3.2 Navigation

An important goal of the IBR Program is to meet the reasonable needs of navigation on the Columbia River for the 100+ year service life of the new Columbia River bridges. This section discusses existing river navigation conditions and evaluates the associated beneficial and adverse effects of the Modified LPA and the No-Build Alternative.

The Columbia River and North Portland Harbor are designated as federal navigable waterways. This designation signifies that all construction or alteration of bridges crossing these waterways must first receive approval from the U.S. Coast Guard (USCG), pursuant the General Bridge Act of 1946, as amended. Additionally, a Memorandum of Agreement (MOA) between USCG and FHWA and a Memorandum of Understanding (MOU) among the USCG, FHWA, FTA, and Federal Railroad Administration (FRA) state that environmental documentation must include a discussion of potential project impacts to navigation and a summary of ongoing coordination with USCG.

The information presented in this section is based on analyses found in the Navigation Impact Report (IBR 2022) and the Navigation Simulation Study (Appendix H).

3.2.1 Changes or New Information Since 2013

The Columbia River Crossing (CRC) Selected Alternative identified in the 2011 Record of Decision, as revised by the 2012 and 2013 re-evaluations, is referred to as the CRC Locally Preferred Alternative (CRA LPA). Over the past 10+ years since the CRC LPA was identified, the physical environment in the study area, community priorities, and regulations have changed, which necessitated design revisions and resulted in the IBR Modified LPA (see Section 2.5.2). Evaluation of potential impacts associated with navigation has been updated in this Draft SEIS to include:

- Changes to existing and prospective marine vessel navigation and marine freight shipments in both the main channel of the Columbia River and North Portland Harbor.
- Changes to USCG policy with 2016 updates to the USCG Bridge Permit Application Guide.
- 2014 MOU among the USCG, FHWA, FTA, and FRA to coordinate and improve bridge planning and permitting.
- 2014 MOA between USCG and FHWA to coordinate and improve bridge planning and permitting.
- New bridge configurations added for evaluation due to changed conditions, one of which would provide increased vertical navigation clearance (VNC).

The replacement bridges over the Columbia River and North Portland Harbor are the main Program component relevant to navigation considerations. The CRC LPA and IBR Modified LPA would both include a pair of double-deck fixed-span replacement bridges with 116 feet of VNC and 400 feet of horizontal navigation clearance (HNC) (a 300-foot channel plus 50 feet on either side for channel maintenance). The Modified LPA also includes two additional bridge configuration design options: a pair of single-level fixed-span bridges and a pair of single-level movable-span bridges. Consideration of the three bridge configurations involves coordination with the U.S. Army Corps of Engineers (USACE) and USCG regarding multiple navigation-related items; see Section 2.6 for a discussion of current and future actions necessary to reach resolution on an acceptable bridge configuration for the IBR Program.

Table 3.2-1 compares the impacts and benefits between the CRC LPA and the IBR Modified LPA and the changes listed above. Based on this analysis, the Modified LPA with fixed-span bridge configurations would have the same or similar effects as the CRC LPA on navigation; the Modified LPA with a movable-span bridge

configuration would provide more VNC than the CRC LPA. A detailed description of impacts and benefits to navigation from the Modified LPA and associated design options follows.

Table 3.2-1. Comparison of CRC LPA Effects and IBR Modified LPA Effects on Navigation

Technical Considerations	CRC LPA Effects as Identified in the 2011 Final EIS	Modified LPA Effects as Identified in the Draft SEIS	Explanation of Differences
River Navigation Clearance	Reduced vertical clearance in the Columbia River primary navigation channel (from 178 feet [during a bridge lift] to 116 feet). Increased horizontal clearance in the Columbia River primary navigation channel (from 263 feet to 400 feet [a 300-foot channel plus 50 feet on either side for channel maintenance]). Vertical and horizontal clearances for North Portland Harbor would remain unchanged.	Vertical and horizontal clearances on Columbia River navigation channels are the same as CRC for the double-deck fixed-span and single-level fixed-span configurations. Same horizontal clearance with an increased vertical navigation clearance to 178 feet with the single-level movable-span configuration. Vertical and horizontal clearances for North Portland Harbor would remain the same or similar.	A movable-span configuration design option was added to the Modified LPA to meet the USCG Preliminary Navigation Clearance Determination (2022). The I-5 bridge over North Portland Harbor would be replaced under the Modified LPA due to continued aging of the seismically obsolete existing bridge.
Federally Authorized Navigation Channel Location	Proposed changes to the location of the Columbia River primary navigation and barge channels.	Same as CRC.	N/A

Note: The CRC LPA and Modified LPA effects are as compared to a No-Build Alternative, unless otherwise noted.
CRC = Columbia River Crossing; LPA = Locally Preferred Alternative; N/A = not applicable; SEIS = Supplemental Environmental Impact Statement; USCG = U.S. Coast Guard

3.2.2 Existing Conditions

Columbia River

As one of the largest rivers in North America, the Columbia River is among the defining geographic features of the Pacific Northwest. It serves as an important part of the U.S. Maritime Transportation System corridor, and its resources have provided, and continue to provide, the economic and cultural foundations of Native American and western settlements.

The Columbia River headwaters are located in British Columbia, Canada, through which the river flows for approximately 425 miles before entering the continental U.S. in northeast Washington. From the U.S./Canada border it flows generally south to its confluence with the Snake River, where it turns west and forms the boundary between Washington and Oregon for the remainder of its course to the Pacific Ocean.

The Columbia River is an important natural resource and serves a vital role for power generation, irrigation, navigation, and recreational purposes. It is navigable for deep-draft vessels from its mouth to Portland, Oregon, and Vancouver, Washington, and for shallow-draft vessels to Lewiston, Idaho via the Snake River. The Columbia River's deep-draft navigation system provides for a 43-foot-deep by 600-foot-wide channel from inside the Columbia River Bar upriver to ports on both the Washington and Oregon sides of the river at

approximately river mile (RM) 106. The upriver end of this section of the channel, known as the Columbia and Lower Willamette, is just downriver from the existing Interstate Bridge.

From just downstream of the Interstate Bridge to the Snake River confluence near Pasco, Washington, the Columbia River is maintained as a shallow-draft system predominantly supporting tug and tow vessel traffic. The shallow-draft system has a maintained depth of approximately 17 feet. Just east of The Dalles is a BNSF Railway Bridge at Celilo Falls with a VNC of 79 feet, which is notably less than the bridge heights under consideration for the IBR Program.

Between the Interstate Bridge and the Celilo Falls BNSF Railway Bridge 95 miles to the east, many shoreline land uses are dependent on the Columbia River. Today, the Columbia River shoreline is often identified by local jurisdictions as a resource to be leveraged for river-dependent uses such as recreational, environmental, habitat, or economical purposes than with industrial marine, water-dependent uses.

Historically, the Columbia River for many Native Americans living in the Pacific Northwest was central to culture, sustenance, trade, and transportation. As EuroAmerican settlement traveled to the Pacific Northwest, river transport, commercial fishing and associated canneries, and agriculture developed along the Columbia River (OHS 2024a). When dams were constructed along the Columbia and Snake rivers in the 1900s, increased industrialization occurred and corresponded to increased movement of freight and agricultural products up and downriver. Shipbuilding operations, supporting industries, and employees were established along the Columbia River during World War II, including three Kaiser Shipyards in the Vancouver and Portland areas (OHS 2024b). Additionally, new and affordable hydroelectric power ushered in aluminum smelting operations, and new U.S. Bureau of Reclamation (USBR) irrigation projects spurred increased agriculture production in central/eastern Oregon and Washington. Navigation along the Columbia and Snake rivers grew tremendously during this time to support these economies. Over the 107 years of service life of the Interstate Bridge (northbound span opened in 1917 and southbound span opened in 1958), numerous bridge lifts have been conducted for mariners with large VNC requirements, including those requiring openings for clearances over 116 feet and up to 178 feet. Over time, industries along the river changed to a mix of marine and non-marine enterprises with a decreasing trend of commercial vessels on the Columbia River (USACE, USBR, BPA 2020); however, the capacity of the Columbia River to support marine development and transport remains similar to conditions after the dams were constructed.

The intrinsic value of the Columbia River is largely in its natural beauty, especially within the Columbia River Gorge located east of the Interstate Bridge. The most significant land use control is the 85-mile-long Columbia River Gorge National Scenic Area, which protects the natural beauty of the gorge and severely limits industrial development outside of existing incorporated communities in Oregon and Washington from roughly Troutdale, Oregon to Wishram, Washington.

Federally Authorized Navigation Projects

I-5 crosses the Columbia River via the existing Interstate Bridge and the North Portland Harbor bridge. Within the vicinity of the Interstate Bridge, there are four federally authorized navigation projects on the Columbia River: three federally authorized navigation channels that pass beneath the Interstate Bridge (the primary navigation channel, barge channel, and alternate barge channel) and the federally authorized Upper Vancouver Turning Basin located immediately downstream of the Interstate Bridge. This turning basin has historically provided a turning location for deep-draft ships navigating up to, but not beyond, the Interstate Bridge.

The primary navigation channel was authorized to accommodate ocean-going vessels past Bonneville Dam to The Dalles. This traffic never materialized, and the channel is currently maintained to a shallower depth consistent with current traffic. There is no federally authorized navigation channel within North Portland

Harbor in the vicinity of the Interstate Bridge. Table 3.2-2 summarizes the widths and depths of the federally authorized navigation projects within the study area.

Table 3.2-2. Widths and Depths of Federally Authorized Navigation Projects in the Study Area

Federally Authorized Navigation Channel	Authorized Width (feet)	Existing Horizontal Clearance (feet)	Authorized Depth (feet)	Maintained Depth (feet)	Current Waterway Depth (feet)
Primary Columbia River Navigation Channel (Vancouver to The Dalles)	300	263	27	17	30
Barge Channel	300	511	15	15	~21 to 25
Alternate Barge Channel	200	260	17	15	~21 to 25
Upper Vancouver Turning Basin	800	N/A[a]	35	35	~20 to 30

Source: IBR 2022

a Not applicable. The federal authorization for the Upper Vancouver Turning Basin includes dimensions of 2,000 feet long and 800 feet wide. Horizontal clearance as referenced for the other federally authorized projects in this table relates to distance between bridge piers for ships navigating beneath the bridge and therefore does not apply to the turning basin.

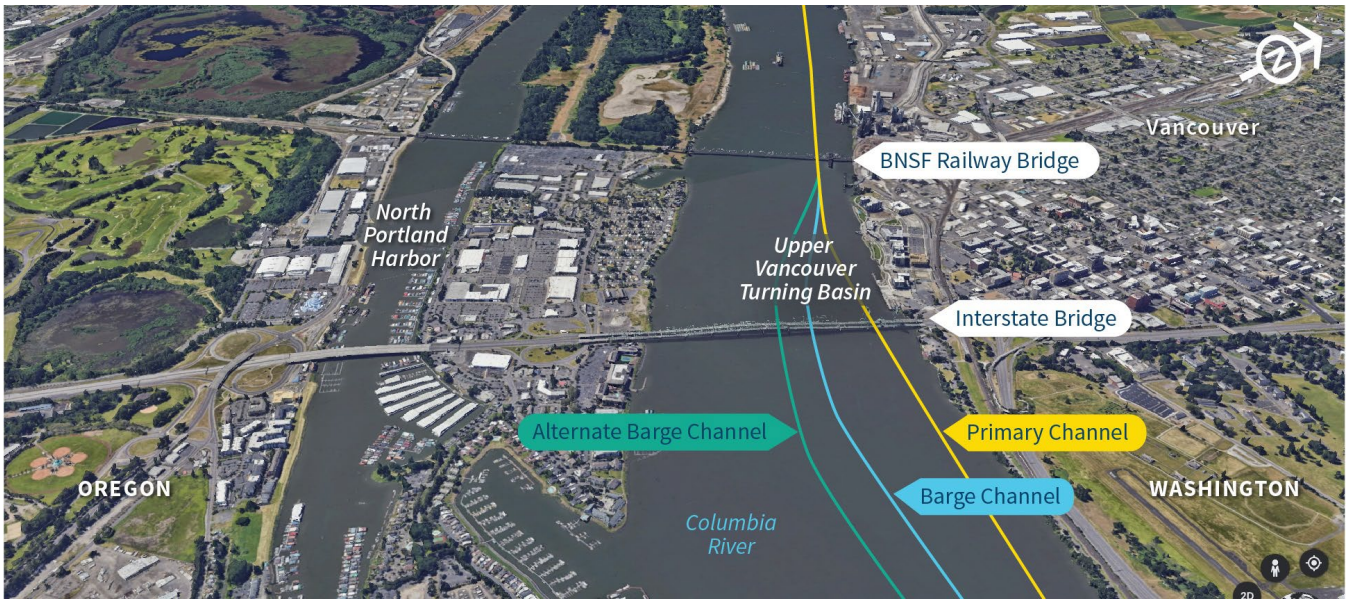
Vessel Operations and Navigation Clearance

Vessels that currently operate near and/or navigate beneath the Interstate Bridge include tugs and barges, recreational sailboats and powerboats, marine contractor barges with construction cranes and materials, cruise and passenger boats, dredges, government vessels, vessels transporting manufactured and fabricated goods, and others. More than 232,000 boat use days[1] occurred in 2017 in the Columbia River from the Interstate Bridge to the Bonneville Dam (approximately 39.5 river miles upstream).

Columbia River navigation is limited by horizontal and vertical clearances associated with the Interstate Bridge and North Portland Harbor bridge, the BNSF Railway Bridge that crosses the Columbia River to the west (downstream) of the Interstate Bridge, and a second BNSF Railway Bridge that crosses North Portland Harbor (see Figure 3.2-1). The alignments of the navigation channels factor into vessel passage of both the Interstate Bridge and the BNSF Railway Bridge. Figure 3.2-1 illustrates these alignments with different magnitudes of curvature between the two bridges. A variety of navigation factors, such as downstream or upstream transit, vessel/cargo load, vessel size and draft, weather conditions, water flow velocities, wind/wave conditions, and more are important considerations for vessel maneuverability and safety.

[1] Boat use days are calculated by multiplying the number of boats that use the river by the number of days of use. Therefore, one boat using the river 200 days would equal 200 boat use days, as would 200 boats each using the river for one day.

Figure 3.2-1. Existing Navigation Channels Under the Interstate Bridge and BNSF Railway Bridge



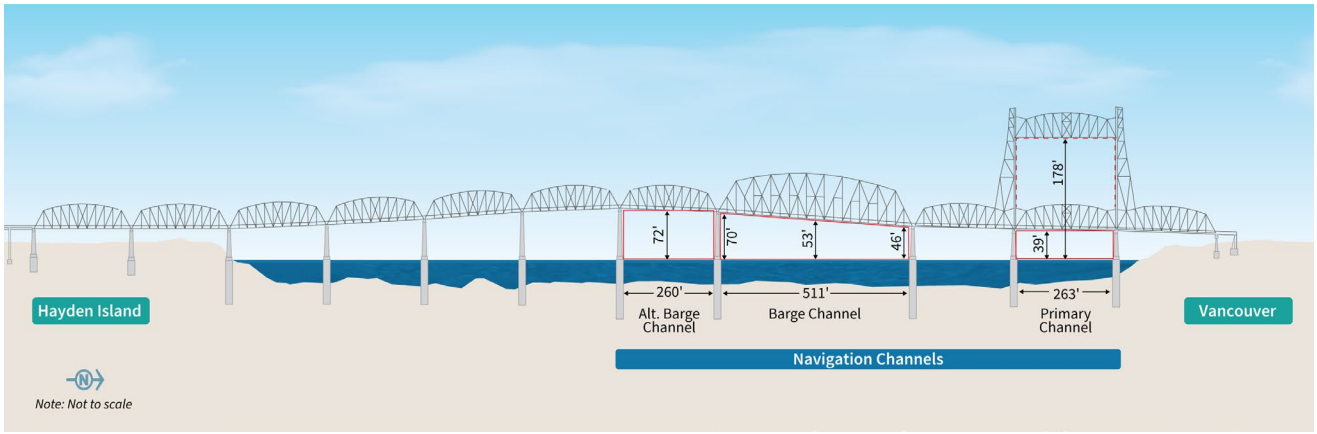
Due to the proximity of the Interstate Bridge and the BNSF Railway Bridge, vessel operators typically plan their route in consideration of navigation factors associated with both bridges. VNC and vessel cargo play a role in route options because USCG regulations specify that movable-span bridge openings are only allowed for vessels that are otherwise unable to pass under the bridge via alternate channels. For example, vessels that need less than 33 feet VNC (including adjustments for weather, water level, and other conditions) to pass the BNSF Railway Bridge may take a route outside the primary navigation channel. Vessels needing additional VNC require the BNSF Railway Bridge swing span to be opened and must use the primary navigation channel. This route is near the Washington shore (shown in Figure 3.2-1).

Figure 3.2-2 shows that when the Interstate Bridge lift spans are in the closed position, the vertical clearance within the primary navigation channel is 39 feet (as measured above 0 Columbia River Datum [CRD]).[2] When the lift spans are raised, the maximum vertical clearance is 178 feet. The barge channel lies under the wide span of the bridge and has an HNC of 511 feet and a vertical clearance ranging from 46 to 70 feet; however, vessels tend to use the southern half of this channel where the vertical clearance is the highest. The alternate barge channel has a HNC of 260 feet and a vertical clearance of 72 feet. Water levels dictate the available clearance at a specific time. Water levels vary seasonally based on flows and daily based on tidal influence. The average daily high is approximately 10 feet CRD and typically occurs in late spring. The average daily low is approximately 2 feet CRD and typically occurs in early fall.

For passage through the Interstate Bridge, vessels requiring more than 72 feet VNC must use the primary navigation channel with the opened lift spans; vessels that can pass with less than 72 feet of VNC can use one or more of the three channels without a bridge lift depending on vessel size and pilot choice. Interstate Bridge lift openings are currently restricted to avoid weekday peak highway traffic operations between 6:30 a.m. and 9:00 a.m. and between 2:30 p.m. and 6:00 p.m., excluding emergency bridge lifts. Thus, vessels that require a bridge lift must schedule their passage time outside these restricted time periods.

[2] Columbia River Datum is the plane of reference from which river stage is measured on the Columbia River from the lower Columbia River up to Bonneville Dam, and on the Willamette River up to Willamette Falls. Equals 1.82 feet above mean sea level (equivalent to National Geodetic Vertical Datum [NGVD]) at Vancouver, Washington (USACE 2014).

Figure 3.2-2. Existing Interstate Bridge Navigation Clearances



Note: all vertical VNCs shown are measured in feet above 0 CRD.

With the exception of some specialized vessels that use the Columbia River infrequently, most vessels require vertical clearances of less than 90 feet (see Table 3.2-3). As detailed in the IBR Program Navigation Impact Report (IBR 2022) issued in May of 2022, required openings of the Interstate Bridge declined by 45% from an average of 289 per year between 1997 and 2011 to 157 per year between 2012 and 2020. From 2012 to 2020, 58% of the bridge openings were for tugs, 17% for sailboats, and the remainder for other vessel types. These openings of the Interstate Bridge represent 5% to 7% of total river traffic based on openings of the downstream BNSF Railway Bridge and use of the locks at the upstream Bonneville Dam.

Table 3.2-3. Summary of Vertical Clearance Requirements and Frequency of Use

Vessel Type	Approximate Vertical Clearance Requirement	Approximate Annual Frequency
Tugs, Tows, and Barges	48 feet to 80 feet	> 500 trips
Sailboats/Recreation	63 feet to 90 feet	> 75 trips
Marine Contractors	40 feet to >175 feet	Varies
Dredges (U.S. Army Corps of Engineers dredge *Yaquina*)	102 feet	24
Marine Industrial	54 to >175 feet	Varies
Cruise/Passenger	50 feet to 80 feet	> 500 trips

Source: IBR 2022
Note: Vertical clearance requirements are based on vessel air draft (distance from water surface to highest point on a vessel) plus a 10-foot additional air gap (extra height allowance beyond the upper limit of air draft to allow a safety factor for vessel movements due to wind and waves). For marine contractors and marine industrial vessels, required clearance can vary based on the height of the cargo and/or construction equipment contained on the vessel.

For the Interstate Bridge, USCG has stated future navigation conditions clearance should not be less than existing conditions. In a June 17, 2022, Preliminary Navigation Clearance Determination, USCG stated that "any proposed new bridge would need to meet or exceed the existing VNC of the current I-5 twin bridges, 178 feet, and would preferably have unlimited VNC over the USACE-approved main navigation channel/project. Any side channels would require vertical clearances equal to or greater than 72 feet." Additionally, the Preliminary Navigation Clearance Determination states that any proposed bridge would

have an HNC requirement greater than or equal to that of the current or future permitted USACE federal navigation channel projects, and notes USACE may have additional requirements.

The federal navigation channels have various authorized widths. The authorized width of the Vancouver to The Dalles channel (i.e., the primary Columbia River navigation channel) is 300 feet. The authorized widths of the two side channels are 300 feet and 200 feet, respectively. The existing 263-foot HNC for the primary navigation channel beneath the Interstate Bridge, which is a function of bridge pier locations within the Columbia River, is less than the USACE-authorized channel width of 300 feet. The existing HNC was established when the original Interstate Bridge (current northbound span) was constructed, which was prior to federal authorization of the primary navigation channel.

Navigation is further affected by other bridges and structures that present obstructions to vessels. Upstream of the Interstate Bridge, this includes the following vertical clearances:

- I-205/Glenn L. Jackson Bridge, 136 feet (144 feet at center)
- Bridge of the Gods, 135 feet
- Hood River Bridge, 148 feet[3]
- The Dalles Bridge, 100 feet
- The Dalles Lock and Dam, 100 feet
- BNSF Railway Celilo Bridge, 79 feet

Downstream of the Interstate Bridge, this includes the following vertical clearances:

- BNSF Railway Bridge, Unlimited (39 feet when swing span closed)
- Lewis & Clark Bridge, 187 feet
- Astoria-Megler Bridge, 193 feet (205 feet at center)

North Portland Harbor

The North Portland Harbor, previously known as the Oregon Slough, is a 5-mile-long side channel of the Columbia River, located between Hayden Island and mainland Oregon. The waterway is bounded by a federal levee on the south bank and urban development and infrastructure on both shorelines.

North Portland Harbor supports marinas of floating homes and primarily noncommercial boats. North Portland Harbor does not include a designated navigation channel. It is largely traveled by recreational boaters and those accessing the water-oriented uses along the harbor. The HNC beneath the existing North Portland Harbor bridge is approximately 215 feet and a vertical clearance is approximately 35 feet. Farther west (downstream), large ocean-going cargo ships use North Portland Harbor to reach Port of Portland Terminal 6. However, they cannot travel farther upstream due to the depth of the waterway.

3.2.3 Long-Term Effects

No-Build Alternative

With the No-Build Alternative, navigation conditions would not change. Vessels requiring more than 72 feet of VNC would need to schedule passage through the Interstate Bridge around existing restrictions on lift-span operation. No additional timing restrictions on bridge lifts would be anticipated since the No-Build Alternative

[3] The Hood River Bridge, currently with a lift span providing up to 148 feet VNC, is proposed to be replaced with a fixed span that would allow for 90 feet VNC.

would not include light-rail transit. The primary navigation channel would remain in its current location and vessels would continue to use the same channels available today.

For navigation safety considerations, the No-Build Alternative would have the same safety considerations for mariners as existing conditions because the pier locations and navigation clearances would remain unchanged. Navigation simulations were conducted to evaluate existing, proposed future, and construction conditions for a variety of vessels (deep draft and shallow draft); upbound and downbound directions; daytime and nighttime conditions; various water flow conditions; loaded, light and unloaded cargo; and wind conditions. For additional detail on the navigation simulations, see Appendix H, List of Technical Reports, Navigation Simulation Study.

The mariners who participated in the vessel simulations indicated existing conditions can require careful maneuvering, especially with downbound direction and loaded cargo, to pass through both the Interstate Bridge and BNSF Railway Bridge due to the horizontal clearances of each bridge and the distance between the bridges.

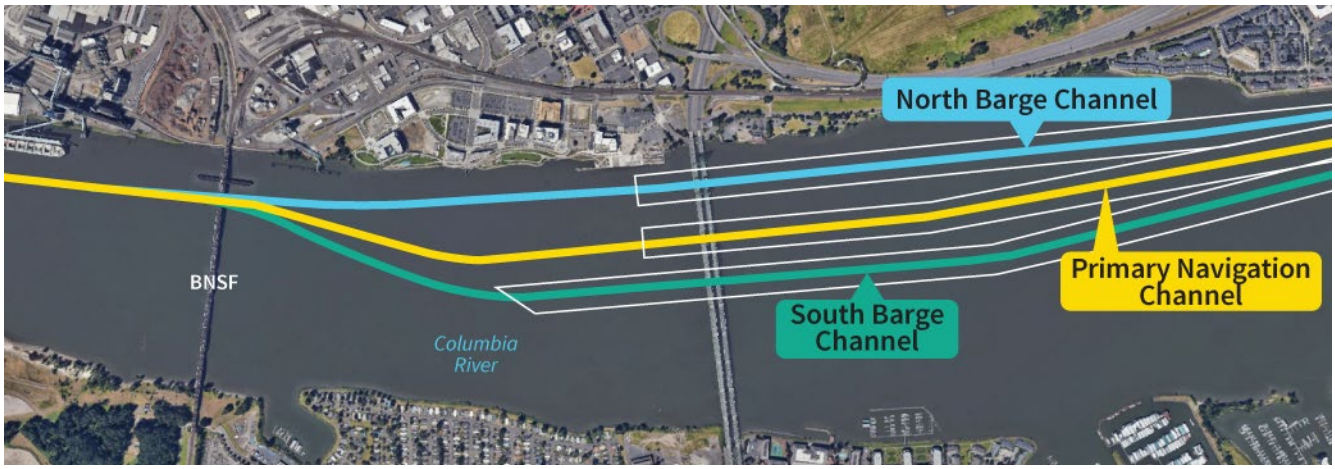
Without the seismic upgrades to the Interstate Bridge, a major earthquake could collapse or seriously damage one or both bridges, temporarily restricting or preventing navigation. Similar impacts to vessels navigating North Portland Harbor could occur if the bridge over North Portland Harbor is not replaced.

Modified LPA

Columbia River Navigation Channels

For all bridge design options under consideration for the Modified LPA, the routes that vessels would be required to take to pass through both the new Columbia River bridges and BNSF Railway Bridge would change due to the proposed relocations of the primary navigation channel and north barge channel (see Figure 3.2-3). All bridge configuration design options would modify the federally authorized navigation channels, switching the relative positions of the primary navigation channel and the barge channel from those shown in Figure 3.2-1. The north barge channel would be located closest to the Washington shore, while the primary navigation channel would be located one bridge span south at the bridge's highest point of vertical clearance. The south barge channel would continue to be in approximately the same location as the existing alternative barge channel.

Figure 3.2-3. Proposed Columbia River Navigation Channels under the Modified LPA



Navigation Clearance

The navigation clearance would change for all channels on the Columbia River:

- The north barge channel dimensions would be 100 feet VNC (fixed-span configurations) or 99 feet VNC (movable-span configuration) with 400 feet HNC. Most vessels and cargo would be able to pass under the new Columbia River bridges using the north barge channel with all bridge configurations. With a wider opening and higher vertical clearance, the north barge channel would provide improved navigation for most users compared to the existing primary navigation channel of the Interstate Bridge, except for vessels or cargo loads that require greater than 100 feet of clearance with the fixed-span configurations or 99 feet with the movable-span configuration and need to use the new primary navigation channel.
- The new primary navigation channel (center location) dimensions would be 116 feet VNC with 400 feet HNC (fixed-span configurations) and 92 feet VNC (closed position) to 178 feet VNC (open position) with 400 feet HNC for the movable-span configuration. Vessels that require more than 100 feet VNC (fixed-span configurations) or 99 feet VNC (movable-span configuration) would use this channel.
- The south barge channel dimensions would be 110 feet VNC (fixed-span configurations) or 90 feet VNC (movable-span configuration) with 400 feet HNC.

Currently, there are no planned new marine-dependent developments upstream of the Interstate Bridge; however, the Modified LPA with either the double-deck fixed-span or single-level fixed-span configuration would limit future navigation by introducing a permanent and complete obstruction to navigation upstream of the new Columbia River bridges for vessels or cargo loads with vertical clearance requirements greater than 116 feet. The Modified LPA with a single-level movable-span configuration would continue to provide unobstructed navigation for vessels requiring up to 178 feet of VNC.

Replacement bridges over North Portland Harbor would retain the same VNC as the existing I-5 bridge.

Navigation Safety

Columbia River navigation safety was evaluated by simulating future navigation conditions with varying vessel types, cargo loads, water flow conditions, wind conditions, transit direction, and other elements (Appendix H, Navigation Simulation Study). Simulations for deep-draft vessels were conducted with a vertical lift-span configuration in the open position; simulations for shallow-draft vessels were conducted with a vertical lift-span configuration in both open and closed positions. Simulations conducted for shallow-draft vessels would apply to the fixed-span configurations unless specialty cargo requiring greater than 100 feet VNC was transiting.

Because the construction of the new bridges would be to the west (downstream) of the existing Interstate Bridge, the distance between the BNSF Railway Bridge and the new Columbia River bridges would be reduced, resulting in a shorter available distance for vessels to align with the openings of the two bridges. However, the Modified LPA would include fewer bridge piers in the water and a greater distance between the piers and thus would provide greater HNC. This increased HNC would provide an opportunity for mariners headed downstream to position earlier to begin turning movements as they are transiting the new Columbia River bridges, compared to the current situation that does not allow them to begin turning until they have fully transited the Interstate Bridge. In addition, realigning the primary navigation channel from the north to the center channel would allow a greater passing distance between cruise vessels docked at Terminal 1 and transiting vessels. Overall, ship pilots and tug masters conducting the navigation simulations described the Modified LPA as providing more HNC to maneuver and reducing the number of direction changes to navigate between the new Columbia River bridges and the BNSF Railway Bridge. Specific pilot and tug master observations from the simulations are presented in Table 3.2-4. The Modified LPA for the double-deck fixed-span, single-level fixed-span, and vertical lift-span configuration design options includes spans of 465 feet, which meets the federally authorized channel width. Because the Modified LPA would require fewer

piers than the No-Build Alternative (six sets of in-water piers versus nine sets for the No-Build Alternative), the spans between pier sets would provide greater HNC and create fewer obstacles to navigation for all river users than would the No-Build Alternative.

Navigation safety for vessels transiting North Portland Harbor would remain unchanged as VNC and HNC with the replacement bridges would not decrease. However, the Modified LPA would increase the number of bridges crossing the North Portland Harbor from the single I-5 bridge that currently spans the harbor to five new bridges; thus, there would be additional piers in the water for vessels to navigate.

Table 3.2-4. Columbia River Navigation Simulation Pilot Observations for the Modified LPA

Draft	Direction	Pilot and Tug Master Observations
Deep-draft Vessels	Upbound	• Navigation channels were a significant improvement in the transition between the BNSF Railway Bridge and new Columbia River bridges as a result of a steady heading through the BNSF bridge toward where the pilot wants to be positionally approaching the Columbia River bridges. • With the proposed channel/bridge there is a single turn point between the BNSF Railway Bridge and Columbia River bridges compared to two corrections with the existing Interstate Bridge. • With the new Columbia River bridge piers, there is more maneuvering area compared to the existing Interstate Bridge piers where the clearance is more restrictive. • Passing through the existing Interstate Bridge, vessels come close to Vancouver and any vessels docked at Terminal 1 and are constrained from maneuvering on one side. Pilots expressed they had to “dig out” from the existing bridge channel. These conditions were mitigated with the proposed bridge span and center channel alignment for the deep-draft vessels (same observation made for downbound transit).
Deep-draft Vessels	Downbound	• The Modified LPA navigation channels and bridge piers allowed for more natural transition from the new Columbia River bridges to the BNSF Railway Bridge. The existing Interstate Bridge required a turn to the south and then another turn to the north, while the proposed bridge just required a single turn to the north to line up for the BNSF Railway Bridge. • Transit in the existing primary navigation channel with the existing bridge required a lot of rudder commands to maintain the intended track. • Increased clearance between bridge piers allowed more maneuvering room and allowed the pilots to start their turn earlier on the downbound passage (started the turn under the bridge) to set up for passage through BNSF Railway Bridge.
Shallow-draft Vessels	Upbound	• The approach to the north barge channel at the new Columbia River bridges is easier and improved from the existing conditions due to the new bridge piers shifting south, allowing the stern of the tug room to stay south rather than having to hold position on the north bank in existing conditions. • The additional width of the new bridge piers is an improvement from existing conditions. • The center channel (new primary navigation channel) was run with fog and nighttime conditions, independently, and no concerns were raised. This proposed center channel felt like a typical transit performed today.

Draft	Direction	Pilot and Tug Master Observations
		• For the south barge channel, it was noted the new channel was preferred over the existing due to the enhanced visibility from the higher low chord elevation of the bridges, a more gradual turn from the BNSF Railway Bridge to the new Columbia River bridges, and wider channel between the bridge piers.
Shallow-draft Vessels	Downbound	• The north barge channel transit at the new Columbia River bridges felt easier than existing conditions due to the proposed bridge piers shifting south making the transition to the BNSF Railway Bridge more natural. Additionally, with the new Columbia River bridges there would no longer be the need to wait for a bridge opening, which is a concern of the mariners as the new vertical clearance is sufficient for all 2-barge by 2-barge tows. • The center channel (new primary navigation channel) and bridge would be a substantial improvement from existing conditions both visually and spatially. The new center channel would limit the course correction needed between the new Columbia River bridges and BNSF Railway Bridge. The tug masters stated this channel would be the preferred channel to transit for both upbound and downbound transits. • For the south barge channel, it was noted that the proposed channel/bridge was easier than the existing conditions due to an easier transition from the new Columbia River bridges to the BNSF Railway Bridge, improving overall safety of the transit. • For specialty barges, tug masters thought maneuvers for the new Columbia River bridges and existing conditions were comparable with a preference for the new channel/bridge due to increased channel width.

Vessel and Operational Adjustments Associated with Columbia River Fixed-Span Bridge Configurations

The Modified LPA with either the double-deck or single-level fixed-span configuration would reduce the maximum VNC of the primary navigation channel from 178 to 116 feet. The IBR Program collected information on vessels traveling this section of the Columbia River to assess the existing clearance needs; the results were discussed and verified with vessel operators and the USCG. Vessel types, owners, names, and specifications were collected and analyzed to determine whether the Modified LPA with fixed-span configurations with a VNC of 116 feet would result in adverse impacts to these river users. In addition, information was also collected from marine industries along the Columbia River about large freight shipments that would be constrained by a fixed-span bridge.

Information on vessels that would be restricted by a 116-foot bridge under the Modified LPA is summarized in Table 3.2-5 and represents vessels transiting the Interstate Bridge during the 2012–2023 period. Five vessels and three industrial fabricators with large freight shipments may have vertical clearance requirements greater than the clearance provided by the Modified LPA with either fixed-span configuration. With the proposed fixed-span VNC of 116 feet, two marine contractor vessels (crane or derrick barges) would be unable to navigate beneath a fixed-span bridge. Two additional derrick barges and the USACE Dredge *Yaquina* would be restricted when the river level is at the ordinary high water level of 16 feet above CRD, which is approximately 1% of days in a typical year. If adjustments to taller vessels, large cargo, or business operations would be infeasible, then the fixed VNC of 116 feet would adversely affect the navigation capabilities of these vessel owners, as well as vessels and industrial businesses that ship cargo and require greater vertical clearance.

Table 3.2-5. River Users Restricted by a 116-foot Bridge under the Modified LPA Fixed-Span Configurations [a]

Type of Affected River Users	Number of Affected River Users	Limiting Factor	Required Clearance (feet CRD) [b]	Approximate Trip Frequency
Industrial fabricators	3	Fabricated materials shipped by barge	140–175	Less than 1 one-way trip per year
Marine contractors unable to pass all times of year	2	Crane boom heights	129–141	1–10 round trips per month
Marine contractors able to pass except during high water conditions (16 feet CRD)	2 [c]	Crane boom or gantry height	102–103	1–2 round trips per month
USACE Dredge *Yaquina*	1	Antenna height	102	1 round trip per month October through July; 2 round trips per month August and September

Source: IBR 2022

a Restrictions on vessel navigation beneath the new bridges were determined based on an OHWL of 16 feet above CRD. This level was exceeded at the Interstate Bridge less than 1.2% of days over the data period between 1972 and 2020.

b Required clearance includes a 10-foot air gap above a vessel's highest point, which provides a safety factor due to wave- and wind-induced movements in the vertical plane when vessels are transiting under the bridges.

c Both vessels have accommodations to lower crane booms/gantries and could implement them to transit during OHWL conditions.

CRD = Columbia River Datum; OHWL = ordinary high-water line; USACE = U.S. Army Corps of Engineers

Compliance with USCG Preliminary Navigation Clearance Determination

The Modified LPA with the single-level movable-span configuration over the Columbia River would continue to provide 178 feet or greater VNC. This configuration would meet the Preliminary Navigation Clearance Determination for the Columbia River issued by the USCG on June 17, 2022.

None of the bridge design options over the Columbia River with the fixed-span configurations would comply with the 2022 Preliminary Navigation Clearance Determination; thus, an updated Navigation Impact Report would need to be submitted and a revised Preliminary Navigation Clearance Determination from the USCG would be required to advance these design options (see Section 2.6, Additional Compliance Underway, for more discussion on this process).

The USCG issued a Preliminary Navigation Clearance Determination for North Portland Harbor on July 12, 2022, with which the Modified LPA is consistent.

Timing Restrictions on Columbia River Movable-Span Bridge Openings

Movable-span operations, and therefore Columbia River navigation, would potentially need to be restricted to minimize impacts to highway traffic and light-rail transit operations (see Section 2.6, Additional Compliance Underway, for more discussion on the rulemaking process to establish timing restrictions on movable-span openings). This would likely be more restrictive than the No-Build Alternative, as bridge openings are currently restricted during peak commute hours Monday through Friday to reduce impacts to highway traffic. The Modified LPA would include light-rail transit; thus, additional timing restrictions for this service would be considered. A factor to consider in determining changes to timing restrictions, is the number of projected

bridge openings. The increased HNC and VNC of the movable-span configuration would allow standard barges to transit all three of the navigation channels, including during high water conditions, without needing to request a bridge opening, thereby reducing the number of bridge openings. Extended timing restrictions on bridge openings could require vessel owners and cargo shipments to be scheduled at earlier or later times of day than are used today and under the No-Build Alternative. For more information on impacts to highway traffic and transit service from movable-span bridge openings, see Section 3.1, Transportation.

Future Maritime Transportation System demands and the associated need for bridge openings for the 100+ year service life of the bridge are difficult to predict because vessel traffic and river-level conditions vary from year to year and economic trends for maritime commerce may change over time. Under the Modified LPA with the double-deck fixed-span or single-level fixed-span configurations, future vessel traffic would be restricted to vessels that could navigate the 116-foot fixed-span, height-restricted navigation of the waterway. The Modified LPA with a single-level movable-span configuration would retain 178 feet VNC; all vessels and cargo that transit the existing Interstate Bridge would continue to transit in the future.

Upper Vancouver Turning Basin

Under the Modified LPA, the proposed Columbia River bridges would be constructed to the west of the existing Interstate Bridge. Consequently, all of the bridge configurations would shift the Upper Vancouver Turning Basin west by approximately 300-350 feet compared to the No-Build Alternative. This shift would continue to provide horizontal distance and vertical depth for vessels that have historically used this turning basin, allowing them to make similar turning movements in the future.

Summary of Long-Term Effects

Table 3.2-6 compares the long-term effects to navigation on the main stem of the Columbia River of the Modified LPA to the No-Build Alternative.

The new North Portland Harbor bridges proposed under the Modified LPA would not reduce or increase vessel navigation clearance from current conditions. In addition, mariners transiting the North Portland Harbor would continue to have an alternate route via the main channel of the Columbia River. Therefore, no long-term effects to navigation are expected to result from the new North Portland Harbor bridges.

Table 3.2-6. Summary of Long-Term Effects to Columbia River Navigation from the No-Build Alternative and Modified LPA

Navigation Component	No-Build Alternative	Modified LPA with Double-Deck or Single-Level Fixed-Span (Girder, Extradosed, Finback) Configurations	Modified LPA with Single-Level Movable-Span Configuration
Primary Navigation Channel	Location: North Width: 263 feet Height: 39 feet (closed) to 178 feet (open)	Location: Center Width: 400 feet Height: 116 feet	Location: Center Width: 400 feet Height: 92 feet (closed) to 178 feet (open)
North Barge Channel	Location: Center Width: 511 feet Height: 46–70 feet	Location: North Width: 400 feet Height: 100 feet	Location: North Width: 400 feet Height: 99 feet
South Barge Channel	Location: South Width: 260 feet Height: 72 feet	Location: South Width: 400 feet Height: 110 feet	Location: South Width: 400 feet Height: 90 feet
Navigation Safety	Primary navigation channel (north location) would provide straightest route to/from the BNSF Railway Bridge compared to existing barge (center) and alternate barge (south) channels	Wider HNC for all channels Reduced VNC for new primary navigation channel Increased VNC for the north barge channel and south barge channel Improve alignment with the BNSF Railway Bridge Increased visibility	Wider HNC for all channels Same or increased VNC for all channels Improved alignment with the BNSF Railway bridge Increased visibility
Number of In-water Pier Sets	9	6	6
Bridge Opening Restrictions	No lifts allowed on weekdays: 6:30 a.m. to 9:00 a.m. and 2:30 p.m. to 6:00 p.m.	N/A	Potentially more restrictions on openings allowed during weekday daytimes and early evenings [a]
Upper Vancouver Turning Basin	Approximately 2,000 feet long	Maintained length with an approximately 300-325-foot shift west	Maintained length with an approximately 350-foot shift west

Navigation Component	No-Build Alternative	Modified LPA with Double-Deck or Single-Level Fixed-Span (Girder, Extradosed, Finback) Configurations	Modified LPA with Single-Level Movable-Span Configuration
Seismic Resilience	Continued risks of impacts to navigation from potential earthquake events including the potential for the bridge failing and blocking or obstructing the navigation channels.	Increased seismic resiliency in event of potential earthquake reducing risk of bridge failure or collapse and blocking or obstructing the navigation channels.	Increased seismic resiliency in event of potential earthquake reducing risk of bridge failure or collapse and blocking or obstructing the navigation channels.
Demolition	N/A	Existing bridge foundation elements would be removed to a depth determined by the USACE to not pose a hazard to current or future dredging operations.	Existing bridge foundation elements would be removed to a depth determined by the USACE to not pose a hazard to current or future dredging operations.

a New bridge opening restrictions would require coordination with USCG and mariners. Federal rulemaking process would need to occur to modify current restrictions for long-term operations of the Modified LPA with a single-level movable-span configuration.

HNC = horizontal navigation clearance; LPA = Locally Preferred Alternative; N/A = not applicable; USACE = U.S. Army Corps of Engineers; USCG = U.S. Coast Guard; VNC = vertical navigation clearance

3.2.4 Temporary Effects

No-Build Alternative

No Program-related construction activities would take place under the No-Build Alternative that would have temporary effects to navigation.

Modified LPA

Construction of the Modified LPA includes the construction of the new bridges and removal of the existing Interstate Bridge. Construction activities would result in temporary effects to navigation on the Columbia River. During construction of the Modified LPA, some of the new piers, which are located outside of the current navigation channel, would not line up with the existing piers. Construction of the new bridge pier sets would occur one-by-one, resulting in changes to the three navigation channels at different points in time. For the estimated 4- to 7-year duration of construction, the existing Interstate Bridge would still be operational, and channels would be restricted by the presence of both the existing and constructed piers until demolition of the existing piers could occur. HNC could be further affected due to crane barges and other equipment present in the vicinity of the channel during pier construction. Smaller vessels and most recreational craft, which have limited horizontal and vertical clearance needs, would not be restricted from passing.

Construction would be staged so that at least one navigation channel would be open at a given time. A minimum unobstructed navigation clearance of 72 to 75 feet (vertical) by 150 to 200 feet (horizontal) would be maintained during construction. This clearance would meet vessel clearance needs of most waterway users; however, accommodations would be implemented to maintain safe passage through the construction area. Pilot and tug master feedback during the navigation simulations provided the following observations for the construction conditions:[4]

- The north barge channel/existing primary navigation channel felt like a typical transit through the existing north channel with more obstacles due to passing through two pairs of bridges. Overall, the mariner had limited concerns with this channel during construction.
- The navigation clearance limitations on the south barge channel, pilots/tug masters noted the channel is tight. As a result, until mariners are familiar with transiting this channel the 2-barge (length) by 2-barge (abreast) tows should be broken into a narrower 2-barge (length) by 1-barge (abreast) tow. For specialty barges, maneuvers should happen during daylight to have greatest visibility. Additionally, the deckhand would need to be on the barge constantly giving the tug captain distances throughout this transit, an assist tug would be required, and environmental conditions would need to be evaluated for each transit.
- All construction barges should have an active Automatic Identification System (AIS) signal and construction channel lines should be updated on the published navigation charts.

For vessels requiring greater than 72 to 75 feet VNC, advance coordination would be undertaken to seek opportunities to accommodate larger vessels and cargo with construction activities. Closures or restrictions on river traffic would need to be approved by the USCG and communicated in advance, enabling river users to accommodate their schedules without undue interruption. The majority of vessels currently using the navigation channel would be able to continue their use throughout most of the construction period. Larger

[4] The new primary navigation channel (center location) was assumed to have a minimum width of 200 feet and be limited to a vertical clearance of 43 feet during the simulated construction scenario. Thus, this channel would be closed as none of the design vessels would have sufficient clearance (see Appendix H, List of Technical Reports, Navigation Simulation Study, for additional details on the modeling assumptions for simulations).

vessels may require a tug to assist their navigation of the construction area, particularly if a vessel is traveling downriver with cargo.

The VNC restrictions during construction would prevent the *Yaquina* from navigating above the Interstate Bridge to conduct yearly maintenance dredging of the federal navigation channel. Without yearly maintenance dredging portions of the river could shoal and reduce the ability of vessels to navigate the federal navigation channel or could require reduced loads and vessel drafts. Modifications to the *Yaquina*, such as converting the fixed mast to a lowerable mast, use of alternative vessels, or changing dredging methods would be required to fulfill the USACE's navigation missions during these time periods.

While the size of vessels transiting the North Portland Harbor is more limited than those using the mainstem of the Columbia River, construction staging schemes would be devised for the Modified LPA to minimize adverse impacts to the vessels using North Portland Harbor. Construction in North Portland Harbor is not expected to occur at the same time as the Columbia River; thus, many vessels that typically transit North Portland Harbor could use the Columbia River as an alternate route. Restrictions and temporary closures of the navigation channel and the availability of the alternate route would be communicated to marinas and moorages on North Portland Harbor, as these are the primary users.

Temporary navigation effects under the single-level movable-span configuration would be similar in character to those described above but would be more pronounced because of the larger footings and piers on either side of the primary navigation channel and the additional construction time, materials, and equipment needed to construct this option compared to the fixed-span configurations.

See Section 3.2.6 for more discussion of staging and related construction-phase mitigation.

3.2.5 Indirect Effects

Under the Modified LPA with fixed-span configurations, vessels or cargo that would be height-limited and unable to transit beneath the new Columbia River bridges could have potential indirect effects on upstream marine-dependent uses. Based on state, port, and local jurisdictions' land use plans, these potential indirect effects would be expected to have limited, at most, impact on future upriver economic activity since there are few upstream opportunities for new or expanded commercial and industrial developments dependent on height-constrained vessels service (Appendix H. Navigation Impact Report). The Modified LPA with movable-span configuration would have no indirect effects to upstream marine-dependent uses.

The Columbia River waterway is currently authorized to a depth of 27 feet from the Interstate Bridge to The Dalles, approximately 83 river miles upstream, and could support greater navigation upriver from the Interstate Bridge than it currently does if the waterway were deepened from the currently maintained depth of 17 feet. However, no new marine-dependent developments are currently known to be planned upstream of the Columbia River bridges.

Constraints related to land use controls and business demand, rather than reducing the VNC from 178 feet (No-Build Alternative) to 116 feet (Modified LPA with fixed-span configurations), represent the primary factors that could potentially impact future commercial and industrial development upstream. Land use restrictions imposed by the Columbia River Gorge National Scenic Area, along with topography, transportation access parallel to shorelines (SR 14, I-84, the BNSF Railway, and the Union Pacific Railroad), and existing protected open spaces, are the limiting factors for future water-dependent commercial and industrial development. Overall, the Modified LPA is expected to result in little to no indirect impact to upstream marine-dependent land uses. See Section 3.4, Land Use and Economic Activity, for further discussion on indirect effects to land uses and the economy.

3.2.6 Potential Avoidance, Minimization, and Mitigation Measures

Long-Term Effects

Regulatory Requirements

- Standards and regulatory measures to avoid or minimize long-term effects on navigation have been evaluated and screened. These measures have been incorporated during the development of the Modified LPA to the extent possible and will continue to be refined as the design progresses.

Avoidance Measures

The Modified LPA with a fixed-span configuration would have long-term effects to marine-based operations currently operating on the Columbia River, including five vessels and three upstream fabricators when shipping large cargo requiring VNC over 116 feet. Under the double-deck and single-level fixed-span configurations, these vessels and cargo shipments would be unable to transit beneath the new Columbia River bridges in either some conditions when river levels approach or exceed ordinary high water levels or be permanently precluded from transiting the bridge. The IBR Program would continue to coordinate with the affected vessel owners and river users to reach mutually acceptable decisions and agreements to avoid impacts through adjustments to vessels or business operations prior to publication of the Final SEIS.

Program-Specific Mitigation

In addition to regulatory requirements, potential Program-specific mitigation measures have been identified and will be developed with the Modified LPA design.

Specific mitigation for navigation includes:

- Provide obstruction marking and lighting to make the river crossing structures visible to river traffic. Design roadway or accent lighting on the bridges and surrounding interchanges to limit light or glare that could affect river navigation.
- Update navigation charts and other navigation publications to reflect changes to VNC and HNC for future river users.

Temporary Effects

Regulatory Requirements

To protect and minimize temporary effects on navigation during construction, standard and regulatory mitigation measures such as best management practices (BMPs) would be implemented. Construction BMPs applicable to the Modified LPA are discussed in Section 3.14, Water Quality and Hydrology.

Standard and regulatory mitigation measures for navigation include:

- Develop construction phasing and staging plans to help ensure that construction activities would be planned to maintain a minimum channel for navigation. The Construction Staging Plan would be reviewed and approved by the USCG Captain of the Port prior to construction. Coordination and approval by the USCG Captain of the Port would occur for changes to the three navigation channels at each of the different times bridge pier sets would be constructed. Closures or restrictions on river traffic would be communicated in advance, enabling river users to accommodate their schedules, tug and barge configurations, requirements for assist tugs, shipping marine freight by other modes (e.g., truck, rail), use of different vessels with lower vertical clearance, and other options during construction activities that disrupt navigation and enable USACE to fulfill its navigation missions.

- Provide Local Notice to Mariners throughout construction to provide information to tug operators, pilots, and the public.

Program-Specific Mitigation

- Make available an assist tug(s) to support safe navigation when vertical or horizontal clearances are reduced and assistance is needed to safely navigate the restricted channel.
- Conduct outreach to inform the navigation community, recreational boaters, and other river users of waterway restrictions and other construction activities that may restrict or otherwise change local navigation conditions.
- Provide information via local maritime publications, social media, local media, and other similar platforms.
- Provide signage and notices at boat ramps, water access points, marinas, and other locations frequented by river users to inform them of the construction activities and where additional information can be found on the Program.
- Notify individual vessel owners where information indicates they could be specifically impacted during construction.
- Require all construction barges to have active AIS signals and construction channel lines be updated on the published navigation charts.
- Modify the USACE Dredge *Yaquina* to have a lowerable mast or other feature to enable passage of the Interstate Bridge during construction.