Request for a Letter of Authorization Under the Marine Mammal Protection Act

Duckabush Estuary Restoration Project

September 2024

Submitted to:
Jolie Harrison, Division Chief
Permits and Conservation Division
NOAA Fisheries Office of Protected Resources
1315 East-West Highway, F/PR1 Room 13805
Silver Spring, MD 20910

Prepared by:
U.S. Army Corps of Engineers, Seattle District
4735 E Marginal Way
Seattle, WA 98134

Contents

List of Figures

List of Tables

Appendices

1 Description of Specified Activity

1.1 Project Location

The Duckabush River Estuary opens into Hood Canal on the south side of the Black Point Peninsula at approximately Mile 310 of Highway 101. The Washington Department of Fish and Wildlife (WDFW) owns the land (Figure 1). The project area is mostly undeveloped. Single-family homes and forested habitat make up the area's boundaries to the north, south, and west. The Duckabush Estuary and Hood Canal form the eastern border. The Duckabush Estuary is a tidally influenced river delta created where the Duckabush River empties into Hood Canal. The main channel of the Duckabush River, a northern arm known as Duckabush Slough, and various side channels all cross the relatively flat estuary site. High tides inundate low-lying areas of the site. The Duckabush Estuary consists of approximately 38 acres of salt marshes, eelgrass beds, and extensive mud and gravel flats that support productive shellfish beds.

Figure 1. Duckabush Estuary project area

1.2 Background

The Duckabush River exists within a single channel encompassing a 76-square-mile watershed near Brinnon, WA. It empties into the marsh and submerged marsh at the Duckabush Estuary on Hood Canal (Figure 2). The estuary contains salt marshes, eelgrass beds, and extensive mud and gravel flats that support productive shellfish beds. The Duckabush Estuary is also home to harbor seals, bald eagles, and regionally significant winter waterfowl.

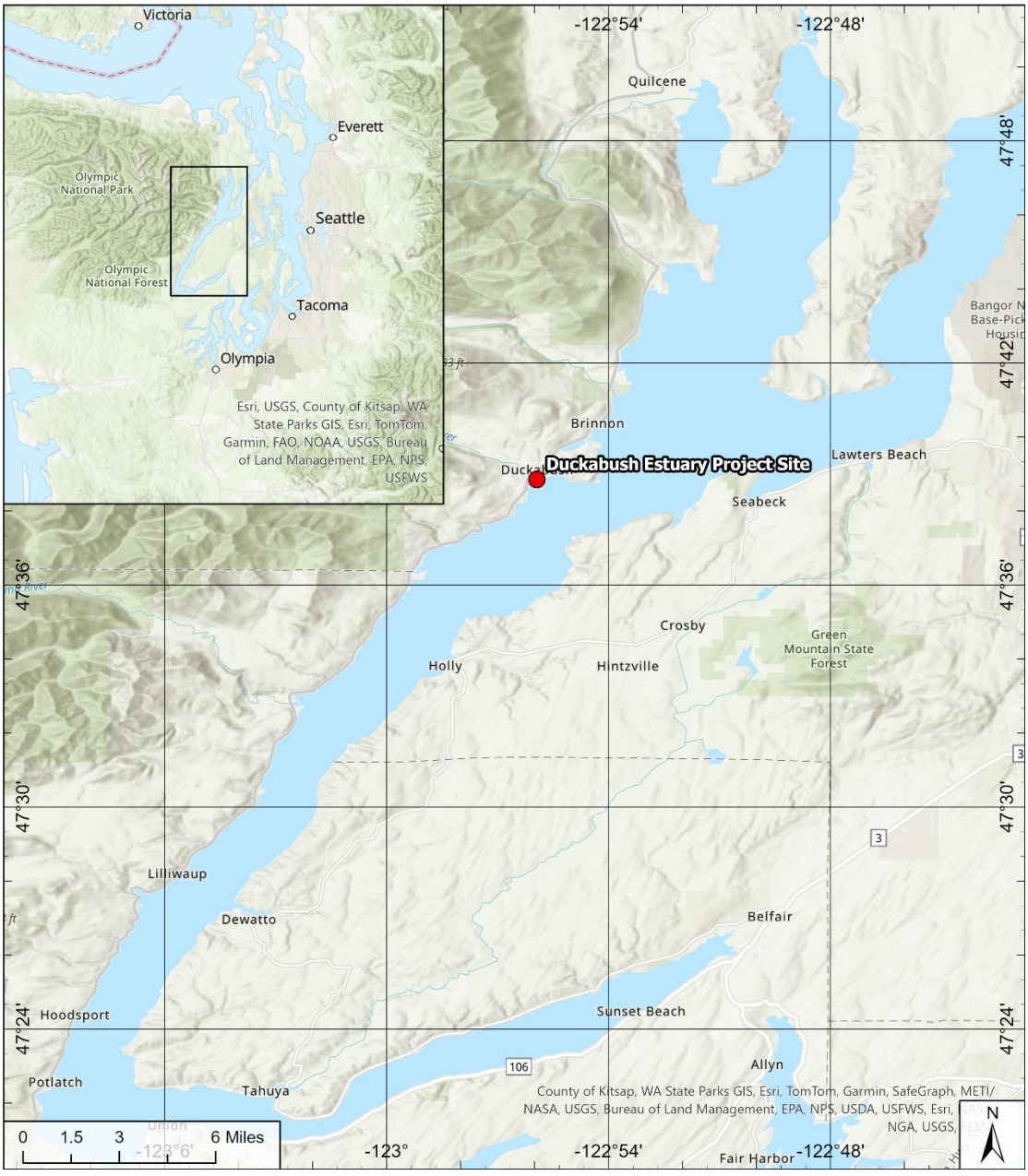

Figure 2. Duckabush Estuary Restoration Project area

The historical northern arm of the river has been blocked. Today, it is an aggraded, partially filled dead-end tidal channel in the middle portion of the site. An early roadway and bridge bisected the Duckabush River Estuary, spanning the two distributary channels. A portion of the roadway, dikes, and abutments remain in place today. Washington replaced most of this infrastructure in 1934 with two separate bridges as part of the construction of Highway 101. This highway cuts across the intertidal river delta and estuary wetland complex, spanning the main channel and a former distributary channel. The Highway 101 bridges disrupt tidal circulation and impede fish access to productive salt marsh and slough habitats. These hydrologic constrictions, along with fill within the estuary, caused decline in mudflats and salt marshes. In addition, training berms at the southern distributary arm of the Duckabush River, just upstream of the Highway 101 crossing, control lateral movement of the channel and prevent river flows into the historical distributary channels. These berms severely restrict lateral connectivity with tidal channels and salt marsh habitat.

As a component of the Puget Sound Nearshore Ecosystem Restoration Program (PSNERP), the U.S. Army Corps of Engineers (USACE), collaborating with WDFW as a local sponsor, proposed process-based ecosystem restoration projects at several locations, including the Duckabush River Estuary.

Highway 101 extends in a generally southwest to northeast direction at the site, supported by an approximately 1,700-foot causeway across the Duckabush Estuary. The causeway consists of an earthen embankment and bridges across the Duckabush River and Duckabush Slough. The Highway 101 embankment is approximately 10 to 15 feet high, with a roadway elevation of approximately 25 feet and side slopes of generally 2 Horizontal to 1 Vertical (2H:1V).

Most components of the project, including the demolition of the Highway 101 bridges and causeway, construction of the new Highway 101 bridge, and excavations of tidal connection channels, will occur within 500 feet of the current Highway 101 footprint between mileposts 309.67 and 310.60.

1.3 Project Goals and Objectives

This project's objectives were developed by PSNERP.

Objective 1: Reconnect and restore lost tidally influenced areas including estuarine and freshwater tidal wetlands in the Duckabush River Estuary.
Objective 2: Re-establish distributary channels in the Duckabush River Estuary to promote greater diversity of delta wetland habitats.
Objective 3: Restore mudflats and salt marsh in the Duckabush River Estuary.

1.4 Project Description and Elements

The Duckabush River Estuary is a process-based ecosystem restoration project that will reconnect floodplain and intertidal wetlands to improve tidal exchange, sediment transport, and estuary development. USACE, WDFW, and the Washington State Department of Transportation (WSDOT) will restore tidal and riverine hydrology to 38 acres of the Duckabush River delta, allowing for natural habitat-forming processes including sediment and detritus exchange, freshwater input, and tidal flushing. Restoration will provide rearing habitat for Hood Canal summer chum salmon by reconnecting 20 river miles of nearly pristine upstream habitat with a now fully functional salt marsh and mudflat estuary.

1.4.1 Temporary Work Platforms

Prior to construction of the new Highway 101 bridge, temporary work platforms will be erected to minimize the impact of construction equipment on the underlying surface (Figure 3). The platforms will remain in place for the duration of construction. When possible, driving, loading, and staging of equipment within the estuary boundary will take place on the platforms. The temporary work platforms will be removed upon the completion of construction in immediately adjacent areas.

Figure 3. Location of temporary work platforms

1.4.2 Highway 101 Bridge Construction

The proposed US 101 crossing of the Duckabush Estuary will consist of an eight-span bridge, 1,613 feet long and 34 feet wide (Figure 4). Span lengths will range from about 175 feet to 228 feet. The bridge will be supported by nine piers and founded on drilled shaft foundations. Structural Earth Walls (SEWs) will retain the bridge approaches on the west side of the highway. Wingwalls approximately 20 feet long will retain the fill on the east side. The existing Highway 101 will remain in service while the new bridge is constructed. WSDOT will use a temporary earthen work embankment and appurtenant trestles to construct the new bridge and its foundations. WSDOT will remove the temporary work embankment and trestles during construction of the new bridge after foundation installation is completed.

WSDOT will construct a small raised temporary parking area south of the main Duckabush River channel and east of Highway 101. This parking area will provide access to the culturally significant shellfish beds in the estuary while ongoing construction restricts the use of the current parking area.

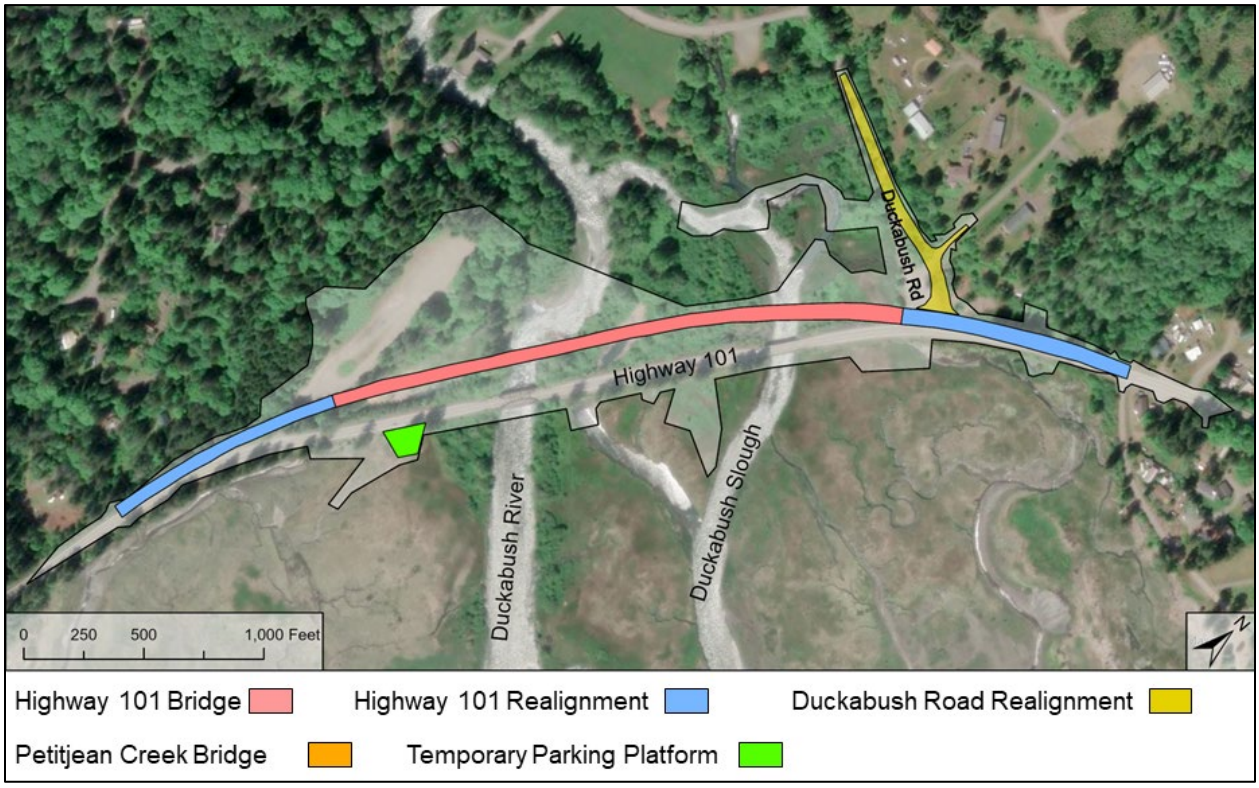

Figure 4. Elements of the Highway 101 realignment

1.4.3 Petitjean Creek Bridge Construction

Construction will replace the 3-foot-diameter culvert conveying Petitjean Creek under Highway 101 into Hood Canal with an 81-foot, single-span bridge (Figure 4). Drilled shaft foundations will support the bridge at its south and north abutments. WSDOT will remove the existing highway embankment at this location and regrade the creek ravine sideways at a 2H:1V slope. SEWs will retain the bridge approaches on the west side of the highway, and approximately 20-foot-long wingwalls will retain the fill on the east side.

1.4.4 Highway 101 and Duckabush Road Realignment

Highway 101 will be relocated from its current footprint such that it properly approaches the new bridge from the north and south. Duckabush Road will also be realigned and slightly widened near its intersection with Highway 101. The intersection will move approximately 85 feet north from its current location.

1.4.5 Highway 101 Causeway and Training Berms Demolition

To restore tidal and riverine hydrology to the Duckabush Estuary, USACE will need to demolish several components of the existing Highway 101 infrastructure (Figure 5). The current Highway 101 causeway and roadbed bisect the estuary and restrict tidal and riverine flow to the two main channels of the river and areas east of the current highway footprint. The goal of these demolition components is to match the finish grade to the upstream and downstream topography and to restore what is thought to be the pre-developed land characteristics.

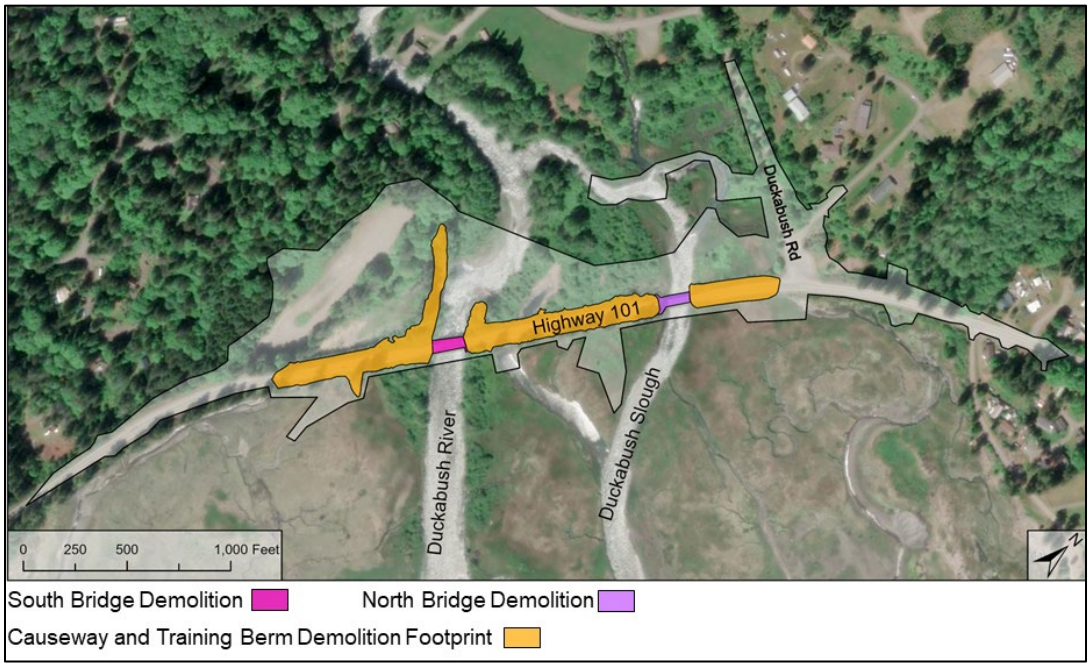

Figure 5. Current Highway 101 causeway, berms, and bridges

1.4.6 Existing Highway 101 Bridges Demolition

USACE will also demolish the two Highway 101 bridges spanning the northern and southern channels of the Duckabush River. The southern bridge was constructed as part of the State Road No. 9 Duckabush River Bridges project in 1933-1934. Its total length of 168 feet consists of three spans. The end spans are approximately 29-foot-long reinforced concrete girder spans. The 110-foot interior span consists of a reinforced concrete through arch. The southern bridge was also constructed as part of the State Road No. 9 Duckabush River Bridges project in 1933-1934. It is a four-span, reinforced concrete girder bridge, with equal span lengths of 30 feet.

1.4.7 Remnant Roadbed and Wood Pile Removal

USACE will remove an existing remnant roadbed south of Duckabush Road to the surrounding elevation, approximate elevation 10 feet NAVD88 (Figure 6). This area is overgrown with brush and vegetation, presently at approximate elevation 14 feet and restricts tidal and river flow in the area.

USACE will also remove 31 old timber piles due to their proximity to the roadbed. The piles will be handled under the assumption that they contain creosote. USACE will attempt to pull the piles. If pulling fails or fracturing occurs, the piles may be cut. The piles shall be removed 3 feet below the existing surface. The depth of the timber piles is unknown.

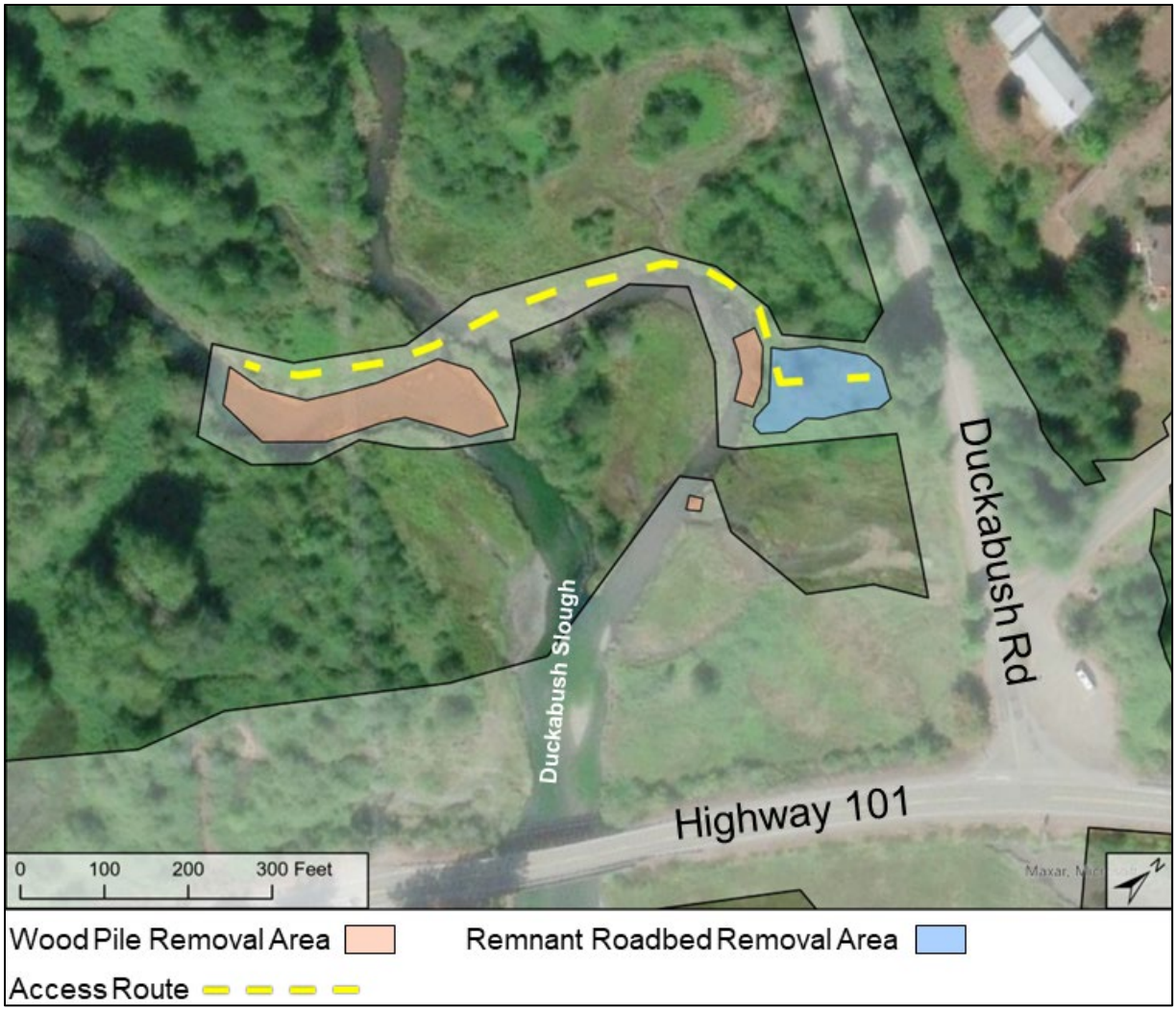

Figure 6. Remnant roadbed and woodpiles

1.4.8 Excavated Channels

The Duckabush Estuary Restoration Project will reconnect river delta distributary channels that were disconnected by the Highway 101 bridge causeway. Distributary channel design utilizes existing and historical dimensions of undisturbed channel segments upstream and downstream of the Highway 101 bridge for reference conditions. USACE proposes two short channels under the causeway along the location of abandoned channels to reinitiate channel-forming processes.

Distributary channels are intended to remain permanently connected through tide cycles and will convey both fluvial discharge and tidal flux. USACE designated the distributary channels 1-4, ordered north to south (Figure 7). Channel side slopes will be vertical or at the angle of repose. Channel thalweg slopes will be relatively flat. Suitable excavated channel material will be used for the top 24 inches of planting substrate over the Highway 101 degrade elevation.

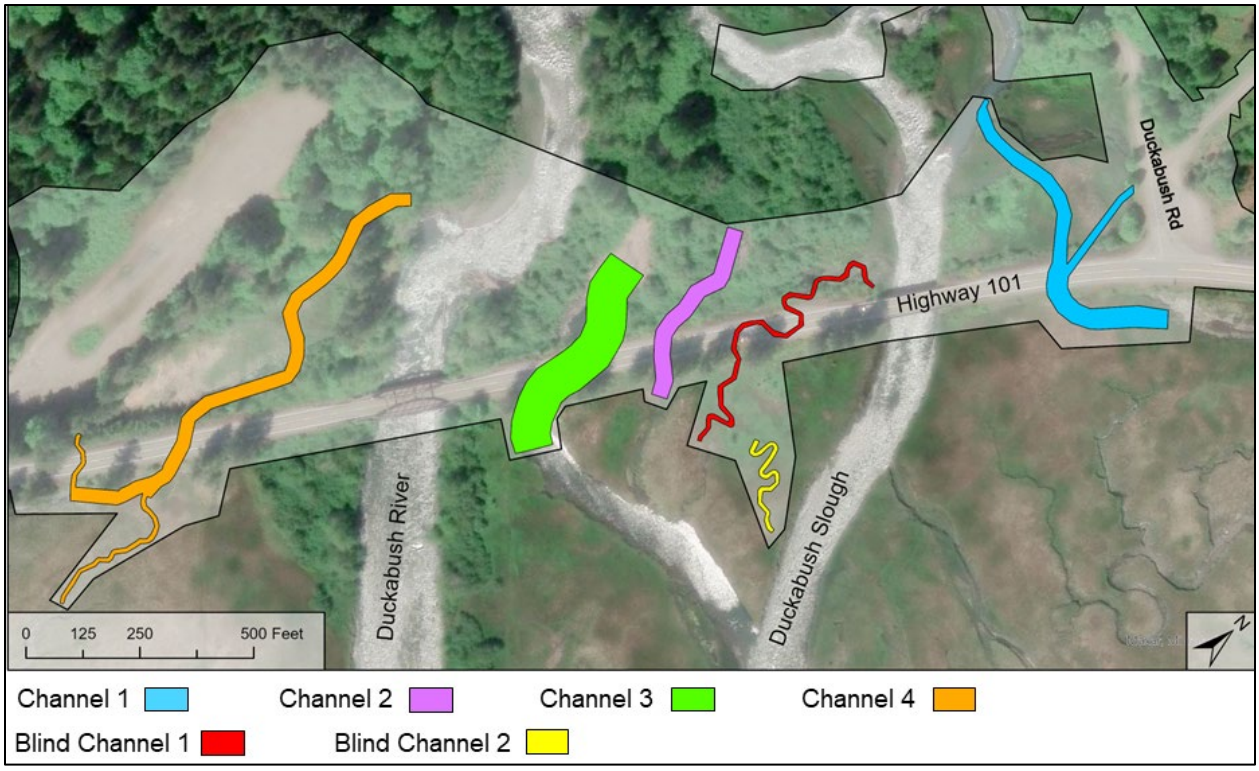

Figure 7. Excavated channels design

1.4.9 Parking Lots

USACE will raise the existing WDFW parking area approximately 3 feet to an elevation of 19 feet using excavated materials from the Highway 101 excavation and finish with a gravel surface (Figure 8). The parking lot will include a drainage bioswale to route stormwater away from the area. The bioswale will capture the majority of the hillside runoff and disperse the runoff prior to flowing to the estuary. The intent is to keep natural runoff separate from hardened surface runoff as much as practicable.

WSDOT will provide a new Duckabush northbound intersection, immediately north of the existing Duckabush intersection, with a turning lane from Highway 101. The intersection is designed as an earthen structure with retaining walls. WSDOT will also provide a small gravel parking area adjacent to the intersection.

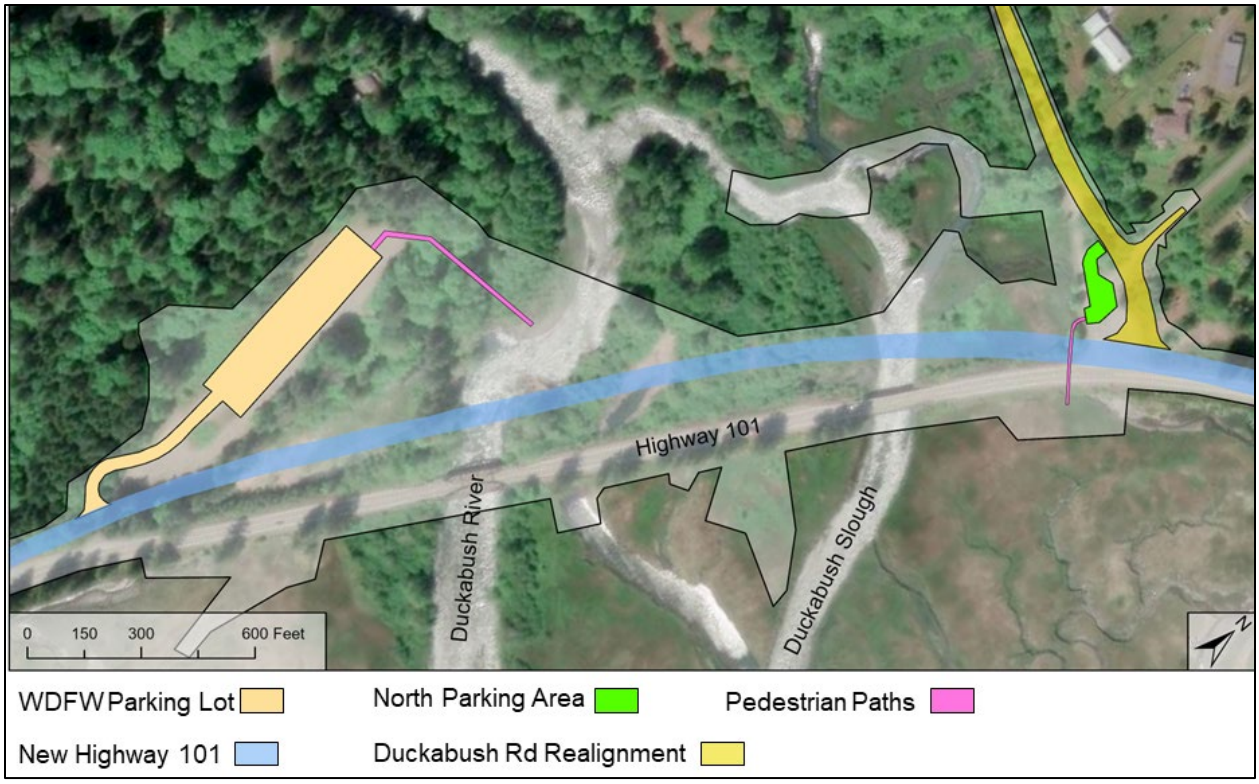

Figure 8. Parking areas and pedestrian paths

1.4.10 Pedestrian Paths

A 4-foot-wide gravel wildlife trail will lead from the north parking area under the new highway bridge terminating close to channel 1 in the estuary (Figure 8). The trail elevation under the bridge is 13 feet and includes erosion protection and wildlife habitat features. An additional path will lead from the north of the new WDFW parking lot to the Duckabush River.

1.4.11 Engineered Logjams and Anchored Large Woody Material

Where indicated, USACE will install large wood structures placed along restored banks to provide near-term bank stability as the river re-establishes flow connections to restored channels and vegetation becomes re-established on banks (Figure 9). These structures are intended to provide erosion protection, bank roughening, and energy dissipation functions, alleviating the need for rock riprap near the bridge ends.

Figure 9. Installation locations of engineered logjams and anchored large woody material

Anchored large wood features would consist of either one or two partially buried logs backfilled along banks (Figure 10). Engineered logjams would consist of a more complex structure and footprint, including several logs anchored to embedded vertical piles (Figure 11).

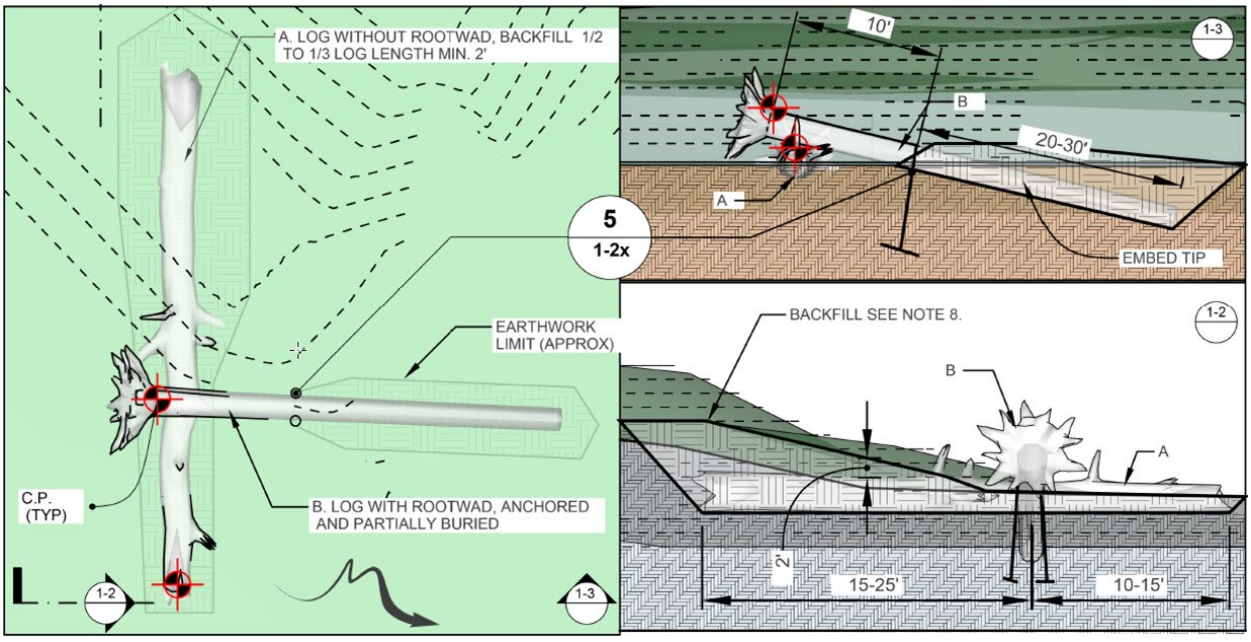

Figure 10. Anchored large woody material design

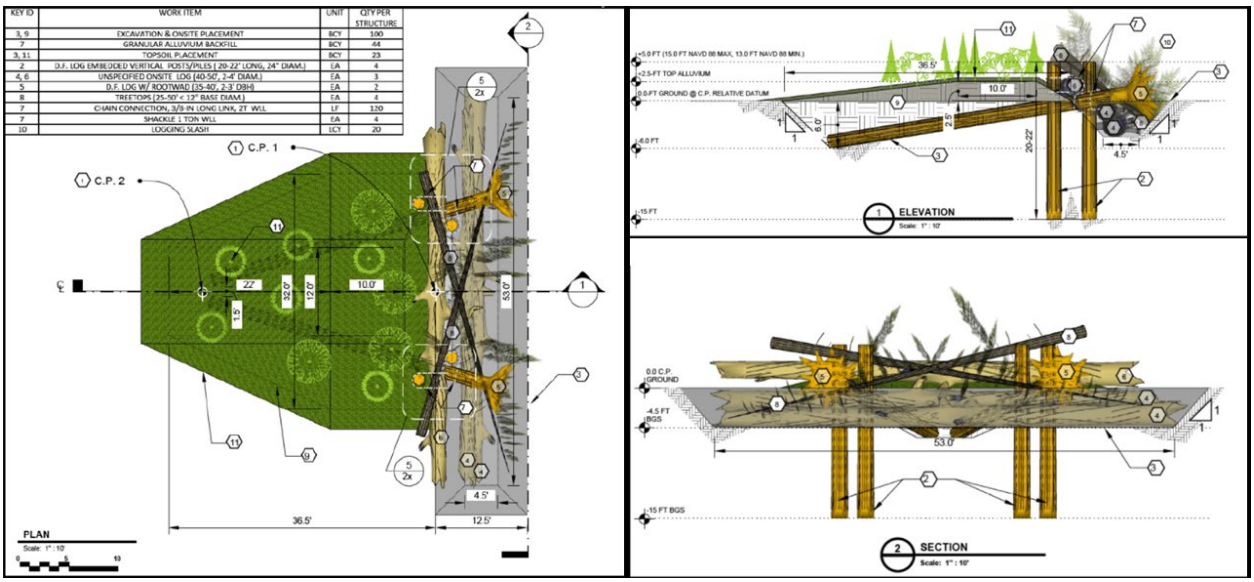

Figure 11. Engineered logjam design

1.4.12 Planting

Following construction, USACE will replant all disturbed areas with native vegetation. Native seed mixes and native plugs will be altered depending on where planting occurs. Mixes will ensure compatibility in estuarine emergent wetland, palustrine scrub shrub, riparian shrub, or upland forest habitats.

1.5 Construction Methodology

The methodology in this section represents the most likely techniques and equipment to be used. However, the actual methodology used on the project may vary depending on how the final contractor decides to implement certain design elements. USACE takes a conservative approach to describe the construction methodology below, which reflects likely construction approaches that would have the greatest impact on marine mammals.

1.5.1 Construction Timing and Duration

Construction of the Duckabush Estuary Ecosystem Restoration Project may start as early as November 2025, pending the receipt of a Letter of Authorization (LOA) from National Oceanic and Atmospheric Administration (NOAA) Fisheries and awarding of contract. USACE anticipates construction will take up to 764 workdays across 48 months to complete. Time estimates assume that construction would take place 8 hours per day, 5 days per week for the majority of the project and 12 hours per day, 7 days per week for some components of the work.

At the project location, the freshwater in-water work window is July 16 - August 15 and the marine in-water work window is July 16 - January 15. When possible, all work

occurring within tidally influenced areas will occur during low tide to minimize effects on water quality and marine mammals.

In the Puget Sound region, wet weather begins about mid-October and continues until about May, although rainy periods could occur at any time of the year. Thus, it would be advisable to schedule earthwork during the drier months of June through September. Soil with fines content higher than 5-8% is highly susceptible to changes in water content and tends to become unstable and difficult or impossible to compact if the moisture content significantly exceeds the optimum. During wet weather months, the groundwater levels could increase, resulting in seepage into site excavations. Performing earthwork during dry weather would reduce these problems and costs associated with rainwater, trafficability, and handling of wet soil. Placing and compacting fill may not be practicable during wet weather.

1.5.2 Equipment List

Table 1. Construction equipment noise level at 50 feet

Equipment Type	**Actual Measured L_{max} (dBA) at 50 feet**
Auger	84[a]
Chain Saw	84[a]
Compactor	83[a]
Concrete Mixer Truck	79[a]
Concrete Pump Truck	81[a]
Concrete Saw	90[a]
Crane	81[a]
Dozer	82[a]
Drill Rig Truck	79[a]
Dump Truck	76[a]
Excavator	81[a]
Front End Loader	79[a]
Grader	79[b]
Impact Pile Driver	101[a]
Paver	77[a]

Equipment Type	Actual Measured L_{max} (dBA) at 50 feet
Roller	80[a]
Vibratory Pile Driver	101[a]
Water Pump	81[a]

Sources: [a] – FHWA (2017), [b] – WSDOT (2020)

1.5.3 Construction Approach

Construction sequencing will broadly occur as follows. Construction crews will first erect temporary work platforms so that all subsequent work will be isolated from the estuary surface. Construction of the new Highway 101 bridge will then begin, generally progressing south to north. The construction of the Petitjean Creek bridge and realignments of Duckabush Road and Highway 101 bridge approaches will also occur during this timeframe. Work within the current Highway 101 footprint would only occur after the new bridge is open to traffic.

Channel excavations, causeway and berm demolitions, bridge demolitions, large wood features installation, and removal of temporary work platforms would occur simultaneously and follow a north to south sequence. Following completion of these elements, the southern WDFW parking lot and pedestrian paths would be constructed.

Because they do not fall within the current Highway 101 footprint, removal of the remnant roadbed and woodpiles south of Duckabush Road could occur simultaneously with the new Highway 101 bridge construction.

1.5.3.1 Temporary Work Platforms

Work crews would first clear temporary work platform areas of vegetation (not grubbed) and place a geotextile fabric layer to delineate the ground surface prior to construction. Crews would then place rock spalls and crushed surfacing base course (CSBC) over the geotextile fabric and utilize as the work platform throughout construction.

1.5.3.2 Highway 101 Bridge Construction

The construction of the Highway 101 bridge may take up to 600 workdays to complete over the course of 27 months. Because the bridge will be built out of alignment with the current Highway 101, substructures and superstructures will be built simultaneously. Construction will progress from south to north. Construction of each section would begin with installing piers and their related superstructure components. WSDOT estimates this in-water work portion of construction will take 150 days to complete across the duration

of the project. Installing piers into the ground would utilize an oscillator, vibratory hammer, auger, cranes, concrete mixing and pump trucks, and a drill rig.

Placement of piers will follow standard protocols. If during, during pier construction, an isolation casing is used it will be installed using either a vibratory hammer or an oscillator. The pier casing will be installed using an oscillator and water slurry to advance the casing to its contract-specified depth. Typical BMPs such as plastic at the top of casing during excavation will be used. After the casing is at depth, the contractor will place the rebar and then pour the shaft with concrete. Water will be pumped out of the shaft as the concrete is poured. The water will be stored in a Baker tank for off-site processing. If a temporary casing is used during the installation, it will be removed at the same time as the concrete is poured. After piers are set and cured, crews would construct columns, girders, surface slabs, and the roadway surface utilizing cranes, concrete mixing and pump trucks, pavers, and rollers.

1.5.3.3 Petitjean Creek Bridge Construction

Because the Petitjean Creek bridge falls within the current Highway 101 footprint, crews must take measures during construction to minimize the impacts on traffic. To accommodate through traffic during construction, crews would temporarily widen the road by about 5 feet. Bridge construction would occur in two phases. The first phase would consist of building the substructure and installing piers. In the second phase, crews would build the superstructure, including the girders, traffic barriers, and road surface.

Pier installations for the Petitjean Creek bridge would follow the same protocol described in Section 1.5.3.2.

1.5.3.4 Highway 101 and Duckabush Road Realignment

The realignment of Highway 101 bridge approaches and Duckabush Road will require subgrade improvement, likely involving the installation of aggregate piers. Construction of these piers may require an auger to dig a pilot hole, filling the pier location with crushed stone, and compacting this fill with a vibratory hammer. After aggregate pier installations, standard road grading and surfacing would occur using front-end loaders, graders, pavers, and vibratory rollers.

1.5.3.5 Highway 101 Causeway and Training Berms Demolition

USACE will clear trees within the demolition footprint and stockpile them for use in engineered logjams and anchored woody material features (Section 1.5.3.11). A dozer or excavator would then demolish the causeway and berms and load excavated material on to dump trucks for off-site removal at an approved site.

The finished causeway demolition cross section would excavate 24 inches below the finished grade and replace this material with excavated channel material. Designs allow a maximum depth of 36 inches below finished grade to remove any logs, cobbles, boulders, sack riprap or man-made material encountered which would artificially prevent free erosion of the restored surface. USACE will lower the causeway to the 8- to 9-foot elevation range, which is within the normal high tide line and Mean Higher High Water (MHHW). The training berms upstream of the south bridge will be removed to an elevation of 10 feet. This will allow the Duckabush River to flow into that area.

1.5.3.6 Existing Highway 101 Bridges Demolition

The demolition of existing Highway 101 bridges will occur after the new bridge is fully operational as not to disrupt through traffic. Following construction sequencing, the north bridge would be demolished before the south bridge. For each bridge, the bridge decks would be removed first, followed by piles and foundations. Work would access from both sides of the bridges, using cranes, excavators, and concrete cutting tools. Materials would be removed from the site using dump trucks.

During south bridge demolition, crews may place a temporary Bailey bridge over the Duckabush River to allow full access to the bridge and egress of construction equipment to the south.

Vibratory hammers may be used to remove embedded piers during north bridge demolition. Some of these piers are located within the wetted river channel up to 10-feet below the high tide line.

1.5.3.7 Remnant Roadbed and Woodpile Removal

Woodpile removal projects typically use a metal chain wrapped around pile to pull it up and out with a crane or excavator. If piles cannot be removed in this manner, it is acceptable to leave piles intact 2-3 feet below the streambed. If this is the case, divers with pneumatic chainsaws would cut the pile tops off at the appropriate level. Piles would then be removed using dump trucks. The piles will be accessed via the route marked in Figure 6. Construction crews would use swamp mats and low-pressure equipment to minimize disturbance.

Crews will clear vegetation from the remnant roadbed south of the current Duckabush Road. They will then break up the remnant roadbed with a hydraulic hammer, excavator, and concrete pulverizer, and then grade it to an elevation of 10 feet NAVD88. All demolished material would be removed from the site by dump trucks.

1.5.3.8 Excavated Channels

USACE will excavate channels from temporary work platforms when possible. Construction will utilize swamp mats and low-pressure equipment when working from

the platforms is not feasible. USACE will save excavated material when possible and store it at the WDFW parking lot for use in backfill for other project elements.

Channel 1 can be described as flat at elevation 5.3 feet, terminating at an existing channel. Channel 1 begins at Pierce Slough and is 20 feet wide and widens to 30 feet farther downstream. The depth of the channel is about 4 feet below the adjacent ground surface.

Channel 2 is located on the large island between the north and south Duckabush River distributary channels. Channel 2 follows the path of a relict distributary cut off by the highway embankment. The new restored channel is 25 feet wide can be described as flat, with the upstream start at elevation 6.6 feet and terminating at an existing channel around elevation 6.0 feet. The bottom of the channel at is about 2 feet below the adjacent ground surface. As the bottom is a couple feet higher than the mean tide elevation this channel will be the least frequently wetted but will be backwatered daily by high tides. During high river flows, it is possible that floodplain erosion could rework the upstream end of this channel and connect it with the Duckabush River north distributary.

Channel 3 is also located on the large island between the north and south Duckabush River distributary channels. Channel 3 follows the path of a relict distributary cut off by the highway embankment. Channel 3 is large and was likely a flowing river channel around the time the Highway 101 bridge was constructed. The proposed channel is 60 feet wide can be described as sloping at 1.7 percent starting at elevation 8 feet and terminating at elevation 4 feet at an existing channel. The bottom of the channel is about 4 feet below the restored bank elevation. Channel 3 meanders away from the new Highway 101 bridge pier to steer the river away from the new pier in the event river avulses into this channel.

Channel 4, 20 feet wide begins at the berm elevation 7.2 feet lowering to elevation 6 feet where it would terminate at an existing channel. The southwestern arm of Channel 4, 6 feet wide, replaces the existing culvert and provides drainage out of the area to an existing channel that flows to the south. The channel depth ranges from near zero to mostly 3 feet below the adjacent ground surfaces.

Blind Channels 1 and 2 are 3 feet wide at constant elevation 5.5 feet. These channels follow existing swales and meander between topographic low spots.

1.5.3.9 Parking Lots

Construction plans call for the removal of any existing pavement in the north or south parking areas using hydraulic hammers, front-end loaders, and excavators. Crews would use dozers, graders, pavers, compactors, and vibratory rollers to install a paved surface at the north parking site and a gravel surface at the WDFW parking lot.

USACE will raise the existing WDFW parking area approximately 3 feet to elevation 19 feet NAVD88 using excavated materials from the Highway 101 causeway excavation and finished with a gravel surface. The plan calls for revegetation of areas beyond the gravel parking with trees and shrubs. Designs include a drainage bioswale to route stormwater away from the area. The bioswale will capture most of the hillside runoff and disperse the runoff prior to flowing to the estuary. The intent is to keep natural runoff separate from runoff from the hardened surfaces.

The new Highway 101 bridge embankment is higher than the existing ground surface. As the Highway 101 embankment and bridge are constructed, the driveway entrance would be constructed to final grade and paved at project completion. Crews would maintain a construction entrance during the Highway 101 causeway degrade. The area will also be used to stockpile trees for future use. The area will be raised to elevation 19 feet NAVD88 with excavated Highway 101 causeway material. Crews will finish the area with gravel parking and plantings.

This area utilizes compost-amended vegetated filter strips (CAVFS) for storm water quality and utilizes the WSDOT flow control exemption. There are two options for placing the CAVFS. A 22-foot-wide roadway requires 6-foot-wide by 13-inch thick CAVFS with 2-foot-wide by 2-foot-thick gravel spreader. A 33-foot-wide parking area requires 11-foot-wide by 12-inch thick CAVFS with 2-foot-wide by 1-foot-thick gravel spreader. Both CAVFS are 12 inches per hour permeability.

WSDOT will provide a new Duckabush northbound intersection (immediately north of the existing Duckabush intersection) with a turning lane from Highway 101. The intersection is designed as an earthen structure with retaining walls. WSDOT will also provide a small parking area adjacent to the intersection (North Parking Area, Figure 8). The stormwater treatment is a bioswale, with no flow control. WSDOT was granted a stormwater flow control exemption “US 101 Duckabush River Estuary Restoration Project DAT Approval” (November 17, 2020). The Demonstrative Approach Team (DAT) includes the Washington State Department of Ecology.

The local Public Utility District (PUD) would need an underground vault installed along the new Duckabush Road approximately 20 feet from the proposed access point. Installation of the PUD vault would occur in two phases. The initial phase would occur prior to the Duckabush Road realignment. The second phase would require the top to be raised as the new Duckabush Road and parking access raised the area approximately 10 feet NAVD88.

1.5.3.10 Pedestrian Paths

Construction crews will clear path footprints using brush chippers, chainsaws, and excavators and material removed using dump trucks. Work crews would compact the

existing ground surface and then use dump trucks, front-end loaders, and compactors to distribute gravel over the surface.

1.5.3.11 Engineered Logjams and Anchored Large Woody Material

USACE would install engineered logjams and anchored large woody material according to the provided designs (Figure 10 and Figure 11). Locations of both engineered logjams and anchored large woody material would first be cleared, grubbed, and leveled.

For engineered logjams, construction teams would augur four pilot holes for vertical anchor piles. They would then place piles using a crane and possibly embedded to the final depth using an impact hammer. Trenches and a scour pool will be excavated around the posts. Logs will first be placed in the scour pool and then two logs with rootwads will be placed in trenches and secured to piles using chain bracings. Treetops will then be placed between the posts, logs, and rootwads. Logging slash will then be placed in gaps within the structure and a 6-inch layer of conserved topsoil from causeway and channel excavations will be placed atop the compacted ballast structure.

For anchored large woody material, construction crews would dig trenches as necessary using excavators. Earth anchors would be installed to a minimum depth of 5 feet. Logs would then be hoisted using a crane, placed in trenches, and attached to earth anchors using appropriate chains or cables. Excavated areas would be backfilled with conserved topsoil from causeway and channel excavations and then compacted.

1.5.3.12 Planting

USACE will spread native seed mixes across disturbed areas, except for excavated channels and planting areas described in Section 1.4.12, using a hydroseeder. Planting of larger plugs and shrubs will be done by hand, using only hand tools.

1.5.4 Pile Driving Noise

USACE did not conduct numeric underwater noise analysis for pile driving activity. Pile driving within a wetted channel is only planned at one location among the river channels, Hood Canal, and other permanently inundated areas (Figure 12). A vibratory driver would be used to remove bridge piers within the wetted river channel during the demolition of the existing north Highway 101 bridge. In consultation with the National Marine Fisheries Service (NMFS), USACE concluded that the meandering path of the river at this location would adequately prevent direct propagation of underwater noise to the nearest haul-out site. All other vibratory and impact pile driving (Figure 12) would occur on solid ground and will either occur during low tide or will be isolated from water using the existing Highway 101 causeway, cofferdams, or aquadams, thereby dampening propagation of sound through the substrate. Therefore, all disturbance caused by pile driving is only expected to be through in-air noise.

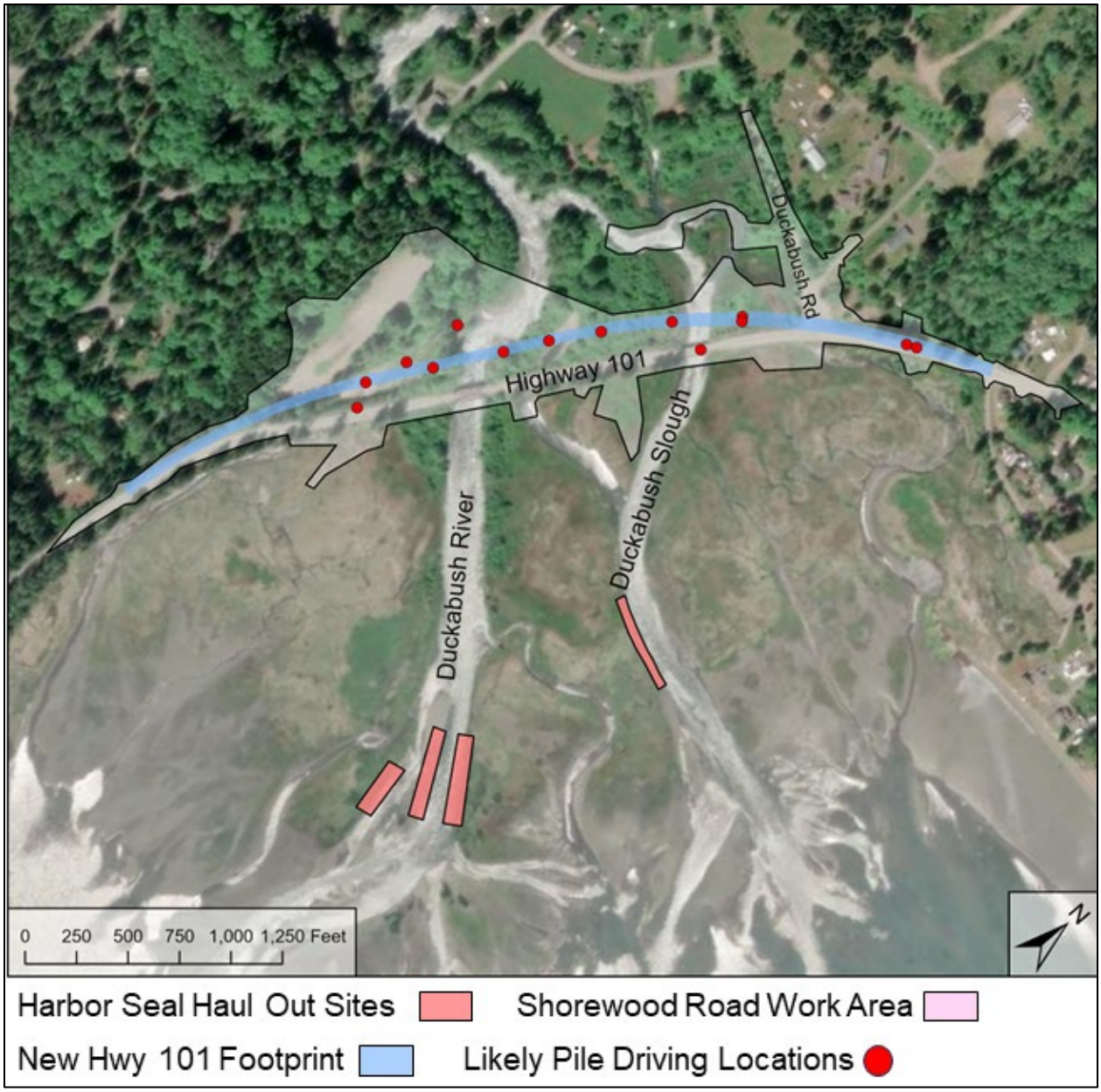

Figure 12. Likely pile driving locations relative to harbor seal haul-out sites

Table 2. In-air level B harassment acoustic thresholds

Species	Threshold
Harbor seal	$L_{p,RMS,flat}$: 90 dB re 20 µPa

Source: NMFS (2022)

The actual measured L_{max} (dBA) at 50 feet for vibratory and impact pile drivers is 101 dB (FHWA 2017). Noise attenuates as the distance from the source of the noise increases. A general equation shows noise propagation loss as 7.5 dB for each doubling distance in areas where landscape features and vegetation exist (WSDOT 2020). Additionally, the following equation can be used to determine construction noise levels at a specific distance from the source (WSDOT 2020):

$$L_{max} = \text{Construction } L_{max} \text{ at 50 feet} - 25 * \text{Log}(D/D_o)$$

Where L_{max} = highest A-weighted sound level occurring during a noise event during the time that noise is being measured.

At 50 feet = the reference measurement distance (standard is 50 feet)

D = the distance from the noise source

D_o = the reference measurement distance (50 feet in this case)

Using this equation, a 101 dB vibratory or impact pile driver will attenuate to 90 dB, the in-air level B harassment acoustic threshold of harbor seals, after 137.71 feet. The nearest vibratory pile driving site in the project area is about 870 feet from known harbor seal haul-out sites at the Duckabush River estuary. At this distance, a 101 dB vibratory or impact pile driver will attenuate to 69.99 dB which is below the in-air level B harassment acoustic threshold of harbor seals.

1.6 Activities that May Result in Take

Project activities that have the potential to result in take of harbor seals include construction activities within 300 meters of harbor seal haul-out sites (CDFW 2021). The following elements, laid out in Section 1.4, directly fall within 300 meters of the nearest harbor seal haul out: construction of temporary work platforms, Highway 101 bridge, pedestrian paths, excavated channels, and anchored large woody material, demolition of the Highway 101 causeway and existing bridges, and restoration planting. Additionally, elements that fall outside of that range are likely to have equipment pass within that range when accounting for access routes and storage sites for excavated soil and trees. Specifically, construction equipment may generate noise or create a visual disturbance as they move to and within the restoration area. Similarly, marine mammal monitors may create a visual disturbance as they conduct monitoring activities.

2 Date, Duration, and Specified Geographic Region

2.1 Dates and Duration

Construction of the Duckabush Estuary Ecosystem Restoration Project would start as early as November 2025, pending the receipt of an LOA from NOAA Fisheries. USACE anticipates construction will take up to 764 workdays across 48 months to complete. Time estimates assume that construction will operate 8 hours per day, 5 days per week for most of the project and 12 hours per day, 7 days per week for some components of the work. Given the proximity of the Duckabush River estuary restoration work area to harbor seal haul out sites, USACE assumes that take of harbor seals could occur any time heavy equipment operates at the site.

2.2 Geographic Setting and Land Use

The Duckabush River is one of several major river systems in the Hood Canal Subbasin draining the east slope of the Olympic Mountains to Hood Canal. The broad river delta fans out into Hood Canal on the south side of Black Point Peninsula. The historical processes and functions of the Duckabush Estuary site differ from current conditions. By the early 1900s, road and bridge construction bisected the estuary. Washington replaced these early roadways in 1934 with the Highway 101 roadway and two bridges. However, portions of the original roadway, dikes, and abutments remain.

Prior to road construction, the Duckabush River emptied into the Hood Canal estuary through two primary distributary channels. Training berms on the main south channel, just upstream of the Highway 101 crossing, control the lateral movement of the channel. The historical north channel of the river is cut off from the Duckabush River. As a result, it has filled with sediment. However, the channel is maintained by flow from Pierce Slough, which crosses under the Highway 101 bridge upstream. Although both channels are tidally influenced, the two bridges of Highway 101 constrict their hydrology (USACE and WDFW 2016).

The shoreline south of the river delta is primarily underlain by basaltic rock with a few pocket beaches, resulting in no appreciable sediment transport in this area. The shoreline north of the river (the south side of Black Point Peninsula) is composed mostly of bluff-backed beaches. The sediment from these bluffs, combined with sediments from the river outflow, are moved by wind and waves generally eastward along Black Point to create the cuspate spit at Quatsop Point.

The Duckabush Estuary project area is located at 47°39’1”N, 122°56’2”W. A map of the project area can be found in Figures 1 and 2. Maps with details for each project element and effort can be found in Figures 3-9 and Figure 12. Figure 14 shows the location of the nearby harbor seal haul out sites with the 300-metter buffer zone.

2.3 Ambient Noise Conditions

WDFW measured noise levels to characterize the existing environmental noise conditions (Table 3) and to assess the potential noise-related impacts from construction and operations (WDFW 2020). WDFW measured existing noise levels at the location of the proposed North Parking Area (Figure 8) on September 20, 2019, between 10:30 a.m. and 1:30 p.m. These time periods generally reflect existing daily noise conditions excluding weekends. During the weekday, the area is generally quiet and influenced by activities at the surrounding residential land uses and Highway 101. Peak traffic occurs on Sundays during the summer season.

Table 3. Ambient noise measurements

Monitoring Locations and Times	Noise Level (dBA)			
	L_{eq}	L_{Max}[a]	L_{10}[b]	L_{90}[b]
11:16–11:31 am	55.0	70.2	58.2	35.3
12:36–12:51 pm	52.9	70.6	55.6	35.9

[a] L_{max} is the instantaneous maximum noise level during a given period of time; Lmax events commonly occur momentarily, such as a loud passing motorcycle or child yelling nearby the noise meter.

[b] L_{10} and L_{90} are standard measures that represent the noise levels that are equaled or exceeded 10% and 90% of a specified time period, respectively.

3 Species and Numbers of Marine Mammals

3.1 Summary of Species Present

Table 4. Summary of marine mammal species present in Hood Canal

Species	Frequency Hearing Group	ESA Status	MMPA Status	Frequency of Occurrence
Harbor Seal (*Phoca vitulina richardsi*)	Phocid	Not Listed	Not Depleted	Common
Harbor Porpoise (*Phocoena phocoena*)	High-Frequency	Not Listed	Not Depleted	Occasional
Dall's Porpoise (*Phocoenoides dalli dalli*)	High-Frequency	Not Listed	Not Depleted	Rare
California Sea Lions (*Zalophus californianus*)	Otariid	Not Listed	Not Depleted	Rare
Steller Sea Lion (*Eumetopias jubatus*)	Otariid	Not Listed	Not Depleted	Rare
Transient Killer Whale (*Orcinus orca*)	Mid-Frequency	Not Listed	Not Depleted	Rare

3.2 Species Typically found within the Area

Harbor seals are the only resident marine mammal species in Hood Canal and that utilize the Duckabush River estuary as one of the primary haul-out sites in the Canal (London *et al*. 2012, Jeffries *et al*. 2000). NMFS considers harbor seals inhabiting Hood Canal as a separate stock with an estimated size of 3,363 (Carretta *et al*. 2023).

Harbor seals typically haul out along the river channels and sloughs at the Duckabush River estuary. Harbor seal counts peak at the Duckabush River during the primary pupping season (late July-September) and molting season (September-November) with seals spending more time in the water during colder winter and spring months (Jeffries *et al*. 2003, Jeffries *et al*. 2000). WDFW conducts regular aerial surveys of hauled-out harbor seals in Hood Canal, typically restricting monitoring to the peak of the pupping

period and the window two hours before and after high tides to maximize the number of individuals observed on land (Clark pers. Comm. 2023). From 2021-2023, the average number of seals hauled out at the Duckabush River estuary when surveys were conducted was 86, with a maximum daily count of 130 seals. Another aerial survey with greater seasonal variation in count dates found similar peak haul-out numbers during the pupping season but with fewer than 10 seals hauled out during observations in March and February (Mitchell pers. comm. 2023, Jefferson *et al*. 2017).

3.3 Species with Low Likelihood of Occurrence

Although harbor seals are the only marine mammal that is resident and utilizes haul-out sites in Hood Canal, other marine mammals are known to utilize the waters to follow and catch prey (Table 4). Harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli dalli*), California sea lions (*Zalophus califiornianus*), Steller sea lions (*Eumetopias jubatus*), and killer whales (*Orcinus orca*) have been observed in Hood Canal (London *et al*. 2012, Smultea *et al*. 2017, Carretta *et al*. 2022). Across six aerial surveys spanning 2013-2016, only 32 California sea lions, one Stellar sea lion, and one Dall's porpoise were observed in the waters of Hood Canal (Smultea *et al*. 2017). These surveys also documented 113 harbor porpoises in Hood Canal, but these were only about 10% as abundant as harbor seals. Transient killer whales infrequently utilize Hood Canal to prey on harbor seals but no Southern Resident killer whales have been spotted in Hood Canal since 1999 (London *et al*. 2012, NOAA 2024). While these marine mammals may be present in the deeper marine water of Hood Canal, they do not utilize the estuaries and river deltas where this project will take place and, therefore, are not expected to be affected by the proposed activities.

4 Affected Species Status and Distribution

4.1 Harbor Seal

Harbor seals are one of the most widely distributed pinnipeds throughout the world. They typically inhabit nearshore waters, ranging from artic to temperate coasts in both the Atlantic and Pacific in the northern hemisphere (Carretta *et al*. 2022). They are not considered migratory as they typically breed and feed within a small range depending on tides, weather, food availability, and reproduction (Jeffries *et al*. 2000, Carretta *et al*. 2022). Harbor seals will haul out on beaches, rocks, and other substrates to rest, pup, and molt (Hanan 1996). They will also typically feed in marine, estuarine, and sometimes fresh waters (Caretta *et al*. 2022). Seasonal variation in haul out frequency is observed, with highest haul out abundance occurring during pupping and molting seasons (London *et al*. 2012, Jeffries *et al*. 2000). The timing of pupping season is highly variable in harbor seal populations resident to Washington State, ranging from April-June in Willapa Bay to late July-early November in Hood Canal (Jeffries *et al*. 2000, London *et al*. 2012).

Historical harbor seal abundance in Washington is unknown. The state government ran a bounty program on harbor seals from 1943-1960, with an estimated 17,133 seals killed within that period (Newby 1973). This likely resulted in a population decrease from pre-bounty program levels. With the termination of the bounty program and the passage of the Marine Mammal Protection Act (MMPA) in 1972, the abundance of harbor seals in Washington has increased (Jeffries 1985). The Washington Inland Waters stocks of harbor seals encompass three smaller but distinct stocks, the Hood Canal, the Southern Puget Sound, and the Washington Northern Inland Waters stocks. The overall population of these stocks increased 6% annually from 1983-1996, peaking at 9,945 in 1996 at which point it was believed to have reached carrying capacity and become stable (Jeffries *et al*. 1997, Jeffries *et al*. 2003).

Hood Canal stock harbor seals exhibit different haul out behaviors and timing of pupping and molting seasons compared to coastal and other Washington Inland Waters stocks. Harbor seals typically haul out during low tide when more beach or substrate area is exposed (Carretta *et al*. 2022). Harbor seals in Hood Canal typically haul out at high tide along river channels and sloughs because those areas are not as accessible during low tides (London *et al*. 2012). Hood Canal has five main harbor seal haul-out sites (Figure 13) including the Duckabush River estuary (Jeffries *et al*. 2000, London *et al*. 2012).

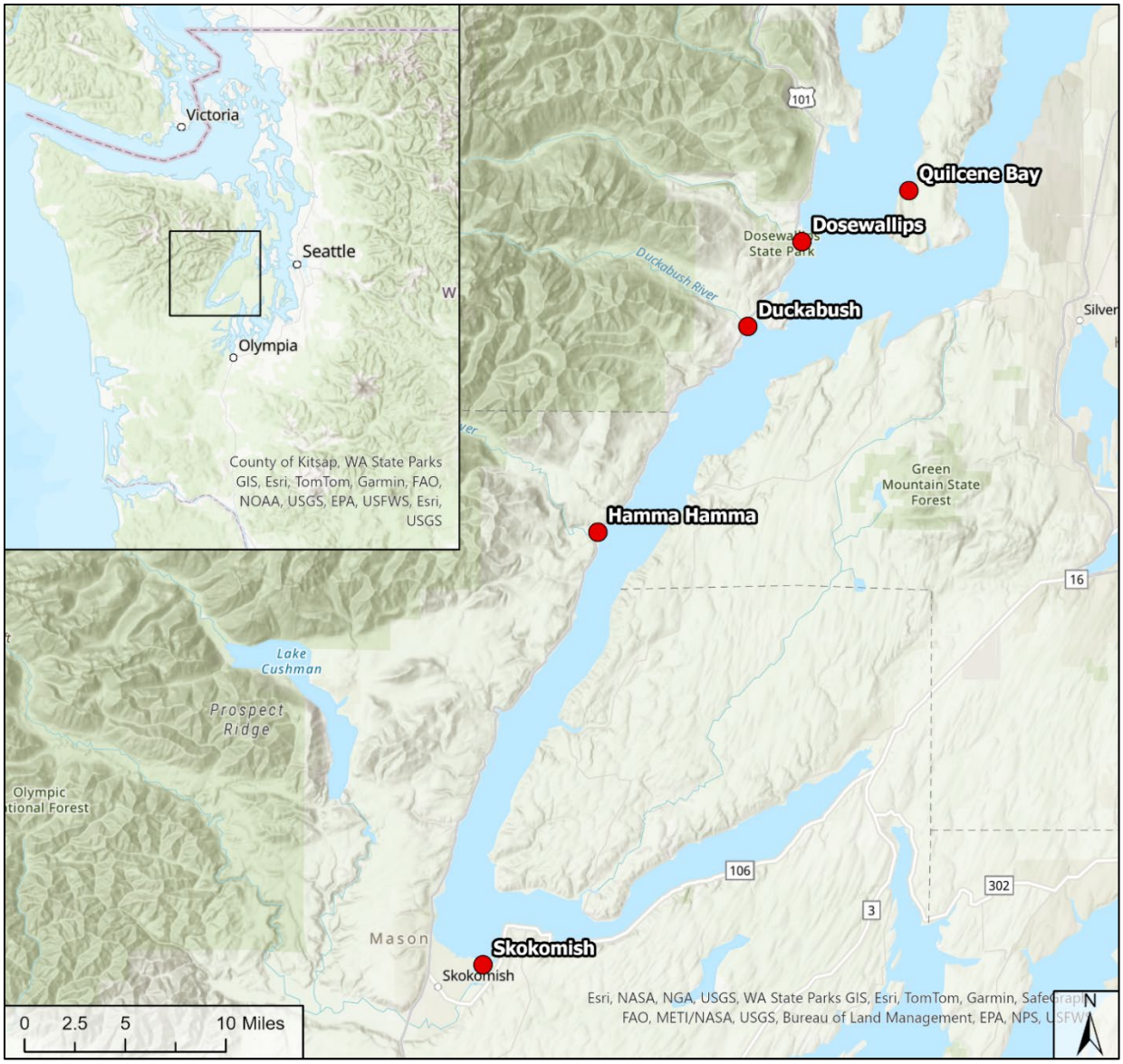

Figure 13. Harbor seal haul-out sites in Hood Canal

Harbor seals typically haul out along the river channels and sloughs at the Duckabush River estuary. Harbor seal counts peak at the Duckabush River during the primary pupping season (late July - September) and molting season (September - November) with seals spending more time in the water during colder winter and spring months (Jeffries *et al*. 2003, Jeffries *et al*. 2000). WDFW conducts regular aerial surveys of hauled out harbor seals in the Hood Canal, typically restricting monitoring to the peak of the pupping period and the window two hours before and after high tides to maximize the number of individuals on land (Clark pers. Comm. 2023). Additional aerial surveys of haul out harbor seals at Duckabush River estuary were performed by Jeffries *et al*. (2014) with slightly more seasonal variation. Table 5 summarizes the results from both surveys.

Table 5. Harbor seal counts at Duckabush Estuary

Date	Year	Pups	Adults	Total Count
February 4	2014	0	0	0[a]
March 13	2013	0	0	0[a]
March 21	2013	0	7	7[a]
July 23	2013	0	0	0[a]
August 26	2013	17	60	77[a]
August 27	2013	21	78	99[a]
September 21	2023	3	127	130[b]
September 22	2023	2	94	96[b]
September 28	2021	2	85	87[b]
September 29	2022	4	111	115[b]
October 17	2023	1	3	4[a]
November 6	2013	0	23	23[a]
November 8	2013	0	13	13[a]

Count source: [a] – Jeffries et al. (2014), [b] – WDFW

From 2021-2023, an average of 86 seals hauled at the Duckabush River estuary during the pupping season, with a maximum daily count of 130 seals. Harbor seal counts during the molting season peaked at 23 per day although data during this period is limited. Available count data outside of the critical life history periods of pupping and molting season is also limited but indicated scarce usage of Duckabush River estuary haul-out sites during the daytime for this period.

5 Type of Incidental Take Authorization Requested

The MMPA defines “harassment” as:

> any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (50 C.F.R, Part 216, Subpart A, Section 216.3-Definitions).

Under Section 101 (a)(5)(D) of the MMPA, USACE requests an LOA from November 2025 through October 2029 for Level B incidental take (behavioral harassment) of harbor seals described in this application during the Duckabush Estuary Ecosystem Restoration. Incidental take is likely to occur due to visual disturbance or noise below the Level B harassment threshold associated with construction equipment or monitoring personnel. Level B harassment includes movement and/or flushing of seals as a result of construction activities.

Level A harassment is not anticipated, therefore take authorization for Level A harassment is not requested.

6 Take Estimate for Marine Mammals

6.1 Level B Harassment

Potential take of harbor seals during construction and restoration activities would be caused by construction equipment-related visual disturbance or below-Level B harassment threshold noise nearby to haul-out sites. The incidental take estimate for the Duckabush River estuary restoration work uses conservative methodology and assumptions as required by NMFS. With no previous data on how harbor seals react to construction noise at the Duckabush River estuary, take rates from the most analogous project were used to estimate take. The Elkhorn Slough Tidal Marsh Restoration Project is a similar wetland restoration project involving land-based construction near harbor seal haul-out sites (CDFW 2021). NMFS has issued IHAs for all three phases of this project, all for Level B harassment of harbor seals through in-air noise and visual disturbance from construction equipment. Nine percent of harbor seals present were taken in Phase I of the Elkhorn Slough Tidal Marsh Restoration Project while 0.7% were taken in Phase II. Monitoring data from Phase III of the project is not available, so the conservative assumption of 9% take rate will be used to estimate take in this application.

Due to the limited survey data of seal presence at the Duckabush River estuary, a basic model was used to estimate seal counts throughout the year. It was assumed that there is a linear increase or decrease in the number of seals between the available survey counts (Figure 14). The most up to date anticipated work schedule was used to estimate the total number of seals expected to be present and hauled-out during construction activities. The total number of seals expected was then multiplied by 9% to give final take estimates (Table 6).

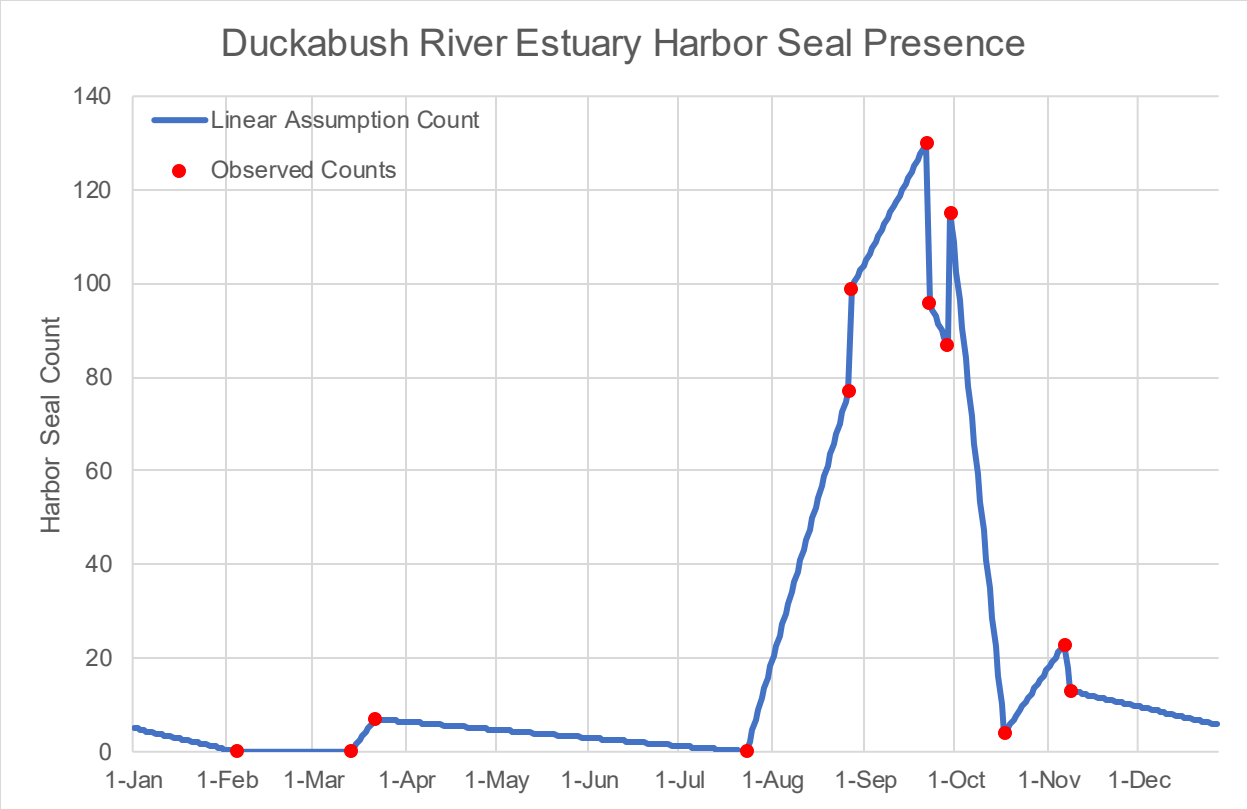

Figure 14. Estimated harbor seal presence at Duckabush River Estuary

Table 6. Harbor seal Level B harassment take estimate

Year	Predicted Work Dates	Predicted Work Days	Estimated Total Seals Present	Estimated Take	Take % of Stock
2025	November 24 – December 31	28	215	20	1
2026	January 1 – December 31	261	5,310	478	15
2027	January 1 – December 31	261	5,310	478	15
2028	January 1 – October 12	205	4,785	431	13

This is likely an overestimate of the take that would be expected to occur throughout the project. The time of day at which Hood Canal harbor seals haul out varies throughout the year. Analysis of haul-out behavior in Hood Canal suggests that harbor seals "are more likely to haul out during nighttime hours in August and September, but then switch to predominantly daylight haul-out patterns in October and November" (London *et al*. 2012). Because construction will only take place during the day, nighttime haul-out patterns during portions of the year will decrease the likelihood that harbor seals will be present during construction activities that could result in take.

The marine in-water work window at Hood Canal is July 16 - January 15, a period that overlaps with both pupping and molting seasons. However, because much of the construction will occur in tidally affected areas, work will be timed to occur during low tide so that work areas are not inundated. Harbor seals in Hood Canal primarily haul out between two hours before and two hours after high tide to access tidal sloughs (Jeffries *et al*. 2000, London *et al*. 2012). As such, some of the construction work will occur during times of the day when harbor seals are less likely to be hauled out and may not have access to haul-out sites.

Repeated flushing at Duckabush haul-out sites may cause harbor seals to preferentially utilize other nearby haul-out sites in Hood Canal such as Hamma Hamma and Dosewallips (Figure 13). While this may increase crowding pressure at other sites, it would decrease the potential incidental take at Duckabush.

7 Anticipated Impact of the Activity

Noise and visual disturbance caused by construction activities have the potential to directly affect harbor seals that haul out or otherwise utilize the environment near the project area. It is possible that seals flushed from haul-out sites at Duckabush will move to other nearby haul-out sites in Hood Canal, the closest of which are Dosewallips 3.5 miles northeast, Quilcene Bay 7 miles northeast, and Hamma Hamma 8.5 miles southwest. Harbor seals may also habituate to constant elevated sound levels and flush from haul-out sites less often due to in-air noise disturbances (Bankhead *et al*. 2023).

It is possible that molting harbor seals or harbor seal pups could be impacted by flushing events due to construction activities. Molting is an energetically demanding process for harbor seals and is best performed hauled-out rather than in the water in order to retain thermal energy (Ashwell-Erickson *et al*. 1985, Boily 1995). Mother-pup pairs also spend a significant amount of time hauled-out which is important for newborn pup feeding, predator avoidance, and formation of mother-pup bonds (Stein 1989, Richardson *et al*. 1995). While pups are able to identify and follow their mothers in the water (Stein 1989), they are more likely to become separated and possibly stranded after flushing events (Thiéry and Kiszka 2005, Osinga *et al*. 2012). However, mother-pup separation from construction noise related flushing has been presumed to be unlikely (CDFW 2021). It is more likely that flushed mother-pup pairs will remain together but not return to their original haul-out site and will instead seek out a different undisturbed site (Jansen *et al*. 2014, Suryan and Harvey 1999, Ruiz-Mar *et al*. 2022). These sites could include Dosewallips 3.5 miles northeast, Quilcene Bay 7 miles northeast, and Hamma Hamma 8.5 miles southwest. The movement of displaced mother-pup pairs may increase crowding pressure at these other sites which are also subject to their own anthropogenic disturbances due to their proximity to other sections of Highway 101 and outdoor recreation activities.

The effects of repeated disturbance may differ for non-pup and non-mother seals. Harbor seals typically demonstrate haul-out site fidelity (Yochem *et al*. 1987, Paterson *et al*. 2019). Most seals utilize one primary haul-out site and while they may spend several hours in the water after flushing, they will tend to haul out again at that same site. This may result in loss of fitness and increased predation risk for seals returning to Duckabush estuary throughout the construction period as they could be subject to disturbances whenever work is occurring. However, there is evidence that harbor seals that regularly haul out at locations with high anthropogenic activity and elevated in-air noise will habituate to those disturbances (Bankhead *et al*. 2023). Although it is unclear how long this habituation takes, seals that regularly haul out at Duckabush River estuary may become accustomed to the regular in-air construction noise that falls below the Level B harassment threshold and flush less frequently as construction progresses.

8 Anticipated Impacts on Subsistence Uses

Not applicable. There are no relevant subsistence uses of marine mammals implicated by this action.

9 Anticipated Impacts on Habitat

9.1 Harbor Seal Haul-Out Sites

This project is not anticipated to adversely affect the habitat of local harbor seal populations. Although construction noise may affect harbor seal haul-out behavior, this will not alter surrounding habitat. The work area is located upstream from harbor seal haul-out sites and tidally influenced areas utilized by harbor seals will not be subject to any construction work.

9.2 Water and Sediment Quality

There may be some short-term turbidity associated with in-water work. Work crews will minimize these effects through various methods, including working behind the existing causeway to remain separated from tidal influences, performing work at low tide when possible, and installing silt fences and floating booms around any in-water work.

9.3 Habitat Benefits

This project will restore several processes, including sediment transport, freshwater input, tidal exchange, distributary channel migration, and marsh accretion. Restoration of this site provides benefits to ESA critical habitat for Chinook salmon, Hood Canal summer chum, steelhead, and bull trout as well as direct benefits to harbor seals, bald eagles, waterfowl, shellfish, and the highly valuable eelgrass habitat at the edge of the site. This project provides an opportunity to reconnect floodplain and intertidal wetlands, improving tidal exchange, sediment transport, and estuary development. Realignment of roads and bridges will restore tidal inundation and hydrology, and reconnection of distributary channels to promote greater diversity of delta wetland habitats. Additional benefits include:

- Reconnects and restores 38 acres of scarce tidal marsh and estuarine mixing zone by removing 1,270 linear feet of tidal barrier, roadway, and shoreline armoring, allowing unrestricted flow of freshwater into the estuary.
- Restores distributary channels, allowing formation of a tidal channel network and more natural tidal exchange for improved estuarine habitat that supports many fish, bird, invertebrate, and marine mammal species.
- Restores mudflats that benefit native shellfish harvested on the public tidelands and the shorebirds that feed on mudflat invertebrates, as well as salt marsh habitat that benefits waterfowl, shrimp, crab, salmon, and marine mammals.
- Restores large river delta that provides valuable nursery habitat for juvenile salmon species, increasing survival and supporting Puget Sound population recovery.

10 Anticipated Effects of Habitat Impacts on Marine Mammals

Short-term habitat impacts would be limited to temporary construction disturbances of haul-out areas near the project area. Although seals could still access haul-out areas at Duckabush River estuary, they may choose to utilize a different haul-out location during the construction period. These disruptions would be limited to the duration of the project and all haul-out sites will be fully accessible again once construction is complete.

As discussed in Section 9, the project would restore the connection between floodplains and intertidal wetlands. This would improve habitat for harbor seal prey base (fish) and promote development of more suitable haul-out locations through marsh accretion and channel migration. Additionally, elevating and setting back Highway 101 farther away from haul-out sites will decrease the amount of anthropogenic noise and visual disturbance experienced by harbor seals.

11 Mitigation Measures to Protect Marine Mammals and Their Habitat

11.1 Measures to Protect Marine Mammals

The following conservation measure shall be implemented to avoid and/or reduce impacts to marine mammals:

1. A NOAA Fisheries approved biologist (see Section 13) shall conduct mandatory biological resources awareness training for construction personnel. The awareness training shall be provided to all construction personnel to brief them on the need to avoid effects on marine mammals. If new construction personnel are added to the project, the contractor shall ensure that the personnel receive the mandatory training before starting work.
2. A NOAA Fisheries approved biological monitor will monitor for marine mammal disturbance within a 300-meter Level B Harassment Zone:
    a. A marine mammal monitor will be present: (1) every other day when construction activities occur in water or at the tidal restoration area; or (2) every fifth day when construction activities are within the Level B Harassment Zone.
    b. The biological monitor will have the authority to stop project activities if marine mammals approach or enter the Level B Harassment Zone, or at any time for the safety of any marine mammal.
    c. A 30-minute pre-clearance observation period will occur prior to the start of construction activities. Construction may not start until the work area is cleared by the biological monitor. Monitoring will occur until 30 minutes after construction is complete.
3. To reduce the risk of potentially startling marine mammals with a sudden intensive sound, the construction contractor will begin construction activities gradually each day by moving around the project area and starting equipment one at a time.
4. In-water construction work shall occur only during daylight hours when visual monitoring of marine mammals can be implemented. No in-water work will be conducted at night.
5. Construction activities will not be initiated, or will be stopped, in the following situations:
    a. Construction activities will not be initiated if a marine mammal is within 10 meters of where heavy equipment will operate. Work will not be initiated until the seal has moved outside the 10-meter buffer on its own volition or has not been observed for 15 minutes.

b. If a marine mammal comes within 10 meters of operating heavy equipment, operations will stop. Operations will not be reinitiated until the seal has moved outside the 10-meter buffer on its own volition or has not been observed for 15 minutes.
c. Construction activities may not be initiated (1) within 300 meters of a mother-pup pair that is hauled out; or (2) within 100 meters of a mother-pup pair in the water.
d. If a pup less than one week old comes within 20 meters of where heavy machinery is working, construction activities in that area will be shut down or delayed until the pup has left the area on its own volition. In the event that a pup less than one week old remains within those 20 meters, NOAA Fisheries will be consulted to determine the appropriate course of action.

6. If marine mammals are present within the work area, or proximate to the work area as described in (5) above, they will be allowed to leave on their own volition.

11.2 Construction Best Management Practices

Best Management Practices (BMPs) act as conservation measures to avoid or minimize effects from construction activities include the following:

1. All in-water work performed in tidally influenced areas shall occur within the marine in-water work window of July 16 - January 15.
2. All in-water work performed in riverine areas that are not tidally influenced shall occur within the fresh water in-water work window of July 16 - September 15.
3. Refueling of any equipment shall occur at least 100 feet from the water in Hood Canal, Duckabush River, or subtidal and intertidal habitat.
4. All previously used construction equipment would be cleaned of any soils, noxious chemicals, and/or plant life that could contaminate the project site prior to bringing it to the project site.
5. All construction equipment will comply with applicable equipment noise standards of the U.S. Environmental Protection Agency, and all construction equipment will have noise control devices no less effective than those provided on the original equipment.
6. The contractor shall be responsible for the preparation of a Spill Prevention, Control and Countermeasures (SPCC) plan to be used for the duration of the project.
    a. The SPCC plan shall be submitted to the Project Engineer prior to the commencement of any construction activities. A copy of the plan with any updates will be maintained at the work site by the contractor.
    b. The SPCC plan shall identify construction planning elements and recognize potential spill sources at the site. The SPCC plan shall outline BMPs, responsive actions in the event of a spill or release and identify

notification and reporting procedures. The SPCC plan shall also outline contractor management elements such as personnel responsibilities, project site security, site inspections and training.

c. The SPCC will outline what measures shall be taken by the contractor to prevent the release or spread of hazardous materials, either found on site and encountered during construction but not identified in contract documents, or any hazardous materials that the contractor stores, uses, or generates on the construction site during construction activities. These items include, but are not limited to gasoline, oils and chemicals. Hazardous materials are defined in Revised Code of Washington (RCW) 70.105.010 under "hazardous substance."

d. The contractor shall maintain, at the job site, the applicable spill response equipment and material designated in the SPCC plan.

7. The contractor shall regularly check fuel hoses, oil drums, oil or fuel transfers valves, fittings, etc. for leaks, and shall maintain and store materials properly to prevent spills.
8. No petroleum products, chemicals or other toxic or deleterious materials shall be allowed to enter surface waters.
9. Equipment that enters the surface water shall be maintained to prevent any visible sheen from petroleum products appearing on the water.
10. There shall be no discharge of oil, fuels, or chemicals to surface waters, or onto land where there is a potential for reentry into surface waters.
11. No cleaning solvents or chemicals used for tools or equipment cleaning shall be discharged to ground or surface waters.

12 Mitigation Measures to Protect Subsistence Uses

Not applicable. The proposed activity will take place in Duckabush estuary and no activities will take place in or near a traditional Arctic subsistence hunting area. Therefore, there are no relevant subsistence uses of marine mammals implicated by this section.

13 Monitoring and Reporting

The construction monitoring plan is detailed in Appendix A. In summary, a NOAA Fisheries approved biological monitor will monitor for marine mammal disturbance during construction within the Level B Harassment Zone, which includes work within 300 meters of heavy equipment being used with the work area (Figure 14). Monitoring will occur (1) every other day when construction activities occur in water or at the tidal restoration area; or (2) every fifth day when construction activities are within the Level B Harassment Zone (Figure 14). Figure A 1 depicts monitoring locations. The biological monitor will have the authority to stop project activities if marine mammals approach or enter the Level B Harassment Zone. Biological monitoring will begin 30 minutes before work begins and continue until 30 minutes after construction is complete. When a biological monitor is onsite, work will only commence with approval of the biological monitor to ensure that no marine mammals are present in the exclusion zone.

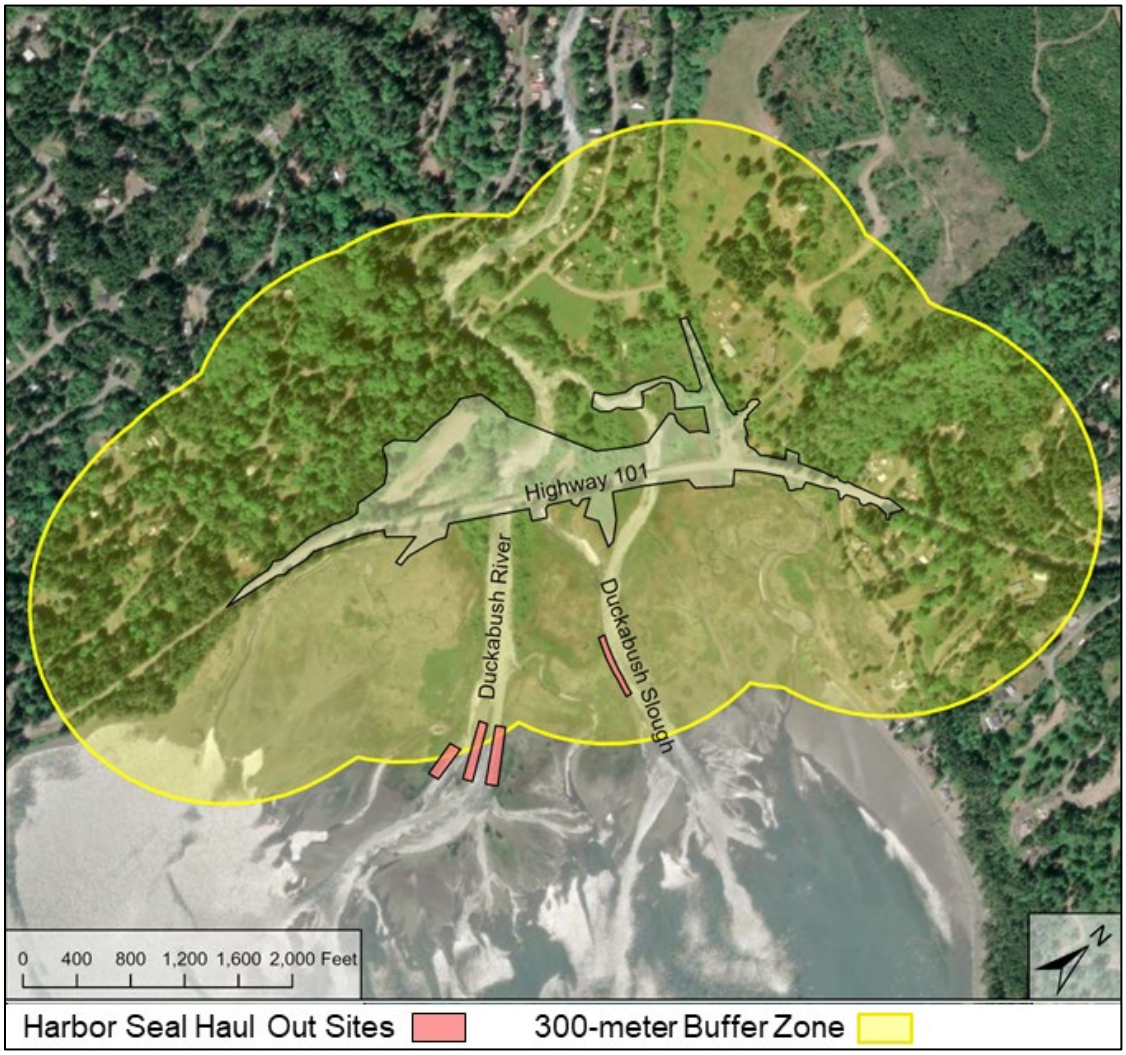

Figure 15. 300-meter buffer zone (highlighted in yellow) surrounding work area

Throughout construction activities that require a monitor, the biological monitor will maintain a log that documents numbers of marine mammals present before, during, and at the conclusion of daily activities (See Appendix A for a detailed description of the monitoring protocol). The monitor will record basic weather conditions and marine mammal behavior. A final report shall be submitted to NOAA Fisheries within 90 days of the conclusion of monitoring efforts. The report shall detail the monitoring protocol, summarize the data recorded during monitoring, and contain an estimate of the number of marine mammals harassed.

NOAA Fisheries approved biologists will have qualifications consistent with those of NMFS Protected Species Observers as follows:

1. Independent observers (i.e., not construction personnel) are required.
2. At least one observer must have prior experience working as an observer.
3. Other observers may substitute education (undergraduate degree in biological science or related field) or training for experience.
4. Where a team of three or more observers are required, one observer should be designated as lead observer or monitoring coordinator. The lead observer must have prior experience working as an observer.

Submission and approval of observer CVs by the NMFS is required. Other important qualifications:

1. Ability to conduct field observations and collect data according to assigned protocols.
2. Experience or training in the field identification of marine mammals, including harbor seals, and the identification of their behaviors.
3. Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations.
4. Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates and times when in-water construction activities were suspended to avoid potential incidental injury from construction sound of marine mammals observed within a defined shutdown zone; and marine mammal behavior.

Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

14 Suggested Means of Coordination

All marine monitoring data collected before, during and after construction of the project would be provided to NOAA Fisheries via email and made available electronically to researchers and other interested parties upon request.

15 References

Ashwell-Erickson, S., Fay, F. H., Elsner, R., & Wartzok, D. (1986). Metabolic and hormonal correlates of molting and regeneration of pelage in Alaskan harbor and spotted seals (*Phoca vitulina and Phoca largha*). *Canadian Journal of Zoology*, *64*(5), 1086–1094. https://doi.org/10.1139/z86-163

Bankhead, K., Freeman, G., Heimbichner Goebel, W., & Acevedo-Gutiérrez, A. (2023). Effects of anthropogenic noise on haul-out numbers of harbor seals (*Phoca vitulina)*. *Canadian Journal of Zoology*, *101*(9), 720–728. https://doi.org/10.1139/cjz-2023-0053

Boily, P. Theoretical heat flux in water and habitat selection of phocid seals and beluga whales during the annual molt. Journal of Theoretical Biology, Volume 172, Issue 3, 1995, Pages 235-244, ISSN 0022-5193, https://doi.org/10.1006/jtbi.1995.0020.

California Department of Fish and Wildlife (CDFW). 2021. Elkhorn Slough Tidal Marsh Restoration Project – Phase II: Request for Incidental Harassment Authorization (IHA). July. Available: https://media.fisheries.noaa.gov/2021-08/ElkhornSloughPhase3_2021IHA_App_OPR1.pdf?null=.

Carretta, James V., Erin M. Oleson, Karin A. Forney, David W. Weller, Aimée R. Lang, Jason Baker, Anthony J. Orr, Brad Hanson, Jay Barlow, Jeffrey E. Moore, Megan Wallen, and Robert L. Brownell Jr. 2022. U.S. Pacific marine mammal stock assessments: 2022. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-684. https://doi.org/10.25923/5ysf-gt95.

Carretta, James V., Erin M. Oleson, Karin A. Forney, David W. Weller, Aimée R. Lang, Jason Baker, Anthony J. Orr, Brad Hanson, Jay Barlow, Jeffrey E. Moore, Megan Wallen, and Robert L. Brownell Jr. 2023. Draft U.S. Pacific marine mammal stock assessments: 2023. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-684.

Clark, C. 2023. Email between WDFW and USACE personnel regarding current data on harbor seal using in Duckabush Estuary. December 2023.

Federal Highway Administration (FHWA). 2006. Construction Noise Handbook. Prepared by U.S. Department of Transportation Research and Innovative Technology Administration. Publication # FHWA-HEP-06-015 August. Available: https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/.

Hanan, D. A. 1996. Dynamics of Abundance and Distribution for Pacific Harbor Seal, Phoca vitulina richardsi, on the Coast of California. Ph.D. Dissertation, University of California, Los Angeles. 158pp.

Jansen, J. K., Boveng, P. L., Ver Hoef, J. M., Dahle, S. P., & Bengtson, J. L. (2015). Natural and human effects on harbor seal abundance and spatial distribution in an Alaskan glacial fjord. *Marine Mammal Science*, *31*(1), 66–89. https://doi.org/10.1111/mms.12140

Jefferson, T.A., M. A. Smultea, and K. Ampela. 2017. Harbor Seals (*Phoca vitulina*) in Hood Canal: Estimating Density and Abundance to Assess Impacts of Navy Activities. Report of a Workshop Held on 15 and 16 October 2015 at National Marine Mammal Laboratory, Alaska Fisheries Science Center, NOAA Western Regional Center, 7600 Sand Point Way, NE, Seattle, WA. Prepared for Commander, U.S. Pacific Fleet. Submitted to Naval Facilities Engineering Command Pacific, Pearl Harbor, Hawaii, under Contract No. N62470-15-D-8006, Task Order KB05, issued to HDR, Inc., San Diego, California. July 2017.

Jefferson, T. A., Smultea, M. A., Ward, E. J., & Berejikian, B. (2021). Estimating the stock size of harbor seals (Phoca vitulina richardii) in the inland waters of Washington State using line-transect methods. *PLOS ONE*, *16*(6), e0241254. https://doi.org/10.1371/journal.pone.0241254

Jeffries, S. J. 1985. Occurrence and distribution patterns of marine mammals in the Columbia River and adjacent coastal waters of northern Oregon and Washington. Pp. 15-50, *In:* Beach, R. J., A. C. Geiger, S. J. Jeffries, S.D. Treacy, and B. L. Troutman, Marine mammals and their interactions with fisheries of the Columbia River and adjacent waters, 1980-1982. NWAFC Processed Report 85-04. 316 pp. Available at National Marine Mammal Laboratory, 7600 Sand Point Way NE, Seattle, WA 98115.

Jeffries, S. J., R. F. Brown, H. R. Huber, and R. L. DeLong. 1997. Assessment of harbor seals in Washington and Oregon, 1996. Pp. 83-94, *In:* Hill, P. S., and D. P. DeMaster (eds.), MMPA and ESA Implementation Program, 1996. AFSC Processed Report 97-10. 255 pp. Available at National Marine Mammal Laboratory, 7600 Sand Point Way NE, Seattle, WA 98115.

Jeffries, S.J., P.J. Gearin, H.R. Huber, D.L. Saul, and D.A. Pruett. 2000. Atlas of Seal and Sea Lion Haulout Sites in Washington. Washington Department of Fish and Wildlife, Wildlife Science Division, 600 Capitol Way North, Olympia WA. 150 p.

Jeffries, S., Huber, H., Calambokidis, J., & Laake, J. (2003). Trends and Status of Harbor Seals in Washington State: 1978-1999. *The Journal of Wildlife Management*, *67*(1), 207. https://doi.org/10.2307/3803076

Jeffries, S. 2014. Aerial Surveys of Pinniped Haulout Sites in Pacific Northwest Inland Waters. Final Report. Prepared for Commander, U.S. Pacific Fleet, Pearl Harbor, Hawaii. Submitted to Naval Facilities Engineering Command (NAVFAC) Northwest, Silverdale, WA under Contract No. N62470-10-D-3011, Task Order JP02 issued to HDR, Inc., San Diego, CA. June 2014.

London, J. M., Ver Hoef, J. M., Jeffries, S. J., Lance, M. M., & Boveng, P. L. (2012). Haul-Out Behavior of Harbor Seals (Phoca vitulina) in Hood Canal, Washington. *PLoS ONE*, *7*(6), e38180. https://doi.org/10.1371/journal.pone.0038180

Muto, M. M., V. T. Helker, B. J. Delean, N. C. Young, J. C. Freed, R. P. Angliss, N. A. Friday, P. L. Boveng, J. M. Breiwick, B. M. Brost, M. F. Cameron, P. J. Clapham, J. L. Crance, S. P. Dahle, M. E. Dahlheim, B. S. Fadely, M. C. Ferguson, L. W. Fritz, K. T. Goetz, R. C. Hobbs, Y. V. Ivashchenko, A. S. Kennedy, J. M. London, S. A. Mizroch, R. R. Ream, E. L. Richmond, K. E. W. Shelden, K. L. Sweeney, R. G. Towell, P. R. Wade, J. M. Waite, and A. N. Zerbini. 2021. Alaska marine mammal stock assessments, 2020. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-421, 398 p.

Newby, T. C. (1973). Changes in the Washington State Harbor Seal Population, 1942-1972. *The Murrelet*, *54*(1), 4. https://doi.org/10.2307/3535680

National Oceanic and Atmospheric Administration (NOAA) Fisheries. 2024. Southern Resident Killer Whale (SRKW) Sightings Dashboard. Available: https://noaa.maps.arcgis.com/apps/dashboards/d29b088d7b4849489c4338a4c3d36e4c.

Osinga, N., Nussbaum, S. B., Brakefield, P. M., & Udo de Haes, H. A. (2012). Response of common seals (Phoca vitulina) to human disturbances in the Dollard estuary of the Wadden Sea. *Mammalian Biology*, *77*(4), 281–287. https://doi.org/10.1016/j.mambio.2012.02.005

Paterson, W. D., Russell, D. J. F., Wu, G., McConnell, B., Currie, J. I., McCafferty, D. J., & Thompson, D. (2019). Post-disturbance haulout behaviour of harbour seals. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *29*(S1), 144–156. https://doi.org/10.1002/aqc.3092

Richardson, W. J., C. R. Greene Jr., C. I. Malme, and D. H. Thomson. 1995. Marine mammals and noise. Academic Press, Inc. San Diego, CA, 576 p.

Ruiz-Mar, M. G., Heckel, G., Solana-Arellano, E., Schramm, Y., García-Aguilar, M. C., & Arteaga, M. C. (2022). Human activities disturb haul out and nursing behavior of Pacific harbor seals at Punta Banda Estuary, Mexico. *PLOS ONE*, *17*(7), e0270129. https://doi.org/10.1371/journal.pone.0270129

Smultea, M.A., K. Lomac-MacNair, G. Campbell, S.S. Courbis, and T.A. Jefferson. 2017. Aerial Surveys of Marine Mammals Conducted in the Inland Puget Sound Waters of Washington, Summer 2013–Winter 2016. Final Report. Prepared for Commander, U.S. Pacific Fleet and Naval Sea Systems Command. Submitted to Naval Facilities Engineering Command Pacific, Pearl Harbor, Hawaii under

Contract No. N62470-15-D-8006, Task Order KB05 issued to HDR, San Diego, California. June 2017.

Suryan, R., & Harvey, J. (1999). Variability in reactions of Pacific harbor seals, Phoca vitulina richardsi, to disturbance. *Fishery Bulletin*, *97*(2), 332–339.

Thiéry, P., & Kiszka, J. (n.d.). *DESCRIPTION ET INTERPRÉTATION DES ÉCHOUAGES PRÉCOCES DE PHOQUES VEAUX-MARINS (PHOCA VITULINA, LINNAEUS 1758) EN BAIE DE SOMME (PICARDIE, FRANCE)*.

U.S. Army Corps of Engineers (USACE) and Washington Department of Fish and Wildlife (WDFW). 2016. Puget Sound Nearshore Ecosystem Restoration: Final Integrated Feasibility Report and Environmental Impact Statement (NEPA EIS). July.

Washington Department of Fish and Wildlife (WDFW). 2020. Duckabush Estuary Restoration Project: SEPA Final Supplemental Environmental Impact Statement (SEPA EIS). Prepared by Environmental Science Associates. May.

Washington State Department of Transportation (WSDOT). 2020. Biological Assessment Preparation Manual. Chapter 7: Construction Noise Impact Assessment. August. Available: https://wsdot.wa.gov/sites/default/files/2021-10/Env-FW-BA_ManualCH07.pdf.

Yochem, P. K., Stewart, B. S., DeLong, R. L., & DeMaster, D. P. (1987). DIEL HAUL-OUT PATTERNS AND SITE FIDELITY OF HARBOR SEALS (*PHOCA VITULINA RICHARDSI*) ON SAN MIGUEL ISLAND, CALIFORNIA, IN AUTUMN. *Marine Mammal Science*, *3*(4), 323–332. https://doi.org/10.1111/j.1748-7692.1987.tb00319.x

Appendix A – Monitoring Protocol

Duckabush Estuary Restoration Project

Marine Mammal Monitoring Protocol

Goals

1. Ensure that marine mammals are not subject to injury under the Marine Mammal Protection Act.
2. Collect field data about the movement and activity of marine mammals during construction monitoring, which will inform NOAA Fisheries on marine mammal sensitivity to disturbance and provide reference for future construction projects.

Objectives

1. Ensure that construction activity is not initiated: (1) when a marine mammal is within 10 meters of where heavy equipment will operate; (2) when construction activities are within 300 of a mother-pup pair that is hauled out; or (3) within 100 meters of a mother-pup pair in the water.
2. Ensure that during site containment activities, heavy machinery does not approach closer than 100 meters of where mothers and pups are actively hauled out.
3. Ensure that construction activity is halted: (1) if a marine mammal comes within 10 meters of operating heavy equipment; or (2) a pup less than one week old comes within 20 meters of where heavy machinery is working.
4. Ensure that presence, distribution, movement and behavior of harbor seals within the project area and surrounding vicinity is recorded when there is a reasonable possibility that marine mammals will experience behavioral harassment.

Observation locations

Monitoring during construction will occur from vantage points along the current Highway 101 elevated causeway that allow monitors to observe any seals hauling out in the estuary. The primary observation locations shall be on the northern Highway 101 bridge and at the head of the existing estuary access path that will become the temporary parking platform (Figure A-1). Monitors may also traverse along the Highway 101 causeway to obtain clearer views of approaching or hauled-out seals, such as from the southern Highway 101 bridge or North Parking Area. The observation area for the restoration area shall be accessed by foot and used to provide a vantage point of the construction area and Duckabush River estuary. This observation area includes all restoration areas within 300 meters of harbor seal haul-out sites.

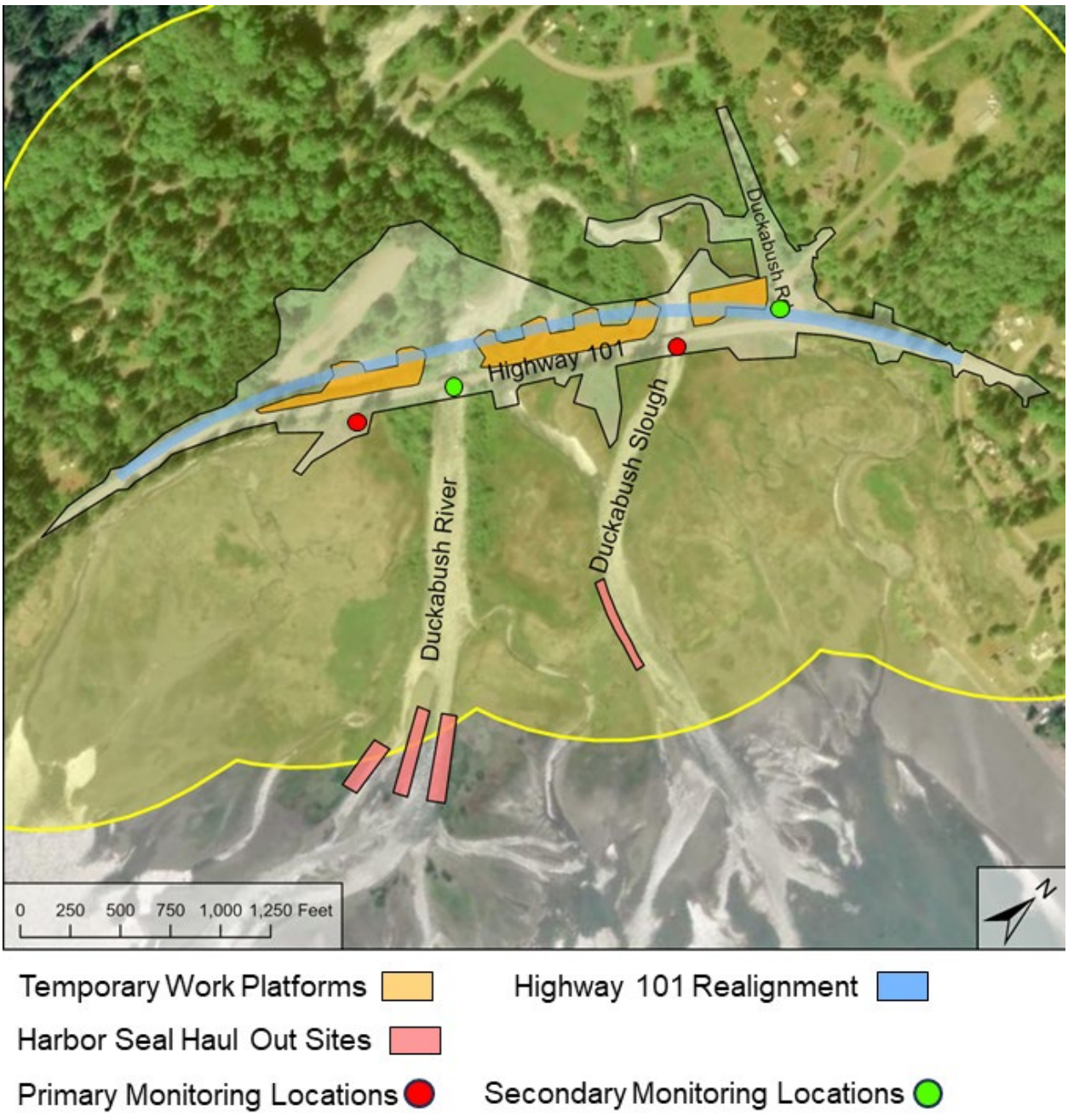

Figure A 1. Marine mammal monitoring locations

Monitoring Protocol

A NOAA Fisheries approved biological monitor will monitor for marine mammal disturbance during construction within the Level B Harassment Zone, which includes work within 300 meters of harbor seal haul-out sites (Figure A-1). Monitoring will occur (1) every other day when construction activities occur in water or at the tidal restoration

area; or (2) every fifth day when construction activities are within the Level B Harassment Zone.

The biological monitor will have the authority to stop project activities if marine mammals approach or enter the exclusion zone. Biological monitoring will begin 30 minutes before work begins and continue until 30 minutes after construction stops. Work will commence only with approval of the biological monitor to ensure that no marine mammals are present in the exclusion zone.

Pre- and Post-Construction Daily Censuses

A census of marine mammals in the project area and the area surrounding the project will be conducted 30 minutes prior to the beginning of construction on monitoring days, and again 30 minutes after the completion of construction activities. Data collected during the pre-and post-construction daily censuses will include:

- Environmental conditions (weather condition, tidal conditions, visibility, cloud cover, air temperature and wind speed)
- Numbers of each marine mammal species spotted
- Location of each species spotted, including distance from construction activity
- Status (in water or hauled-out).
- Behavior

Hourly Counts

Conduct hourly counts of animals hauled out and in the water.

- Data collected will include:
    - Numbers of each species
    - Location of species, including whether inside the Level B harassment zone; whether hauled-out or in the water; and distance from construction activities
    - Time
    - Tidal conditions
    - Time construction activities start and end
    - Primary construction activities occurring during past hour
    - Any noise or visual disturbance
    - Number of mom/pup pairs and neonates observed
    - Notable behaviors, including foraging, grooming, resting, aggression, mating activity, and others
- Notes may include any of the following information to the extent it is feasible to record:
    - Age-class
    - Sex

- Unusual activity or signs of stress
- Any other information worth noting

Construction Related Reactions

Record reaction observed in relation to construction activities including:

- Tally of each reaction
- Time of reaction
- Concurrent construction activity (including duration) and assumed cause (whether related to construction activities or not) and whether observer feels the disturbance was visual or acoustic.
- Location of animal during initial reaction and distance from the noted disturbance
- Direction of movement
- Activity before and after disturbance
- Status (in water or hauled out) before and after disturbance
- Coded reaction (Levels 1-3; Table A-1)

Table A-1. Marine mammal reaction codes

Level	Type of Response	Definition
1	Alert	Head orientation or brief movement in response to disturbance, which may include turning head towards the disturbance, craning head and neck or craning head and neck while holding the body rigid in a u-shaped position, changing from a lying to a sitting position, or brief movement of less than twice the animal's body length. Alerts would be recorded, but not counted as a 'take'.
2	Movement	Movements away from the source of disturbance, ranging from short withdrawals at least twice the animal's body length to longer retreats, or if already moving a change of direction of greater than 90 degrees. **These movements would be recorded and counted as a 'take'.**
3	Flush	All retreats (flushes) to the water. **Flushing into the water would be recorded and counted as a 'take'.**

Steps for shutting down and resuming construction

1. Alert construction foreman of animal.
2. Record the construction activity and the time of shutdown.

3. Record the reaction and location of the animal.
4. Give clearance for construction activities when animal is seen outside of exclusion zone and traveling away from the construction area, or when the animal is not spotted for 15 minutes.
5. Record the time construction resumes.