classification and Spacing Standards), which sets access spacing standards for driveways and approaches to the state highway system;
- Policy 3C (Interchange Access Management Areas), which sets policy for managing interchange areas by developing an IAMP that identifies and addresses current interchange deficiencies and short-, medium- and long-term solutions; and
- Policy 3D (Deviations), which establishes general policies and procedures for deviations from adopted access management standards and policies.

The OHP describes I-5 as having interstate significance, serving as the primary north and south through route for traffic traveling through the area. Marine Drive is classified by the OHP as having statewide significance. It provides alternate route connections to Portland International Airport and N. Columbia Boulevard via NE Martin Luther King Jr. Boulevard and N. Swift Highway. Marine Drive is also a designated freight route.

Metro Regional Framework Plan

The interchange vicinity comprises an existing MAX light rail station (Expo Center) in a designated Region 2040 Industrial Area with Station Community overlay. Although Marine Drive is not specifically addressed in the Framework Plan, the proposed Marine Drive project supports Fundamental 4, which states: *Ensure the identified function, capacity and level of service of transportation facilities are consistent with applicable regional land use and transportation policies as well as the adjacent land use patterns.*

Metro Regional Transportation Plan

The Marine Drive interchange is on the financially constrained list of RTP Projects (RTP #4006). The financially constrained system is a 20-year transportation scenario that assumes existing and proposed funding sources that can reasonably be expected to be available for transportation uses during the 20-year plan period.

City of Portland Comprehensive Plan

The Marine Drive interchange vicinity is located within a designated “Industrial Sanctuary” in the comprehensive plan. Through Goal 2 (Urban Development) of the comprehensive plan, the City strives to encourage the growth of industrial activities in the city by preserving industrial land primarily for manufacturing purposes. Through Goal 5 (Economic Development), Policy 5.8 (Diversity and Identity in Industrial Areas), the City promotes a variety of efficient, safe, and attractive industrial sanctuary and mixed employment areas.

City of Portland Transportation System Plan

Marine Drive is a designated “Priority Truck Street” as displayed in North District Map 6.35.5 of the Portland Transportation System Plan (TSP). The vicinity of the Marine Drive interchange is also situated within a freight district which, as defined in the City of Portland Freight Master Plan (February 2006), provides for local truck circulation and access. Policy 6.35 of the TSP, specific to the North Transportation District, strives to reinforce neighborhood livability and commercial activity by planning and investing in a multimodal transportation network, relieving congestion through measures that reduce transportation demand, and routing non-local and industrial traffic

along the edges of the residential areas. Among the objectives listed under this policy is Objective (B), which states: *Support efficient functioning of the N Marine Drive/N Lombard (west of N Philadelphia)/N Columbia Boulevard loop as the truck and commuter access to the Rivergate industrial area and adjacent industrial areas.*

DISCUSSION

In the context of the policies described above, and considering the factual information developed for each alignment, the question presented to the SG is: Which alignment best addresses the variety of competing interests?

Support for Desired Land Uses

In Oregon, the starting point for evaluating a major transportation investment is how well it supports desired land uses. The Marine Drive interchange is a regional facility and, therefore, the land use analysis must consider desired regional land uses as well as immediately adjacent properties.

The regional analysis focuses on how well the five alternative designs support industrial uses located along Marine Drive and in the Port of Portland facilities located in Rivergate and at Terminal 6. Almost all deep water ships calling at Portland are docked in this area.

For these regional land uses, a fast, efficient, and safe connection to the interstate highway system is a high priority. The data developed for each of the alternatives demonstrates that, while the Standard Alignment and Option 14 perform slightly better on most transportation measures than the other alignment options, they do not address the City of Portland's or the CRC Urban Design Advisory Group (UDAG) representatives' desire for locating the interchange as far south as possible to provide the most space to design an "iconic" bridge structure over the Portland Harbor, and providing better connections to the waterfront and recreational amenities in the vicinity of the project, such as at Delta Park and the regional trail system. The Standard Modified Alignment, Option 12, and Option 12 Modified provide for the possibility of providing those connections and still provide an acceptable level of service for freight and automobiles using the interchange.

Support for the immediately adjacent land uses is the other land use consideration. The immediate area is zoned for heavy industrial uses, and the applicable policies indicate that this is the desired land use for the area. The primary land use in the project area between Force Avenue and the interchange is the Expo Center, owned by Metro and operated by MERC. It occupies approximately 60 acres. This is the only large site that provides for a future development opportunity under any of the alternatives, because the majority of the site is a parking lot. Other industrial uses in the area are expected to remain as they are today.

Although there are four other parcels within the western portion of the interchange area, they are not likely to develop differently than what is seen today. Two of the parcels are ODOT property, one of which is currently leased to Diversified Marine for storage and would not likely be redeveloped because of the future construction of the light rail bridge bisecting the property under all of the options. The Standard Modified Alignment, Option 12, and Option 12 Modified with their more southerly location, would retain a small parcel when the existing Marine Drive ramps are removed, but with its size, ODOT ownership, and location between an elevated ramp system and the I-5 mainline, its most likely use is as a storm water facility for the interchange and freeway. The City of Portland has also expressed an interest in providing an opportunity for water-related recreational amenities in the area with a potential small boat launch into the Portland Harbor. The Standard Modified Alignment, Option 12, and Option 12 Modified provide the largest land area of the options for this potential future use.

The two other parcels are owned by Diversified Marine and Ross Island Sand and Gravel. These are both waterfront industrial uses, consistent with the existing zoning, and on unique sites. Access to these two parcels would be modified by any of the build options. Proposed direct

access from Marine Drive to Ross Island Sand and Gravel does not meet ODOT access spacing standards under any of the build options and will be evaluated as part of the Marine Drive Interchange Area Management Plan as to whether or not direct access is provided; access to the new local road system will be provided to Ross Island Sand and Gravel under all of the options except the Standard Alignment, where no local connection is proposed Access to Diversified Marine would be provided to the local street system under all of the options.

MERC has stated that it is committed to more intensive use of its site. It seeks to take greater advantage of the MAX station for its future facilities. There has been discussion and some disagreement among the stakeholders about the impact the Standard Modified Alignment and Option 12 would have on the feasibility of incorporating the light rail station into the Expo Center's future development plans because of the ramp location over a portion of the light rail station. The Standard Modified Alignment would locate the Marine Drive ramps in Expo Center parking lot between the existing buildings and the light rail station, covering the southern portion of the light rail station. Metro and MERC strongly expressed that ramps over the light rail station were an unacceptable design condition. Option 12 would have less impact to Expo property by placing the ramps to the east of the light rail station, but would still place the ramps over the northern corner of the light rail station. Option 12 Modified has the least impact to the Expo property and light rail station by moving the ramps further to the north; it does not directly cross the light rail station as the Standard Modified and Option 12 do. Under any of the options, MERC would orient its future facilities to the south towards its primary access and would use the adjacent wetlands as a visual amenity. MERC also would seek to connect its facilities visually and perhaps physically to the water amenity to the north.

Transportation

The transportation analysis looked at several factors, including geometry, travel times, level of service, and volume to capacity ratios for intersections under each of the options. The Marine Drive interchange is the critical link between the Port of Portland Terminal 6 and other industrial uses located west and east of the interchange. Speed and efficiency are priorities for these uses. For the transportation analysis, the primary goal was to determine which alignment provides the greatest efficiency and safety to car and truck drivers.

All of the options offer similar improvements with respect to design speed, adherence to NHS standards, and meeting driver expectation. All of the options follow typical intersection design practice and meet access control standards for Force Avenue. Where Marine Drive crosses I-5, the Standard Modified Alignment, Option 12, and Option 12 Modified provide an improvement to the skew angle of the interchange compared to the Standard Alignment and Option 14. This provides for a safer and more efficient signal at the interchange.

The merge/weave distance on the CD roads between Hayden Island and Marine Drive is improved with the Standard Modified, Option 12, and Option 12 Modified compared to the Standard Alignment and Option 14.

Trucking interests represented on the SG have identified overall delay, as well as the cost of that delay, as an important consideration. Travel times were measured for both vehicles and trucks. From a traffic operations standpoint, the Standard Alignment and Option 14 perform the best of the alignments, but are not considerably faster than the Standard Modified Alignment, Option 12, or Option 12 Modified. Travel times for the Standard Modified Alignment, Option 12, and Option 12 Modified are approximately 1-10 seconds slower than the Standard Alignment or Option 14, depending on movement.

Based on the transportation analysis completed, the Standard Alignment and Option 14 perform slightly better from and travel speed standpoint than the Standard Modified Alignment, Option 12, and Option 12 Modified, but the Standard Modified and Option 12 are preferred by the freight interests because the alignments offer improved geometry and still provide an acceptable level of service.

Environmental

The 90-acre Vanport wetlands are a valuable environmental resource near the interchange. This site is owned by the Port of Portland, which has granted a conservation easement to the Multnomah Drainage District. The Vanport wetlands constitute one of the region's anchor and connector habitats for a wide variety of wildlife species, including migratory birds. The site is bordered on the north side by a stand of cottonwood trees. Qualitative assessments of fish and wildlife, plant communities, air quality, and water quality were completed for each of the options.

There are no listed threatened and endangered species in the interchange area. All of the options place elevated ramps near the Vanport wetland, which could increase noise and light emission in the area, although given the Vanport wetland's proximity to I-5, the impact associated with the elevated ramp system compared to what is already occurring along I-5 isn't necessarily going to change the natural character of the area . The Standard Alignment and Option 14 are separated from the Port of Portland property line (and thus the wetlands) by approximately 60 feet, whereas Option 12 Modified places the ramps approximately 210 feet from the Port of Portland property line. The Standard Modified Alignment and Option 12 would locate ramps between approximately 60 feet and 130 feet, respectively from the Port of Portland property line. Impacts to the Portland Harbor are not significantly different between the options. Storm water retention/treatment proposed for any of the options could benefit water quality.

Option 12 and Option 12 Modified are the only alignments that do not directly impact wetland L/M (although they do affect the combined Vanport/wetland L/M buffer) whereas the Standard Alignment, Option 14, and the Standard Modified Alignment would affect wetland L/M near the existing interchange area. None of the options would be located within the Vanport wetland boundary, although all of the options would have some impact to the Vanport Wetland buffer.

RECOMMENDATION AND IMPLEMENTATION ACTIONS

After considering all of the findings and analysis, the Marine Drive Stakeholder Group concludes that Option 12 Modified best satisfies the criteria established by the stakeholders and should be advanced to the Final EIS and the next stage of design.

Regarding key issues, Option 12 Modified has the following attributes:

- Provides good operational characteristics for freight mobility;
- Separates new overhead ramps from the LRT platform;
- Separates new highway infrastructure from Vanport wetlands;
- Provides good open space relationships to the Portland Harbor;
- Provides separation of new highway infrastructure from Delta Park;
- Provides a new local circulation network in the vicinity of the interchange;
- Allows for access to waterfront industrial businesses;
- Minimizes impacts to the Expo property.

Option 12 Modified, as illustrated in Exhibit 5, includes the following specific design features that were part of the basis for Stakeholder Group support of the Option:

1. The local street system design within the interchange area will conform to the concept plan shown in Exhibit 5.

   This design meets a number of objectives related to circulation, station access, access to the Expo site, and access to Diversified Marine and Ross Island Sand and Gravel. The CRC project will continue to communicate with City of Portland Bureau of Transportation and the property owners to ensure that the detailed designs meet their needs.

2. There will be a new 40-mile trail alignment on the west side of the interchange that intersects the LRT alignment at grade and minimizes impacts to existing businesses.

   TriMet, CRC, Metro, Diversified Marine and the City of Portland will continue to explore an optimum design through the PE phase.

3. The interchange design will preserve the opportunity for open space and public water access.

   This includes a finished grade that maximizes the visual connection between the local street, pedestrian paths and the water. The open space/public water access is initially intended to be located on ODOT right-of-way. Implementation of this recommendation will primarily be the responsibility of ODOT and the City of Portland.

4. The final design will maintain connections from Martin Luther King, Jr. Blvd to Vancouver Way and Union Court.

   Considerations include providing good freight connections to and from Vancouver Way and separation to the extent possible of industrial traffic from neighborhood and park access routes. CRC will continue to work with the City of Portland to identify an acceptable circulation plan.

5. The final design will include improvement plans for local street, bike and pedestrian circulation east of the interchange.

   Considerations include providing good multi-modal access to East Delta Park, to the Bridgeton and Kenton neighborhoods, to local businesses and for local bus service. CRC will continue to work with the City of Portland to identify an acceptable circulation plan.

6. The interchange design will allow MERC flexibility for additional development on the EXPO property.

   MERC should proceed with development of a master plan for the EXPO site that incorporates the light rail station and uses its location as an opportunity to be a gateway civic structure. New development on the site should acknowledge the wetlands to the south through building orientation and other features. Future development should also strive to provide visual access to the North Portland Harbor. Among the issues to be addressed is the creation of a public street on the alignment of the private road on the south side of the EXPO site.

7. CRC should evaluate the feasibility of both a "fly under" ramp and a local street connection under I-5. The evaluation criteria should be the same as those used to evaluate the "fly over" ramp. CRC will report to the stakeholder group on the results of the analysis.

Exhibits:

Exhibit 1: Standard Alignment

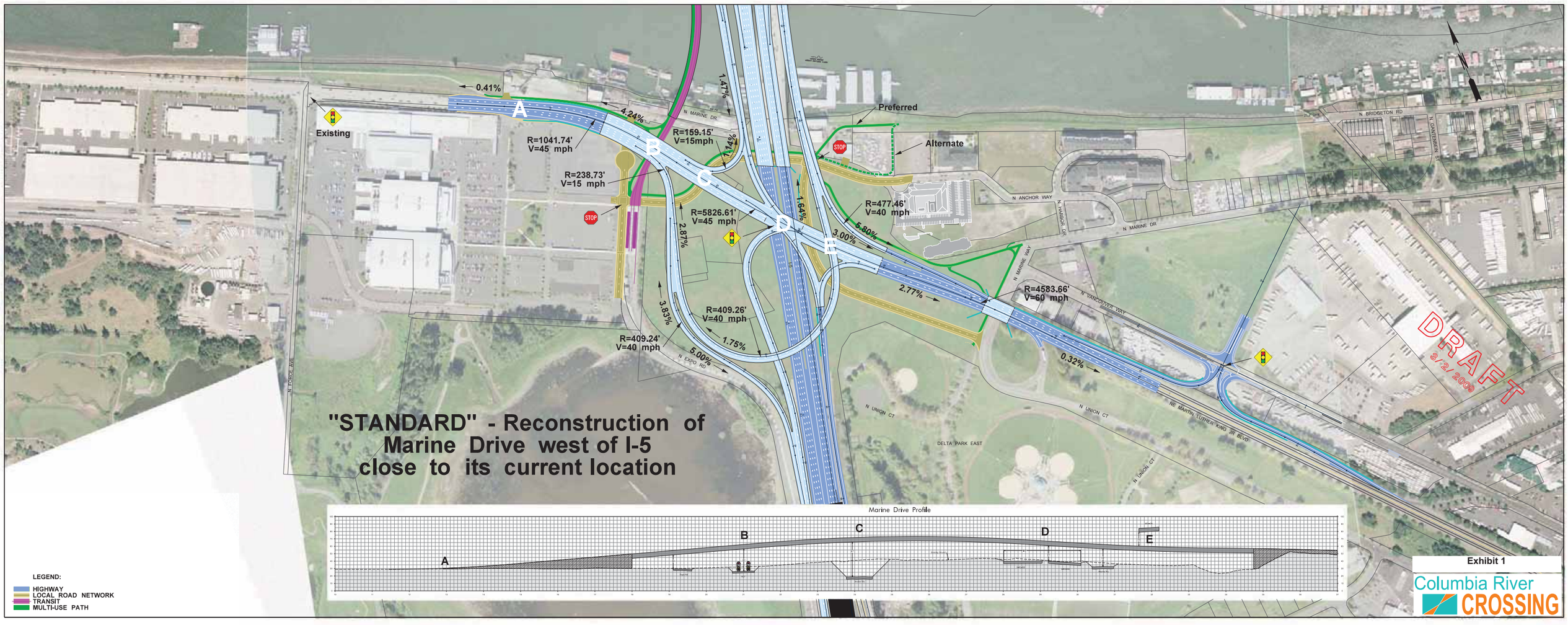
Exhibit 2: Standard Modified Alignment

Exhibit 3: Option 12

Exhibit 4: Option 14

Exhibit 5: Option 12 Modified

Exhibit 6: Evaluation Matrix


0.41%
Existing
A
4.24%
R=1041.74'
V=45 mph
N MARINE DR
1.47%
R=159.15'
V=15mph
1.14%
B
C
R=238.73'
V=15 mph
STOP
R=5826.61'
V=45 mph
2.87%
1.64%
D
3.00%
Preferred
Alternate
STOP
R=477.46'
V=40 mph
5.80%
N ANCHOR WAY
N HARBOR DR
N MARINE DR
N BRIDGETON RD
N CANTERBURY ST
N MARINE WAY
2.77%
R=4583.66'
V=60 mph
N VANCOUVER WAY
0.32%
NE MARTIN LUTHER KING JR BLVD
N UNION CT
DELTA PARK EAST
3.83%
R=409.26'
V=40 mph
1.75%
R=409.24'
V=40 mph
5.00%
N EXPO RD
N FERRIS AVE
"STANDARD" - Reconstruction of
Marine Drive west of I-5
close to its current location
Marine Drive Profile
A
B
C
D
E
LEGEND:
HIGHWAY
LOCAL ROAD NETWORK
TRANSIT
MULTI-USE PATH
DRAFT
3/2/2009
Exhibit 1
Columbia River
CROSSING

"MODIFIED STANDARD REALIGNMENT"
Reconstruction of Marine Drive west of I-5 and north of Exposition Center

Existing

Preferred

Alternate

A

B/C

D

E

0.11%

1.49%

2.17%

2.75%

4.89%

2.45%

0.20%

4.04%

R= 716.20'
V= 45mph

R= 572.96'
V= 40mph

R=159.16'
V= 15mph

R=603.11'
V= 45mph

R= 572.96
V= 35mph

R= 1432.39'
V= 60mph

R= 409.26'
V= 40mph

N MARINE DR

N EXPO RD

N ANCHOR WAY

N HARBOR DR

N MARINE WAY

N VANCOUVER WAY

N BRIDGETON RD

N CANTERBURY ST

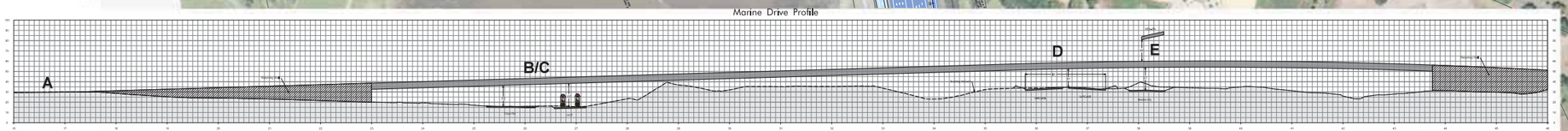
N UNION CT

DELTA PARK EAST

MARTIN LUTHER KING JR BLVD

DRAFT
Jan. 20, 2009

Marine Drive Profile



LEGEND:
- HIGHWAY
- LOCAL ROAD NETWORK
- TRANSIT
- MULTI-USE PATH

Exhibit 2

Columbia River CROSSING

"OPTION 12"
Reconstruction of Marine Drive west of I-5 and north of Exposition Center

Existing

Preferred

Alternate

A

B/C

D

E

R= 572.96'
V= 40mph

0.41%

2.65%

R= 159.15'
V= 15mph

0.92%

1.97%

5.71%

R= 409.26'
V= 40mph

R= 159.15'
V= 15mph

0.95%

R= 572.96'
V= 40mph

2.68%

R= 458.37'
V= 40mph

R= 5826.69'
V= 45mph

2.53%

R= 1432.39'
V= 60mph

0.67%

0.02%

N BRIDGETON RD

N CANTERBURY CT

N ANCHOR WAY

N HARBOR DR

N MARINE DR

N MARINE WAY

N VANCOUVER WAY

N EXPO RD

N UNION CT

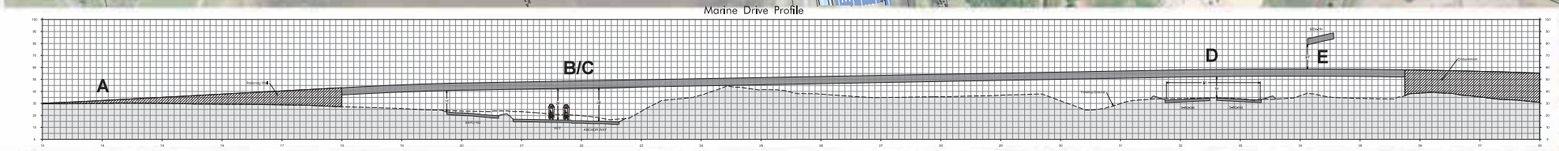
DELTA PARK EAST

N FORCE AVE

INTERSTATE 5 (MARTIN LUTHER KING JR BLVD)

DRAFT
3/2/2009

Marine Drive Profile



LEGEND:

- HIGHWAY
- LOCAL ROAD NETWORK
- TRANSIT
- MULTI-USE PATH

Exhibit 3

Columbia River CROSSING

"OPTION 14"
Reconstruction of Marine Drive west of I-5 Close to Its Current Location

Existing

Preferred

Alternate

R= 881.47'
V= 45mph

R= 159.15'
V= 15mph

R= 238.73'
V= 15mph

R= 8594.37'
V= 55mph

R= 477.46'
V= 40mph

R= 3819.72'
V= 60mph

R= 409.26'
V= 40mph

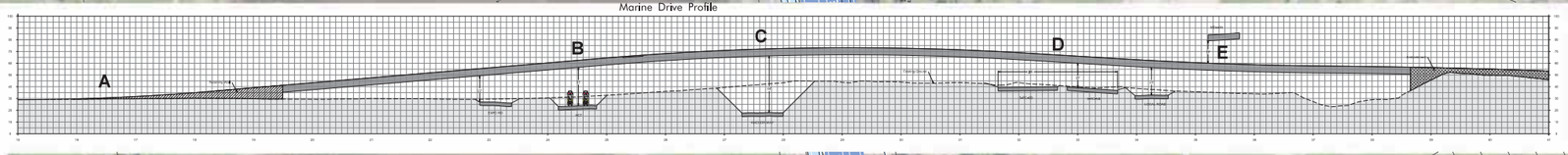
0.07%
4.24%
1.14%
1.47%
1.64%
5.80%
3.00%
2.87%
3.83%
1.75%
5.00%
2.77%
0.32%

A
B
C
D
E

STOP

N MARINE DR
N ANCHOR WAY
N HARBOR DR
N MARINE WAY
N VANCOUVER WAY
N BRIDGETON RD
N CANTERBURY LN
N EXPO RD
N UNION CT
DELTA PARK EAST
NE MARTIN LUTHER KING JR BLVD
N FORCE AVE

Marine Drive Profile



LEGEND:
- HIGHWAY
- LOCAL ROAD NETWORK
- TRANSIT
- MULTI-USE PATH

DRAFT
3/2/2009

Exhibit 4

Columbia River CROSSING

"OPTION 12 MODIFIED"
Reconstruction of Marine Drive west of I-5 close to its current location

DRAFT
9/29/2009

Existing

0.41%

A

3.18%

R=572.96'
V=40 mph

STOP

R=2291.84'
V=40 mph

B

C

0.97%

R=159.15'
V=15mph

1.52%

1.00%

R=572.96'
V=40 mph

Future Expo Road Extension
to be determined through
City of Portland process

N EXPO RD

3.44%

R=440.74'
V=40 mph

N FORCE AVE

D

E

2.42%

4.86%

R=5826.69'
V=45 mph

2.53%

Future (by others)

N HARBOR DR

N ANCHOR WAY

STOP

R=572.96'
V=45 mph

STOP

N MARINE DR

N MARINE WAY

N VANCOUVER WAY

R=2864.79'
V=60 mph

0.17%

N BRIDGETON RD

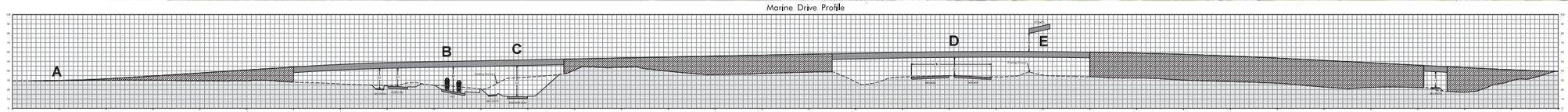
N CANTERBURY LN

DELTA PARK EAST

N GREELEY AVE

NE MARTIN LUTHER KING JR BLVD

Marine Drive Profile



LEGEND:

- HIGHWAY
- LOCAL ROAD NETWORK
- TRANSIT
- MULTI-USE PATH

Exhibit 5

Columbia River CROSSING

Columbia River CROSSING

Exhibit 6

Tier 1 Criteria							
Criteria	**Measurement/Methodology**	**No Build**	**Standard Alignment**	**Option 14**	**Modified Standard [1]**	**Option 12[1]**	**Option 12 Modified[1]**
Traffic							
Traffic Operations	• Travel time • 1,000 feet west of Force Avenue to the center of the interchange	• Model does not provide an appropriate comparison for No Build. Qualitatively, travel times for all Build scenarios would be improved from the No Build scenario.	AM EB WB PM EB WB	AM EB WB PM EB WB	AM EB WB PM EB WB	AM EB WB PM EB WB	AM EB WB PM EB WB
	• Vehicles per peak hour		300 1420 435 630	300 1420 435 630	300 1420 435 630	300 1420 435 630	300 1420 435 630
	• Travel time (seconds)		75 68 92 75	75 68 92 75	83 78 92 72	83 78 92 72	83 78 92 72
	• Cumulative travel time (volume*travel time for peak hour in hours)		6 27 11 13	6 27 11 13	7 31 11 13	7 31 11 13	7 31 11 13
	• Terminal 6 to interchange (seconds)		394 387 411 394	394 387 411 394	402 397 411 391	402 397 411 391	402 397 411 391

	• Truck Travel Time (in seconds)
	  • 1,000 feet west of Force Avenue to NB ramp meter (PM Peak Period)
	  • SB off ramp to 1,000 feet west of Force Avenue (AM Peak Period)
		• Traffic for the two most critical movements in the peak hours is severely congested: AM southbound off-ramp traffic impacts the I-5 mainline. PM northbound traffic experiences delays > 10 minutes per vehicle.	• PM eastbound: 138
			(1,025 vehicle/hr, 39 hours of cumulative travel time)
			• AM westbound: 100
			(700 vehicle/hr, 19 hours of cumulative travel time)
				• PM eastbound: 138
				(1,025 vehicle/hr, 39 hours of cumulative travel time)
				• AM westbound: 100
				(700 vehicle/hr, 19 hours of cumulative travel time)
					• PM eastbound: 140
					(1,025 vehicle/hr, 40 hours of cumulative travel time)
					• AM westbound: 111
					(700 vehicle/hr, 22 hours of cumulative travel time)
						• PM eastbound: 140
						(1,025 vehicle/hr, 40 hours of cumulative travel time)
						• AM westbound: 111
						(700 vehicle/hr, 22 hours of cumulative travel time)
							• PM eastbound: 140
							(1,025 vehicle/hr, 40 hours of cumulative travel time)
							• AM westbound: 111
							(700 vehicle/hr, 22 hours of cumulative travel time)

	• Level of Service (peak hour) • Marine Drive/Force Avenue intersection(s) (average delay per vehicle in seconds)	AM PM LOS A (8.7) LOS F (99.7)	AM PM LOS A (6.1) LOS B (11.3)	AM PM LOS A (6.1) LOS B (11.3)	AM PM LOS A (5.8) LOS A (9.6)	AM PM LOS A (5.8) LOS A (9.6)	AM PM LOS A (5.8) LOS A (9.6)
Ramp design and access (Geometry of Marine Drive and Interchange movements) ***D** indicates curve*	• MD skew with I-5: 90° ideal • Interchange spacing (HI-MD): 15,800' Std. • Ramp Weave (HI-MD): 1000' Min.		• MD skew with I-5: 54° • Interchange spacing (HI-MD): 2500' • Ramp Weave (HI-MD): 875'	• MD skew with I-5: 57° • Interchange spacing (HI-MD): 2500' • Ramp Weave (HI-MD): 875'	• MD skew with I-5: 80° • Interchange spacing (HI-MD): 2900' • Ramp Weave (HI-MD): 1450'	• MD skew with I-5: 76° • Interchange spacing (HI-MD): 2900' • Ramp Weave (HI-MD): 1375'	• MD skew with I-5: 67° • Interchange spacing (HI-MD): 2900' • Ramp Weave (HI-MD): 1230'

[1] Traffic operations for this option were similar to the Standard Alignment. Minor differences in geometry could change these values by less than 5%.

Tier 1 Criteria							
Criteria	**Measurement/Methodology**	**No Build**	**Standard Alignment**	**Option 14**	**Modified Standard [1]**	**Option 12[1]**	**Option 12 Modified[1]**
delta: *the central angle of the curve (acute deltas are more desirable)* ***G*** *indicates the* ***grade:*** *the steepness of the vertical alignment expressed in percentage (flatter grades are more desirable)*	• Marine Drive to Martin Luther King Jr. Boulevard	•	45 mph curve right (D=30°) G=4.2% - 45 mph curve left (D=14°) – G=3.0% - - - 60 mph curve right (D=6°) - G=2.8%	45 mph curve right (D=28°) G=4.2% - 55 mph curve left (D=11°) – G=3.0% - - - 60 mph curve right (D=6°) - G=2.8%	- - 45 mph curve right (D=60°) G=1.5% Straight line: G=1.5% 40 mph curve left (D=63°): G=1.5% Straight Line: G=1.5% 60 mph curve right (D=25°): G=2.5%	40 mph curve right (D=61°) – G=2.7% straight line – G=0.9% 40 mph curve left (D=55°) - G=0.9% - 45 mph curve left (D=7°) – G=flat - 60 mph curve right (D=25°) - G=2.5%	40 mph curve right (D=56°) – G=3.2% straight line – G=1.0% 40 mph curve left (D=43°) - G=1.0% - 45 mph curve left (D=9°) – G=2.5% - 60 mph curve right (D=18°) - G=0.2%
	• I-5 southbound to Marine Drive westbound	•	straight line - G=1.5% 15 mph curve right (D=132°) G=1.1%	straight line - G=1.5% 15 mph curve right (D=128°) - G=1.1%	Straight line: G=0.7% 15 mph curve right (D=104°): G=0.1%	Straight line: G=0.7% 15 mph curve right (D=128°): G=0.1%	Straight line: G=1.0% 15 mph curve right (D=136°): G=1.0%
	• Marine Drive eastbound to I-5 northbound	•	15 mph curve right (D=55°): G=2.9% 40 mph curve left (D=171°): G=1.8% Straight line: G=3.4%	15 mph curve right (D=54°): G=2.9% 40 mph curve left (D=171°): G=1.8% Straight line: G=3.4%	45 mph curve left (D=88°): G=4.0% 40 mph curve left (D=87°): G=flat% Straight line: G=flat	- 40 mph curve left (D=179°) – G=2.7% Straight line - G=flat	- 40 mph curve left (D=179°) – G=3.4% Straight line - G=2.4%
	• Marine Drive eastbound to I-5 southbound	•	40 mph curve left (D=59°) - G=3.8%(combined with MDe-5n) Straight line - G=5.0% 40 mph curve right (D=48°) - G=5.0%	40 mph curve left (D=54°) - G=3.8% (combined with MDe-5n) Straight line - G=5.0% 40 mph curve right (D=48°) - G=5.0%	15 mph curve right (D=72°) – 3.3% Straight line – 3.3%	15 mph curve right (D=60°) - G=3.3% Straight line - G=3.3%	15 mph curve right (D=58°) - G=0.4% Straight line - G=2.0%
	• Martin Luther King Jr. Boulevard to I-5 northbound	•	40mph curve right (D=52°) - G=5.8%	40 mph curve right (D=51°) - G=5.8%	35 mph curve right (D=66°): G=4.9%	40 mph curve right (D=66°) - G=5.7%	40 mph curve right (D=57°) - G=4.9%
	• Potential for arterial to impact ramp or freeway operations	•	• Little to none				
[2] Marine Drive Access Spacing Standard	• Standard for Access • 1320’ from interchange for first full access • 1320’ from interchange for a right-in/right-out	•	• 175’ to Ross Island Sand & Gravel west driveway	• 215’ to Ross Island Sand & Gravel west driveway	• 740’ to Ross Island Sand & Gravel west driveway	• 620’ to Ross Island Sand & Gravel west driveway	• 525’ to Ross Island Sand & Gravel west driveway

[2] Final access to Marine Drive will be determined through the IAMP and r/w negotiation process.

Tier 1 Criteria							
Criteria	**Measurement/Methodology**	**No Build**	**Standard Alignment**	**Option 14**	**Modified Standard [1]**	**Option 12[1]**	**Option 12 Modified[1]**
Roadway alignment	• Qualitative evaluation of impacts to trucks west of I-5 • Number of curves • signalized intersections • Signalized intersection on curves	•	• 1 curve (45 mph) • 1 signalized intersection • 0 signalized intersections on curve	• 1 curve (45 mph) • 1 signalized intersection • 0 signalized intersections on curve	• 2 curves (40 mph s, 40 mph n) • 1 signalized intersection • 0 signalized intersections on curve	• 2 curves (40 mph s, 40 mph n) • 1 signalized intersection • 0 signalized intersections on curve	• 2 curves (40 mph s, 40 mph n) • 1 signalized intersection • 0 signalized intersections on curve
Design Standards	• Intersection design – standard intersections and intersections on a curve AASHTO 2004 p. 68,72, 388, and 469	•	• Meets AASHTO guidance for design speed and intersection design				
	• NHS-route design standards	•	• Meets CFR Title 23, part 625 requirements				
Multi-modal	• Transit/bicycle/pedestrian amenities • Grade for LRT bridge near Marine Drive • Pedestrian and bicycle facilities	• No change	• 5% LRT grade • Sidewalk, bike lanes and Multi-use path to be included. Similar bicycle and pedestrian facilities for all of the alternatives				
Land Use and Development							
Development opportunities	• Qualitative assessment of development opportunities near the LRT station • Potential new open land	• No change	• East of station would be reserved for interchange. Interchange area could be used for storm water retention/detention. Expo property remains intact. • Redevelopment of Expo property could be toward Vanport wetland and light rail station. • No additional ODOT surplus ROW available.	• Similar to the Standard Alignment. • Redevelopment of Expo property could be toward Vanport wetland and light rail station.	• Ramps would cross northeast corner of Expo property and the existing light rail station. • Areas east of the light rail station would most likely be used for storm water retention/detention, or potentially as an open space area • Redevelopment of Expo property could be toward Vanport wetland and light rail station.	• Ramps would affect less Expo property than the Standard Modified. • Redevelopment of Expo property could be toward Vanport wetland and light rail station. • Location of the ramps east of the light rail station would limit any potential development on ODOT-owned parcels. The most likely use would be for storm water retention/detention, or potentially as an open space area	• Redevelopment potential and orientation would be similar to Option 12.
Land use	• Acreage within area by zoning (identify existing uses in area)		• Entire project area is IG2 and part of a Regionally Significant Industrial Area (RSIA) overlay. Conservation overlays cover areas along the Vanport wetlands to the south and the Multnomah Channel to the north. Design and aircraft landing overlays cover Expo and interchange areas.				

Tier 1 Criteria							
Criteria	**Measurement/Methodology**	**No Build**	**Standard Alignment**	**Option 14**	**Modified Standard [1]**	**Option 12[1]**	**Option 12 Modified[1]**
Right-of-way	• Acres of new right-of-way required		3.0 acres	3.2 acres	3.8 acres	3.0 acres	2.9 acres
Businesses							
	• Number and type businesses affected, displaced • Acquisition (number of parcels with r/w acquisition)	• No change	• 8 – parcels with r/w acq	• 8 – parcels with r/w acq.	• 7 – parcels with r/w acq.	• 7 – parcels with r/w acq.	• 7 – parcels with r/w acq.

	• Access on west side of Force Avenue
	  • Harsch
	  • Peninsula Terminal
	  • Harsch Stockyards
	  • Harbor Oil
		
		• 2 full to Force Ave
		• 1 full to Force Ave
		• 1 full to Force Ave
		• 2 full to Force Ave
			
			• No change
			• No change
			• No change
			• No change				

Access to developed and developable parcels	• Access on north side of Marine Drive
	  • Ross Island Sand & Gravel
	  • Diversified Marine
	  • Larson Parcel
	  • Pier 99
		
		• 2 full to Marine Drive
		• 1 full to Marine Drive
		• 1 full to Marine Drive
		• 1 full to Marine Drive
			
			• TBD to Marine Dr[2]
			• 1 full to local road
			• 1 full to local road
			• 1 full to local road
				
				• TBD to Marine Dr[2], 1 full to local
				• 1 full to local road
				• 1 full to local road
				• 1 full to local road			

	• Access to existing vacant parcels north of Marine Drive	• No Change	• No direct access is proposed. Light rail bridge restricts access to vacant parcel currently used for storage	• Same as Standard Alignment	• Similar to Standard Alignment, although the more southerly location of Marine Drive could improve circulation and may permit some room for storage space for Diversified Marine.	• Similar to Modified Standard but would locate Marine Drive closer to Ross Island Sand and Gravel and Diversified Marine and provide less potential storage space.	• Access to vacant storage areas would be similar to Option 12.
	• Access to Expo Center	• 1 full to Expo road • 3 full to Force Ave • 3 full to Marine Dr	• No change to Expo Road • No change to Force Avenue • No access to Marine Drive[2]	• 2 full to Expo Road • No change to Force Avenue • No access to Marine Dr[2]			
	• Neighborhood connectivity • Local street system connections	• No change	• All alternatives would provide similar local street connectivity.				

Tier 1 Criteria							
Criteria	**Measurement/Methodology**	**No Build**	**Standard Alignment**	**Option 14**	**Modified Standard [1]**	**Option 12[1]**	**Option 12 Modified[1]**
Permitting	• Level of difficulty in permitting (types of permits potentially required, conflicts with Vanport wetlands easement)		• Direct impacts to Wetland near interchange will require Corps and DSL permits, also needed for bridge construction. Although mitigation for impacts less than 0.1 acre is often not required, overall project impacts will exceed this threshold. • City of Portland permitting will need to include impacts to E-zone (wetland buffer). • No conflict with the Vanport conservation easement has been identified with this alignment. • Impacts to the Portland Harbor levee will be reviewed through the Section 408 process.	• Permitting would be similar to the Standard Alignment.		• Permitting would be similar to the Standard, although any impacts to the Portland Harbor levee, such as relocating it, will require Corp approval.	
Environmental impacts or benefits							
Wetlands	• Estimated acreage (including buffer) affected and potential mitigation		• Approximately 0.09 acre of direct impact to wetland L/M near interchange with 0.71 acres of combined Vanport-L/M wetlands buffer impact. Although mitigation for direct impacts less than 0.1 acre is often not required, overall project impacts will exceed this threshold.	• Approximately 0.09 acre of direct impact to wetland L/M near interchange with 0.71 acres of combined Vanport-L/M wetlands buffer impact. Although mitigation for direct impacts less than 0.1 acre is often not required, overall project impacts will exceed this threshold.	• I-5 NB on-ramp would cross the northern extent of wetland L/M near the interchange, resulting in approximately 0.18 acres of direct impact and 0.62 acres of combined Vanport-L/M wetlands buffer impact.	• I-5 NB on-ramp would cross the northern extent of wetland L/M and the combined Vanport-L/M wetlands buffer near the interchange, resulting in 0.60 acres of buffer impact. There would be no direct impact to wetland L/M or the Vanport wetlands.	• I-5 NB on-ramp would avoid the northern extent of wetland L/M but cross the combined Vanport-L/M wetlands buffer near the interchange, resulting in 0.07 acres of buffer impact. There would be no direct impact to wetland L/M or the Vanport wetlands.
	• Minimum distance between north bound flyover ramp and Vanport Wetland Boundary	•	• 60’	• 60’	• 80’	• 130’	• 210’

Tier 1 Criteria							
Criteria	**Measurement/Methodology**	**No Build**	**Standard Alignment**	**Option 14**	**Modified Standard [1]**	**Option 12[1]**	**Option 12 Modified[1]**
Biology	• Potential impacts to threatened and endangered (T&E) species (vibration, noise, lights)		• All of the options place elevated ramps near the Vanport wetlands. The Standard Alignment and Option 14 place ramps the closest to the Vanport wetlands • Noise and air quality impacts would likely be similar for all of the options • Biological impacts to the Portland Harbor are not significantly different between the options. Storm water retention/treatment with any of the options • No currently listed threatened and endangered (T&E) species use the interchange area, impacts to the nearby wetlands and buffer areas (see above) would affect native songbirds, mammals, and amphibians.	• All of the options place elevated ramps near the Vanport wetlands. The Standard Alignment and Option 14 place ramps the closest to the Vanport wetlands • Noise and air quality impacts would likely be similar for all of the options • Biological impacts to the Portland Harbor are not significantly different between the options. Storm water retention/treatment with any of the options could benefit water quality. • Noise and air quality impacts would likely be similar for all of the options • No currently listed threatened and endangered (T&E) species use the interchange area, impacts to the nearby wetlands and buffer areas (see above) would affect native songbirds, mammals, and amphibians.	• All of the options place elevated ramps near the Vanport wetlands. Standard Modified places ramp system slightly further from the Vanport wetlands than Standard and Option 14. • Noise and air quality impacts would likely be similar for all of the options • Biological impacts to the Portland Harbor are not significantly different between the options. Storm water retention/treatment with any of the options could benefit water quality. • Noise and air quality impacts would likely be similar for all of the options • No currently listed threatened and endangered (T&E) species use the interchange area, impacts to the nearby wetlands and buffer areas (see above) would affect native songbirds, mammals, and amphibians.	• All of the options place elevated ramps near the Vanport wetlands. Option 12 places ramp system slightly further from the Vanport wetlands than Standard Modified. • Noise and air quality impacts would likely be similar for all of the options • Biological impacts to the Portland Harbor are not significantly different between the options. Storm water retention/treatment with any of the options could benefit water quality. • Noise and air quality impacts would likely be similar for all of the options • No currently listed threatened and endangered (T&E) species use the interchange area, impacts to the nearby wetlands and buffer areas (see above) would affect native songbirds, mammals, and amphibians.	• All of the options place elevated ramps near the Vanport wetlands. Option 12 Modified places ramp system slightly further from the Vanport wetlands than Option 12.
Environmental Mitigation Considerations	• Wetlands, runoff and water quality treatment		• Mitigation for unavoidable impacts to wetland(s) will be required. Buffer impacts will be mitigated for by replacing functions elsewhere. • Storm Water would be treated regardless of which alternative is chosen. No appreciable difference between alternatives.				
Cost							
	• 2008 costs (does not include access modifications, wetland mitigation, contingency, escalation, or inflation)		• $365M	$360-370 M	$365-$385M	$360-370 M	$360-380 M

Columbia River CROSSING

Exhibit 6

Tier 1 Criteria							
Criteria	**Measurement/Methodology**	**No Build**	**Standard Alignment**	**Option 14**	**Modified Standard [1]**	**Option 12[1]**	**Option 12 Modified[1]**
Constructability/Staging							
	• Qualitative discussion of constructability/staging		• New structure crosses I-5 to the north of existing Marine Drive alignment. • The overlap over the existing road would require constructing a temporary intersection and some realignment both north and south of Marine Drive,	• Constructability would be similar to the Standard Alignment	• New structure crosses I-5 to the south of existing Marine Drive alignment. • Most of structure can be built while existing interchange is in service.	• Constructability would be similar to the Modified Standard Alignment	• Constructability would be similar to the Modified Standard Alignment • There would be some improvement on the east side with the tie in to MLK.

Tier 2 Criteria

Criteria	Measurement/Methodology	No Build	Standard Alignment	Option 14	Modified Standard [3]	Option 12[1]	Option 12 Modified[1]
Traffic							
Traffic Operations	• Peak hour truck trips on Marine Drive west of I-5-2030	AM EB 230, AM WB 260, PM EB 140, PM WB 80	AM EB 230, AM WB 260, PM EB 140, PM WB 80	• Similar to the Standard Alignment			
	• Free-flow versus stop locations at ramp terminals		• All alternatives would provide similar ramp terminal operations				
	• Marine Drive Interchange Level of Service • Intersection at interchange (average delay per vehicle in seconds)	AM LOS F(>100) V/C: 0.97 PM LOS F(>100) V/C: 1.00	AM LOS B (15.4) V/C: 0.59 PM LOS B (19.1) V/C: 0.66	AM LOS B (15.4) V/C: 0.59 PM LOS B (19.1) V/C: 0.66	AM LOS B (11.8) V/C: 0.61 PM LOS B (14.6) V/C: 0.66	AM LOS B (11.8) V/C: 0.61 PM LOS B (14.6) V/C: 0.66	AM LOS B (11.8) V/C: 0.61 PM LOS B (14.6) V/C: 0.66

Way-finding I-5 to Port of Portland	• Signage requirements
	  • Potential for confusion
	  • Single or combined ramp access
			• MD WB similar to existing
			• MD EB to I-5 south and north combined
				• MD WB similar to existing
				• MD EB to I-5 south and north separated
					• MD WB similar to existing
					• MD EB to I-5 south and north separated
						• MD WB similar to existing
						• MD EB to I-5 south and north separated
							• MD WB similar to existing
							• MD EB to I-5 south and north separated

Design Standards	• Approach speed/Posted Speed, side street traffic, back of queue conditions	• Force Avenue intersection loaded from south, right turn from Force is the primary movement	• Force Avenue intersection loaded from south, right turn from Force is the primary movement	• Similar to Standard Alignment			
	• NHS-route design standards		• Meets CFR Title 23, part 625 requirements				

[3] Traffic operations for this option were similar to the Standard Alignment. Minor differences in geometry could change these values by less than 5%.

Tier 2 Criteria

Criteria	Measurement/Methodology	No Build	Standard Alignment	Option 14	Modified Standard [3]	Option 12[1]	Option 12 Modified[1]
Land Use and Development Opportunities							
Access to developed and developable parcels	• Qualitative discussion of accessibility and visibility of areas from interchange • Freight access and internal circulation		• The interchange ramps and interchange intersection would all be elevated and would be the dominant structure in the area. Views on and in the vicinity of the interchange could be obstructed by the interchange itself and/or the ramp system, except for the Marine Drive/I-5 northbound ramp that would have the highest elevation in the interchange. • Freight movement similar to today because alignment on existing Marine Drive Interchange. • Access to Diversified Marine and Ross Island modified. • Access to Expo includes the addition of an access point to the local road system near the light rail station • Access on the east side of the interchange would be on the new local road system. Freeway access would be via Martin Luther King Junior Boulevard.	• Views and visibility similar to Standard Alignment • Access to Expo includes the addition of an access point to the local road system near the light rail station • Freight movement similar to Standard Alternative • Provides full access to Ross Island Sand and Gravel and Diversified Marine from local street system. • Access on the east side of the interchange would be on the new local road system. Freeway access would be via Martin Luther King Junior Boulevard.	• The interchange shifts slightly to the south under these options, although the ramp system on the west side of the interchange would obstruct views from Expo Center to the east. Views from the east side of the interchange toward the west could be less affected than under the Standard and Option 14 because the interchange is further to the south. Views on and in the vicinity of the interchange could be obstructed by the interchange and/or ramp system, except for the Marine Drive/I-5 northbound ramp that would have the highest elevation in the interchange. • Provides one access to Ross Island Sand and Gravel from the local street system. • Provides one access to Diversified Marine from the local street system. • Provides full access to Ross Island Sand and Gravel and Diversified Marine from local street system. • Access to Expo includes the addition of an access point to the local road system near the light rail station • Freight movement similar to Standard Alternative • Access on the east side of the interchange would be on the new local road system. Freeway access would be via Martin Luther King Junior Boulevard.		

Tier 2 Criteria

Criteria	Measurement/Methodology	No Build	Standard Alignment	Option 14	Modified Standard [3]	Option 12[1]	Option 12 Modified[1]
	• Qualitative discussion of riverfront accessibility for recreation/potential redevelopment	• No change	• Riverfront accessibility would be the same as No Build, although improved recreational amenities could improve access • Interchange is close to the waterfront. Ramp system could make the area less attractive for recreation because of local road system, ramp piers, and existing industrial uses.	• Recreational amenities similar to the other alternatives. • Riverfront accessibility could be possible north of new Marine Drive alignment, although the levy and existing industrial uses currently prevent direct access to the river. • Interchange is close to the waterfront. Ramp system could make the area less attractive for recreation because of local road system, ramp piers, and existing industrial uses.	• Recreational amenities similar to other alternatives. • Potential river accessibility the greatest of the alternatives, although levy would still prevent direct access to channel. Existing industrial uses along interchange would also prevent access to that area. • Interchange location further from the Portland Harbor than the Standard Alignment and Option 14 and may allow using vacant area for open space.	• Both options provide similar potential for riverfront access and recreational opportunities as the Modified Standard option	
Freight movement	• Qualitative discussion of impact to trucks and value/type of freight • Travel times/delay/wear and tear for freight and vehicles		• Travel times and delay are discussed in Tier 1. Wear and tear on vehicles was not analyzed.				
	• Qualitative discussion of cost of delay for freight (FHWA estimates that delay costs approximately $70 per hour per trip).		• The Standard Alignment would have the least delay of the options the least cost from delay of the options.	• Option 14 would likely be similar to the Standard Alignment	• Both options would likely be similar to the Modified Standard. Delay was not significantly more per trip than the Standard Alignment.		
Impacts or benefit to rail spur	• Potential impacts from construction		• No Impacts are anticipated to rail spur				
Environmental impacts or benefits							
Historic resources	• Potential impacts to historic properties		• Pier 99 (built 1960)				
Visual Resources	• Qualitative discussion of visual impacts		• All alternatives would construct a new interchange on I-5. No significant differences between the alternatives				

Tier 2 Criteria

Criteria	Measurement/Methodology	No Build	Standard Alignment	Option 14	Modified Standard [3]	Option 12[1]	Option 12 Modified[1]
Air quality and greenhouse gas (GHG)emissions	Potential impacts from intersection operations • Qualitative discussion based on number of intersections and traffic modeling results		• No significant air quality impacts and no substantial differences between the options[4]				

[4] Sub-area emissions for mobile source air toxins (MSATs) and other pollutants would be lower than No-build, based on modeling conducted for the DEIS; none of the interchange options being evaluated would be expected to substantially change that finding. Carbon monoxide (CO) hotspot analysis for the DEIS showed that the intersections most impacted by the project would have CO concentrations well within (about 50 to 85 percent below) federal CO standards; none of the interchange options being evaluated would be expected to change that finding. The DEIS analysis showed that the project would reduce overall greenhouse gas (GHG) emissions compared to No-build; traffic speeds have an effect on GHG emissions, but the expected differences in speeds associated with the different interchange design options would be expected to have no meaningful differences in carbon dioxide (CO_2) emissions.
Updated data from previous version is shown in bold text.