Request for an Incidental Harassment Authorization Under the Marine Mammal Protection Act

Mukilteo Multimodal Project Season 3
Washington State Department of Transportation
Ferries Division

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Submitted To:

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Note: Thanks to Jim Laughlin of WSDOT for analyzing the data to provide site specific threshold zones for this project.

Cover: Harbor seal at Mukilteo Project Site. February 2018. Tyler Graham. WSDOT/WSF.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

Abbreviations and Acronyms

BMP	best management practices
CA-OR-WA	California-Oregon-Washington
CFR	Code of Federal Regulations
dB	decibels
DPS	Distinct Population Segment
DPS	dynamic positioning system
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FR	Federal Register
HPA	Hydraulic Project Approval
Hz	hertz
IHA	Incidental Harassment Authorization
IWC	International Whaling Commission
kHz	kilohertz
kJ	kilojoules(s)
km	kilometer(s)
m	meters
MLLW	Mean Low-Low Water
MHHW	Mean High-High Water
MM	mitigation measure
MMPA	Marine Mammal Protection Act of 1972
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Laboratory
NOAA	National Oceanographic Atmospheric Administration
NOAA Fisheries	National Oceanic Atmospheric Administration/National Marine Fisheries Service
NTU	nephelometric turbidity units
OHW	ordinary high water
PBR	Potential Biological Removal

PSAMP	Puget Sound Ambient Monitoring Program
RCW	Revised Code of Washington
RL	Received Level
RMS	root mean square
SAR	Stock Assessment Report
SEL	Sound Exposure Level
SL	Source Level
SPCC	Spill Prevention, Control, and Countermeasures Plan
SPL	Sound Pressure Level
TL	Transmission Loss
TTS	Temporary Threshold Shift
μPa	micro-Pascals
UHMW	Ultra High Molecular Weight
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation
WSF	Washington State Department of Transportation Ferries Division
ZOE	Zone of Exclusion
ZOI	Zone of Influence

1.0 Description of the Activity

A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

1.1 Season Three Incidental Harassment Authorization Application

The Mukilteo Multimodal Project consists of four in-water construction seasons:

- Season 1 was the demolition of the Tank Farm Pier, which was completed in 2015/16.
- No in-water work took place in 2016/17.
- Season 2 included ground improvement, trestle and terminal building foundation piles, and was completed in 2017/18 (in-water work ended 2/15/18).
- Season 3 (the subject of this application) will consist of installation of the remaining in-water piles, which will be completed in 2018/19.
- Season 4 will consist of the demolition of the existing Mukilteo terminal, which will be completed in 2019/20.

When planning for Season 2 construction, it was uncertain how much pile work would be completed in 2017/18. To be conservative, all in-water pile installation work was included in the Season 2 Incidental Harassment Authorization (IHA) application, but only ~30% of the pile work was completed in 2017/18.

Therefore, all potential effects on marine mammals from the installation of new project piles were analyzed in the Season 2 IHA application and Environmental Assessment. The effects on marine mammals from Season 3 pile work (the remaining 70% of new pile installation) will be less than the effects that were analyzed in the Season 2 IHA application. Table 1-1 summarizes the piles that were planned for Season 2, those that were completed, and the piles that are planned for Season 3.

The effects on marine mammals of Season 4 (existing Mukilteo terminal demolition), will be analyzed in a future IHA application.

Table 1-1. Pile Numbers Planned/Completed by Season

Method	Pile Size (inch)	Season 2 Planned	Season 2 Completed	Season 3 Planned	Comment
Vibratory Drive	12	139	134	0	Fewer needed, complete
	24	69	4	65	Up to 69 temporary
	24	48	0	26	Fewer needed, permanent
	30	40	25	16	Permanent
	36	6	0	6	Permanent
	78	2	0	2	Permanent
	120	1	0	1	Permanent
	sheet	90	0	0	Design change, not needed
Vibratory Removal	24	69	4	65	Temporary
	30	9	0	9	Permanent
	sheet	90	0	0	Design change, not needed
Impact Drive	24	69	4	65	Proofed for load-bearing
	30	30	25	0	Fewer needed, complete

1.2 Project Introduction

The Washington State Department of Transportation (WSDOT) Ferries Division (WSF) operates and maintains 19 ferry terminals and one maintenance facility, all of which are located in either Puget Sound or the San Juan Islands (Georgia Basin) (Figure 1-1). Since its creation in 1951, WSF has become the largest ferry system in the United States (U.S.), operating 28 vessels on 10 routes with over 500 sailings each day.

Figure 1-1 Washington State Ferry System Route Map

To improve, maintain, and preserve the terminals, WSF conducts construction, repair and maintenance activities as part of its regular operations. One of these projects is the relocation of the Mukilteo ferry terminal, and is the subject of this Incidental Harassment Authorization (IHA) request. The proposed project will occur in marine waters that support several marine mammal species. The Marine Mammal Protection Act of 1972 (MMPA) prohibits the taking of marine mammals, which is defined as to “harass, hunt, capture or kill, or attempt to harass, hunt, capture or kill,” except under certain situations. Section 101 (a) (5)(D) allows for the issuance of an IHA, provided an activity results in negligible impacts on marine mammals and would not adversely affect subsistence use of these animals.

The project’s timing and duration and specific types of activities (such as pile driving) may result in the incidental taking by acoustical harassment (Level B take) of marine mammals protected under the MMPA. WSDOT/WSF is requesting an IHA for thirteen marine mammal species (harbor seal, Northern Elephant seal California sea lion, Steller sea lion, Transient killer whale, gray whale, humpback whale, Minke whale, harbor porpoise, Dall’s porpoise, bottlenose dolphin, and long-beaked common dolphin) that may occur in the vicinity of the project.

1.3 Project Purpose and Need

The WSDOT/WSF and the Federal Transit Administration (FTA) are proposing the Mukilteo Multimodal Project to improve the operations and facilities serving the mainland terminus of the Mukilteo-Clinton ferry route in Washington State. The ferry route is part of State Route (SR) 525, the major transportation corridor crossing Possession Sound, the portion of Puget Sound that separates Island County (Whidbey Island) from the central Puget Sound mainland. In 2011 the Mukilteo-Clinton route was WSF's busiest route for vehicle traffic and had the third highest total annual ridership, serving almost four million total riders.

The purpose of the Mukilteo Multimodal Project is to provide safe, reliable, and effective service and connection for general purpose transportation, transit, high occupancy vehicles (HOV), pedestrians, and bicyclists traveling between Island County and the Seattle/Everett metropolitan area and beyond. The Mukilteo ferry terminal has not had significant improvements for almost 30 years and needs key repairs. The existing facility is deficient in a number of aspects, such as safety, multimodal connectivity, capacity, and the ability to support the goals of local and regional long-range transportation and comprehensive plans. The project is intended to:

- Reduce conflicts, congestion, and safety concerns for pedestrians, bicyclists, and motorists by improving local traffic and safety at the terminal and the surrounding area that serves these transportation needs.
- Provide a terminal and supporting facilities with the infrastructure and operating characteristics needed to improve the safety, security, quality, reliability, efficiency, and effectiveness of multimodal transportation.
- Accommodate future demand projected for transit, HOV, pedestrian, bicycle, and general purpose traffic.

1.4 Project Setting and Land Use

The Mukilteo Ferry Terminal is located in the City of Mukilteo, Snohomish County, Washington. The terminal is located in Township 28 North, Range 4 East, Section 3, in Possession Sound. The new terminal would be approximately 1,700 feet (ft.) east of the existing terminal in Township 28N, Range 4E, Section 33 (Figure 1-2). Land use in the Mukilteo area is a mix of residential, commercial, industrial, and open space and/or undeveloped lands.

1.5 Project Description

WSF is proposing to relocate the Mukilteo Ferry Terminal approximately one-third of a mile east of the existing terminal. The Mukilteo terminal has not had significant improvements since the early 1980s and components of the facility are aging and do not meet current seismic standards. The current terminal layout makes it difficult for passengers to get in and out of the terminal and contributes to traffic congestion, safety concerns and conflicts between vehicle and pedestrian traffic. The new terminal will improve operations and multimodal connections and safety.

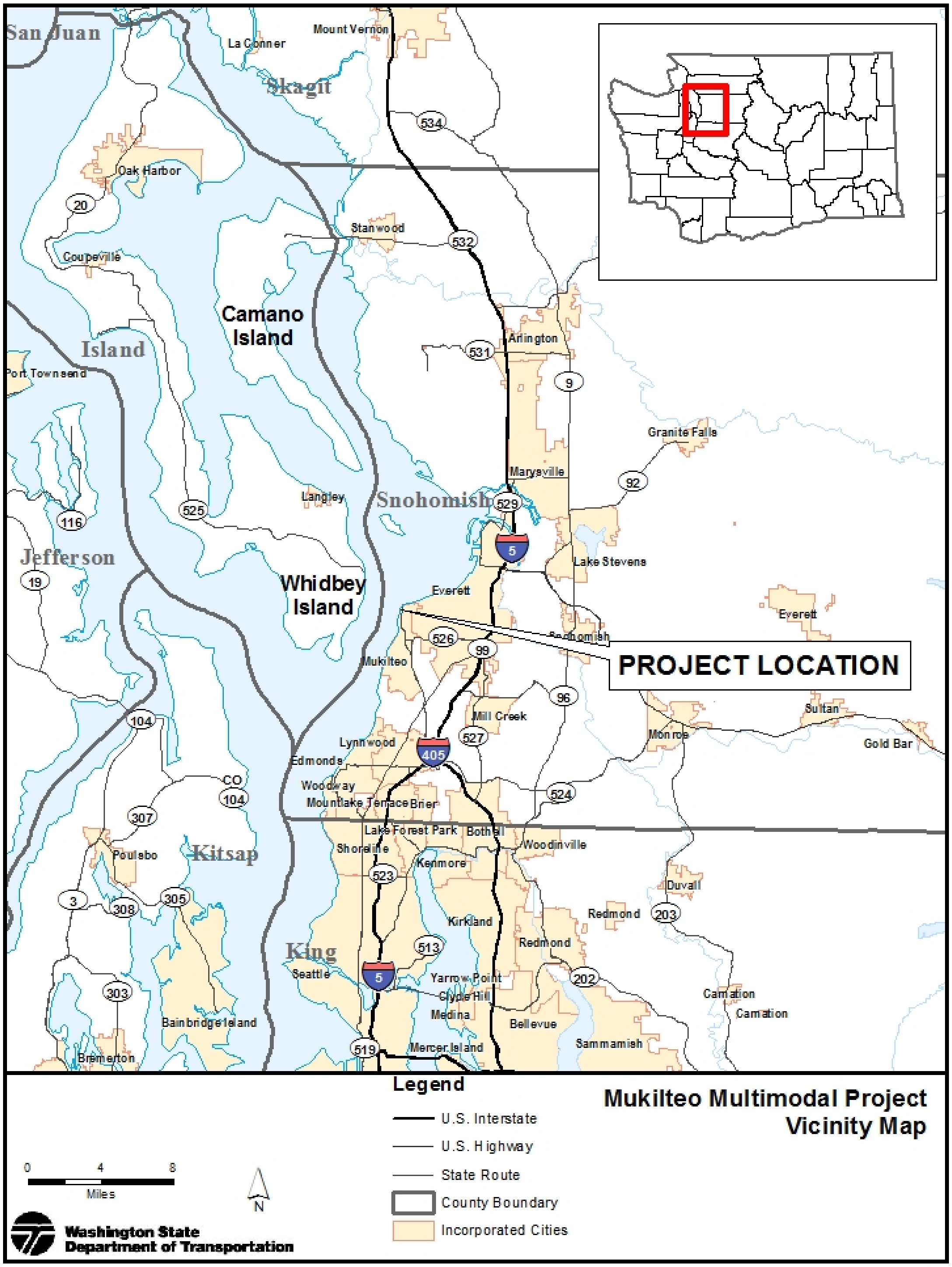

Figure 1-2. Location of Mukilteo Ferry Terminal and nearby features.

Phase 1 of the project, the removal of the tank farm pier, is complete. Phase 2 of the project is construction of the new terminal, which includes a new passenger and maintenance building, a supervisor's building, four new toll booths and a new transit center.

1.5.1 In-water Project Elements Completed in 2015/16 (Season 1)

1.5.1.1 Tank Farm Pier Removal and Navigation Channel

The U.S. Air Force built the Tank Farm Pier to load military ships and transport fuel, and it was in operation from 1950 until the late 1970's. Removal of the pier was necessary to construct the new ferry terminal.

The pier covered approximately 3.17 acres over-water and contained approximately 3,515 12-inch diameter creosote-treated piles, which were removed with a vibratory hammer or by direct pull. Demolition of the pier removed over 4,000 tons of creosote-treated timber from the aquatic environment.

Though demolition was to take approximately ten months spanning two in-water work windows, it was completed ahead of schedule, in eight months and spanned only one in-water work window (2015/16). Removal of the pier took place from land and from a barge containing a derrick, crane and other necessary equipment.

Dredging for a navigation channel for the ferry approach to the new terminal was also completed during this work window.

1.5.2 In-water Project Elements Completed in 2017/18 (Season 2)

1.5.2.1 Test Pile Project

A test pile project was implemented before major construction began. The purpose of the test pile project was to confirm pile load-bearing capacity. The test pile project consisted of driving two temporary 30-inch-diameter hollow steel piles, first with a vibratory hammer, then with an impact hammer to collect pile capacity data. The piles were driven in the upland and nearshore, in line with the location of the proposed permanent upland trestle foundation piles. The piles were removed with a vibratory hammer. During the test, acoustic monitoring was implemented to gather in-water noise data on flanking sound. Monitoring was implemented to protect species of concern and record permitted take.

1.5.2.2 Trestle and Terminal Building Piles

The trestle and portion of the terminal building will be supported by (25) 30-inch steel piles below mean higher high water (MHHW). The 30-inch trestle piles were installed with a vibratory hammer. Since these are load-bearing piles, they were proofed with an impact hammer.

1.5.2.3 In-water Ground Stabilization

The in-water slope waterward of the terminal building was stabilized with 134-steel H-piles in a grid pattern over a 4,500 square foot area. The H-piles were installed with a vibratory hammer fixed with a leader from a barge-mounted derrick. In its final configuration, the top of the pile was placed below the mud line. There was very little benthic disturbance because each H-pile occupies less than one square foot of substrate and was pushed below the mud line.

1.5.2.4 Stormwater Outfall

The proposed upland terminal design discharges 7.2 acres of impervious and 2.9 acres of pervious surface to two outfalls. The current design uses an existing outfall along Park Avenue and includes installation of a new outfall to the east of the Terminal Building. New outfall installation was to require temporary construction of a coffer dam consisting of 90 sheet piles, followed by dewatering and excavation on the beach to install the outfall. However a design change resulted in the use of another shoring technique to install the outfalls, which did not require the use of sheet pile in the water. Therefore, installation and removal of the 90 sheet piles was not needed.

1.5.3 In-water Project Elements to be Completed in 2018/19 (Season 3)

1.5.3.1 Overhead Loading Structure and Vehicle Transfer Span

The overhead loading structure design includes three 30-inch steel piles and one 120-inch drilled shaft. The vehicle transfer span will be supported by two 78-inch drilled shafts. Construction for the drilled shafts will require the contractor place temporary piles to access the shaft overwater.

The drilled shafts will be installed by first vibrating either the casings into the soil, depending on the location. The casing, which is a large-diameter steel pile that matches the size of the drilled shaft, will extend about 25 to 40 feet above the MLLW surface elevation. The casing will extend into the soil a minimum of 85 feet below the existing mudline, but the bottom of the drilled shaft will extend about 35 feet below the bottom of the casing.

Once the casing is placed, an auger will drill out soil on the inside of the casing and the soil will be placed on a barge by the auger. A slurry, which is made up of either bentonite or a synthetic polymer, will be used to prevent the hole from collapsing as the auger drills below the casing. The removed soil will be disposed of at an approved location, likely the approved in-water disposal site.

Once the shaft has been fully drilled, it will be filled with concrete, which will also displace the slurry inside the hole. The slurry will be suctioned off the top of the casing, ensuring that no slurry enters aquatic habitat. The total volume of concrete fill in the two vehicle transfer span shafts is approximately 250 cubic yards, and the volume for the overhead loading shaft is approximately 300 cubic yards.

Temporary platforms consisting of up to (65) 24-inch temporary piles may be needed, although it is likely that fewer piles will be required. The temporary piles will be vibrated into place then may require proofing for up to two to five feet to support construction equipment.

1.5.3.2 Public Fishing Pier

The public fishing pier will be supported by (26) 24-inch steel piles. The timber and composite floats located at the existing fishing pier will be rebuilt and relocated to the new fishing pier. An additional 80-foot by 5-foot gangway and an additional 8-foot by 15-foot float will be added at the waterward end of the gangway to meet ADA requirements. The additional float will be located above the location where the mud line is at approximately -32 feet MLLW.

1.5.3.3 Construction Fill Transport

Construction of the upland portions of the terminal will require approximately 58,000 tons of gravel fill. This material will be transported to the site using a barge. The size of the barge is estimated to be 75 feet by 250 feet, or 55 feet by 180 feet. The barge is proposed to moor and offload material along four of the relocated fishing pier's steel piles. To provide additional support for the moored barge, one temporary steel pile will be installed with a vibratory hammer as a breasting pile west of the fishing pier. The fill is proposed to be offloaded using an enclosed conveyor system temporarily located on the fishing pier piles.

1.5.4 Durations

The number of days it will take to complete construction of the new terminal facility depends on the difficulty in penetrating the substrate during pile installation. It is assumed that only one vibratory or impact hammer will be in operation at a time. Durations are conservative, and the actual amount of time to install and remove piles will likely be less. Duration estimates of each of the pile driving/removal elements are summarized in Table 1-2.

1.5.5 Project Schedule

Construction of the new terminal began in 2017, and the terminal will be operational in 2019. The existing terminal will be removed in 2019/2020 after the new facility is in operation. Regardless of the construction start date, the project will adhere to in-water work windows and BMPs described in this document.

All in-water work will be conducted during the Washington Department of Fish and Wildlife (WDFW) authorized work times in saltwater areas. The project is located within Tidal Reference Area 7. According to Washington Administrative Code (WAC) 220-660-330 (2016), the in-water work window in this area is July 15 through February 15. In-water work associated with this project will occur between August 1 and February 15.

Table 1-2. Season 3 In-water Pile Durations

Method	Pile Size (inch)	Season 3 Planned	Minutes per Pile	Duration (hours)	Piles per day	Days
Vibratory Drive	24	91	60	91	3	30
	30	16	60	16	3	5.5
	36	6	60	6	3	2
	78	2	60	2	2	1
	120	1	60	1	1	1
Vibratory Removal	24	65	15	16	3	5.5
	30	9	30	5	9	1
Impact Drive (proof)	24	91	15	23	3	30
Total				**160**		**75**

1.6 Project Activities

The proposed project has two activities involving noise production that may impact marine mammals: vibratory hammer driving and removal, and impact hammer driving.

1.6.1 Vibratory Hammer Driving and Removal

Vibratory hammers are commonly used in steel pile driving where sediments allow and involve the same vibratory hammer used in pile removal. The pile is placed into position using a choker and crane, and then vibrated between 1,200 and 2,400 vibrations per minute (Figure 1-3). The vibrations liquefy the sediment surrounding the pile allowing it to penetrate to the required seating depth, or to be removed. The type of vibratory hammer that will be used for the project will likely be an APE 400 King Kong (or equivalent) with a drive force of 361 tons.

Figure 1-3 Vibratory Hammer Driving a Steel Pile

1.6.2 Impact Hammer Installation

Impact hammers are used to install plastic/steel core, wood, concrete, or steel piles. An impact hammer is a steel device that works like a piston. Impact hammers are usually large, though small impact hammers are used to install small diameter plastic/steel core piles.

Impact hammers have guides (called a lead) that hold the hammer in alignment with the pile while a heavy piston moves up and down, striking the top of the pile, and drives it into the substrate from the downward force of the hammer on the top of the pile.

To drive the pile, the pile is first moved into position and set in the proper location using a choker cable or vibratory hammer. Once the pile is set in place, pile installation with an impact hammer can take less than 15 minutes under good conditions, to over an hour under poor conditions (such as glacial till and bedrock, or exceptionally loose material in which the pile repeatedly moves out of position). Figure 1-4 shows a pile being driven with an impact hammer.

Figure 1-4 Impact Hammer Driving a Steel Pile

1.7 Sound Levels and Noise Analysis

NOAA technical guidance requires application of dual criteria (Level A/B thresholds) to in-water noise analysis. Level A (permanent and temporary threshold shift) and Level B (harassment) are analyzed to understand the potential effects of in-water project noise on marine mammals.

1.7.1 Reference Underwater Vibratory Sound Source Levels

The project includes vibratory driving of 24-, 30-, 36-, 78- and 120-inch-diameter hollow steel pilings, and steel sheet piles. The project also includes vibratory removal of 24-inch and 30-inch diameter steel piles and steel sheet piles. Table 1-2 summarizes the estimated continuous noise levels generated by these piles.

Table 1-3. Summary of underwater vibratory sound source levels.

Method	Pile Diameter (In)	Estimated Noise Level
Installation	24	166 dB_{RMS}[1] at 10m
Removal	24	180 dB_{RMS}[2] at 10m
Installation	30	167 dB_{RMS}[3] at 10m
Removal	30	167 dB_{RMS}[3] at 10m
Installation	36	163 dB_{RMS}[4] at 11m
Installation	78	170 dB_{RMS}[5] at 15m
Installation	120	170 dB_{RMS}[5] at 15m
Total		

1.7.1.1 Vibratory Driving and Removal Level A Injury Take Analysis

Calculation and modeling of applicable ensonified zones are based on source measurements of comparable types and sizes of piles driven by a vibratory hammer during the Manette Bridge project (24-inch steel piles) (Laughlin 2010a), and the Port Townsend project (30-inch steel piles) (Laughlin 2011) within the Puget Sound. Source measurements collected during the Edmonds/Kingston Pile Reset project (Laughlin 2017a) were used to estimate source levels associated with vibratory removal of both 24-inch steel piles and sheet piles. Isopleths for injury zones are based on peak SPL (Lpk) and cumulative SEL (LE) dual criteria, whichever zone is larger.

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[1] Manette Bridge Vibratory Pile Driving Noise Measurements - Technical Memorandum. WSDOT Office of Air Quality and Noise. October 25, 2010.

[2] Edmonds/Kingston Pile Reset Acoustic Monitoring. Email from Jim Laughlin (WSDOT) to Rick Huey (WSF). WSDOT Office of Air Quality and Noise. October 30, 2017.

[3] Port Townsend Test Pile Project: Underwater Noise Monitoring Draft Final Report. WSDOT Office of Air Quality and Noise. November 10, 2010.

[4] Edmonds Ferry Terminal – Vibratory Pile Monitoring Technical Memorandum. WSDOT Office of Air Quality and Noise. October 20, 2011.

[5] Underwater Sound Levels Associated with Driving 72-inch Steel Piles at the SR529 Ebey Slough Bridge Replacement Project. WSDOT Office of Air Quality and Noise. March 2011. With no recordings of 120-inch steel shaft vibratory driving the vibratory data from SR 529 72-inch vibratory driving was used as a reasonable surrogate for 120-inch steel shaft vibratory driving. Pers. comm. J. Laughlin to R. Huey/J. Dreier. October 30, 2017.

For peak SPL (Lpk), distances to marine mammal injury thresholds were calculated using a simple geometric spread using a transmission loss coefficient of 15:

$$SL_{Measure} = EL + 15\log_{10}(R - D_{Measure})$$

where $SL_{Measure}$ is the measured source level in dB re 1 μPa, EL is the specific received level of threshold, $D_{Measure}$ is the distance (m) from the source where measurements were taken, and R is the distance (radius) of the isopleth to the source in meters.

For cumulative SEL (LE), distances to marine mammal exposure thresholds were computed using spectral modeling that incorporates frequency specific absorption. First, representative pile driving sounds recorded during the Manette Bridge, Port Townsend, and Edmonds/Kingston projects with vibratory hammers were used to generate power spectral densities (PSDs), which describe the distribution of power into frequency components composing that sound, in 1-Hz bins. Parserval's theorem, which states that the sum of the square of a function equals to the sum of the square of its transform, was applied to ensure that all energies within a given period of time for vibratory pile driving were captured through the fast Fourier transform, an algorithm that converts the signal from its original domain (in this case, time series) to a representation in frequency domain. For vibratory pile driving, broadband PSDs were generated from a series of continuous 1-second SEL. Broadband PSDs were then adjusted based on weighting functions of marine mammal hearing groups (Finneran 2016) by using the weighting function as a band-pass filter. For vibratory pile driving, cumulative exposures were computed by 1-second noise exposure by the duration need to drive on pile, then by the number of piles to be driven in a given day, as shown in the equation below:

$$E_{sum} = \sum_{i=1}^{N} E_{1s,i} \Delta t_i$$

where E_{1s} is the 1-second noise exposure, and Δt is the duration needed to install 1 pile by vibratory driving.

Frequency-specific transmission losses, TL(f), were then computed using practical spreading along with frequency-specific absorption coefficients that are computed with nominal seawater property (i.e., salinity = 35 psu, pH = 8.0) at 15oC at the surface by:

$$TL(f) = 15\log_{10}(R) + \alpha(f)R/1000$$

where α(f) in dB/km, and R is the distance (radius) of the specific isopleth to the source in meters. For broadband sources such as those from pile driving, the transmission loss is the summation of the frequency-specific results.

1.7.1.2 Background Noise and Vibratory Driving Level B Disturbance Take Analysis

Background noise is the sound level absent of the proposed activity (pile driving/removal in this case) while ambient sound levels are absent of human activity (NMFS 2009). Various factors contribute to background noise levels in marine waters: ship traffic, fishing boat depth sounders, waves, wind, rainfall, current fluctuations, chemical composition and biological sound sources (e.g., marine mammals, fish, shrimp) (Carr et al. 2006). Background noise levels are compared to the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) threshold levels designed to protect marine mammals to determine the zone of influence for noise sources.

In-water background sound level data are available for the Mukilteo Ferry Terminal area. These levels were measured as broadband and within different frequency ranges (Table 1-4). These data were collected and plotted as a Cumulative Distribution Function (CDF) during daytime hours per NMFS guidelines (NMFS 2009). The lowest frequency weighted background noise level (121 dB_{RMS}) was in four different frequency ranges. Since background sound levels are greater than the threshold value for Level B acoustical harassment of marine mammals exposed to continuous noise sources, the 121 dB_{RMS} background/threshold level is used to determine the harassment zone of influence for the Mukilteo project.

Table 1-4. In-water background noise data for the Mukilteo Ferry Terminal area.

Frequency Range	Functional Hearing Group	Species	50% CDF (dB)
7 Hz to 20 kHz	Low-frequency Cetaceans	Gray whale, humpback whale	124
75 Hz to 20 kHz	Phocid Pinnipeds	Seals	121
100 Hz to 20 kHz	Otariid Pinnipeds	Sea lions	121
150 Hz to 20 kHz	Mid-frequency Cetaceans	Killer whale	121
200 Hz to 20 kHz	High-frequency Cetaceans	Harbor porpoise, Dall's porpoise	121
1 Hz to 20 kHz	Broadband Background	Fish, marbled murrelet	124

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1.7.1.3 Underwater Vibratory Sound Source Verification Measurements

On November 7, 2017, WSDOT conducted site measurements of the Level B harassment zones from vibratory pile driving of a 30-inch diameter steel pile at the Mukilteo Ferry Terminal. The results show that underwater noise cannot be detected at a distance of 7.9 km (4.9 miles) (Laughlin 2017b). Average RMS values were higher than background sound levels at 7.6 km and 7.4 km (4.7 and 4.6 miles) from the source. It is assumed that the detection distance would be similar for 24-inch piles.

1.7.1.4 Reference Underwater Impact Sound Source Levels

The project includes proofing (impact driving) of 24-inch and 30-inch diameter hollow steel piles. A bubble curtain will be used to attenuate steel pile impact driving noise. Due to tidal fluctuations and the shallow location of some of these piles, a bubble curtain may not be feasible during all impact pile driving. Therefore, this analysis assumes a conservative assumption of unattenuated impact pile noise.

Based on in-water measurements during impact driving at the Coupeville Ferry Terminal, impact pile driving of a 24-inch steel pile generated 190 dB_{RMS} measured at 10 meters (Laughlin 2017c)

In-water measurements for impact driving of 30-inch diameter steel piles were collected at the Port Townsend Ferry Terminal. This pile size generated 183 dB_{RMS} measured at 10 meters (WSDOT 2014). Table 1-3 summarizes underwater vibratory sound source levels associated with this project.

1.7.1.5 Impact Driving Level A Injury Take Analysis

Calculation and modeling of applicable ensonified zones are based on source measurements of comparable types and sizes of piles driven by an impact hammer during the Colman test pile driving project within the Puget Sound (WSDOT 2016). Isopleths for injury zones are based on peak SPL (Lpk) and cumulative SEL (LE) dual criteria, whichever zone is larger.

For peak SPL (Lpk), distances to marine mammal injury thresholds were calculated using a simple geometric spread using a transmission loss coefficient of 15:

$$SL_{Measure} = EL + 15\log_{10}\left(R - D_{Measure}\right)$$

where $SL_{Measure}$ is the measured source level in dB re 1 µPa, EL is the specific received level of threshold, $D_{Measure}$ is the distance (m) from the source where measurements were taken, and R is the distance (radius) of the isopleth to the source in meters.

For cumulative SEL (LE), distances to marine mammal exposure thresholds were computed using spectral modeling that incorporates frequency specific absorption. First, representative pile driving sounds recorded during Colman test pile driving with impact hammers were used to generate power spectral densities (PSDs), which describe the distribution of power into frequency components composing that sound, in 1-Hz bins. Parserval’s theorem, which states that the sum of the square of a function equals to the sum of the square of its transform, was applied to ensure that all energies within a strike for impact pile driving were captured through the fast Fourier transform, an algorithm that converts the signal from its original domain (in this case, time series) to a representation in frequency domain. For impact pile driving, broadband PSDs were generated from SPLRMS time series of a total of 270 strikes with a time window that contains 95% of pulse energy.

For impact pile driving, cumulative exposures (Esum) were computed by multiplying the single RMS pressure squared by RMS pulse duration for the specific strike, then by the number of strikes required to drive one pile, then by the number of piles to be driven in a given day, as shown in the equation below:

$$E_{sum} = \sum_{i=1}^{N} p_{rms,i}^{2} \tau_i N_s$$

where P^2rms,i is the RMS pressure, τ is the RMS pulse duration for the specific strike, Ns is the anticipated number of strikes needed to install one pile, and N is the number of total piles to be installed.

Frequency-specific transmission losses, TL(f), were then computed using practical spreading along with frequency-specific absorption coefficients that are computed with nominal seawater property (i.e., salinity = 35 psu, pH = 8.0) at 15ºC at the surface by:

$$TL(f) = 15\log_{10}(R) + \alpha(f)R/1000$$

where ɑ(f) in dB/km, and R is the distance (radius) of the specific isopleth to the source in meters. For broadband sources such as those from pile driving, the transmission loss is the summation of the frequency-specific results.

1.7.1.6 Impact Driving Level B Disturbance Take Analysis

WSDOT has deployed bubble curtains at multiple locations, with noise attenuation ranging from 0-32 dB, and an overall average attenuation of 12 dB (WSDOT 2017). Assuming a more conservative range of 8-10 dB reduction, a worst-case noise level for impact driving of 24-inch steel test piles will be 180-182 dB_{RMS} (190-10/8) at 10 m. However, due to tidal fluctuations and the shallow location of some of these piles, a bubble curtain may not be effective during all impact pile driving. Therefore, this analysis conservatively assumes unattenuated impulsive noise.

The NOAA/NMFS practical spreading model (sound transmission loss of 4.5 dB per doubling distance) was used to determine the distance where underwater impulsive noise will attenuate to the 160 dB_{RMS} background/disturbance sound level for all marine mammals.

1.7.2 Underwater Transmission Loss

Underwater transmission loss has been described by Burgess et al. (2005):

> As sound propagates away from its source, several factors act to change its amplitude. These factors include the spreading of the sound over a wider area (spreading loss), losses to friction between water or sediment particles that vibrate with the passing sound wave (absorption), scattering and reflections from boundaries and objects in the sound's path, and constructive and destructive interference with one or more reflections of the sound off the surface or seafloor. The sound level that one would actually measure at any given distance from the source includes all these effects, and is called the received level. Received levels differ in dimensions from source levels, and the two cannot be directly compared. Received levels of underwater sound are usually presented in dB re 1 micro-Pascal (μPa), whereas the idealized source level at a distance of 1 m from the source is presented in dB re 1 μPa-m. The sum of all propagation and loss effects on a signal is called the transmission loss.

Transmission loss (TL) is characterized by the following equation:

$$TL = B*\log_{10}(R) + C*R$$

Where **B** represents the logarithmic (predominantly spreading) loss, **C** the linear (scattering and absorption) loss, and **R** the range from the source in meters.

Transmission-loss parameters vary with frequency, temperature, sea conditions, source depth, receiver depth, water depth, water chemistry, and bottom composition and topography. Logarithmic loss **B** is typically between 10 dB (10 Log R cylindrical spreading) and 20 dB (20 Log R spherical spreading). Linear loss **C** has several physical components, including absorption in seawater, absorption in the sub-bottom, scattering from in-homogeneities in the water column and from surface and bottom roughness, and (for RMS levels of transient pulses) temporal pulse-spreading (Greeneridge 2007). Linear loss is also a function of frequency and is less a factor in the lower frequencies in which pile driving sounds dominate. Further, linear loss is site-specific, which is why there is no generally accepted **C** value for estimating linear loss in the broadband.

NMFS has requested that the 15 Log R practical (or semi-cylindrical) spreading model, without considering for linear loss, be used to estimate distances to marine mammal noise thresholds.

1.7.3 Airborne Reference Sound Source Levels

While in-air sounds are not applicable to cetaceans, they are to pinnipeds, especially harbor seals when hauled out. Loud noises can cause hauled out seals to panic back into the water, leading to disturbance and possible injury to stampeded pups.

No unweighted in-air data is available for vibratory driving of most of the pile types and sizes associated with the Mukilteo project. Based on in-air measurements at the Vashon Ferry Terminal, vibratory driving of a 30-inch steel pile generated a maximum of 96.9 dB_{RMS} (unweighted) at 50 ft. (Laughlin 2010b). It is assumed that in-air noise generated during vibratory driving of 24- and 36-inch diameter steel piles, 78- and 120-inch diameter drilled steel shafts, and steel sheet piles will generate the same source level (96.9 dB_{RMS}). It is also assumed that vibratory removal of these piles will generate the same source level.

Based on in-air measurements at the WSF Port Townsend Ferry Terminal, impact pile driving of a 24-inch steel pile generated 108 dBA at 50 feet. Impact pile driving of a 30-inch steel pile generated 110 dBA (Laughlin 2015).

1.7.4 Attenuation to NMFS Thresholds

NMFS has established disturbance and injury noise thresholds for marine mammals (Table 1-5). Determining the area(s) exceeding each threshold level (the zone of influence [ZOI]/zone of exclusion [ZOE]) is necessary to estimate the number of animals for the Level B acoustical harassment take request, and to establish a monitoring area. Note that for vibratory disturbance, the Mukilteo background of 121 dB_{RMS} will be used. Attenuation to thresholds are provided in Table 1-6.

Table 1-5. Injury and Disturbance Thresholds for Underwater and Airborne Noise

Marine Mammals	Airborne Noise Level at which Pinniped Haul-out Disturbance has been Documented	Vibratory Driving In-water Disturbance Threshold	Vibratory Driving In-water Injury Threshold	Impact Driving In-water Disturbance Threshold	Impact Driving In-water Injury Threshold
Low-frequency cetaceans	N/A	120 dB_{RMS}	199 dB SEL_{cum}	160 dB_{RMS}	183 dB_{RMS}
Mid-frequency cetaceans	N/A	120 dB_{RMS}	198 dB SEL_{cum}	160 dB_{RMS}	185 dB_{RMS}
High-frequency cetaceans	N/A	120 dB_{RMS}	173 dB SEL_{cum}	160 dB_{RMS}	155 dB_{RMS}
Phocid pinnipeds	90 dB_{RMS} (unweighted) for harbor seals	120 dB_{RMS}	201 dB SEL_{cum}	160 dB_{RMS}	185 dB_{RMS}
Otariid pinnipeds	100 dB_{RMS} (unweighted) for all other pinnipeds	120 dB_{RMS}	219 dB SEL_{cum}	160 dB_{RMS}	203 dB_{RMS}

1.7.4.1 Vibratory Driving (Underwater Noise)

WSDOT conducted site measurements of the Level B harassment zone from vibratory pile driving of a 30-inch steel pile at the Mukilteo Ferry Terminal in November 2017 (Laughlin 2017b). The results show that underwater noise cannot be detected at a distance of 8.0 km (5.0 miles) for 30-inch piles; therefore, this distance will be used to define the vibratory ZOI for 24- and 30-inch steel piles.

The underwater ZOI and ZOEs for vibratory driving and removal of piles are provided in Table 1-6.

1.7.4.2 Impact Pile Driving of 24-inch Steel Piles (Underwater Noise)

The NOAA/NMFS practical spreading model was used to determine the distance where underwater noise will attenuate to the 160 dB_{RMS} disturbance threshold level. The injury ZOEs were determined using the methods described in Section 1.6.2.1 (Laughlin 2017d).
The ZOI and ZOEs associated with impact pile driving of 24-inch diameter steel piles are provided in Table 1-6.

Table 1-6. Marine Mammal ZOE and ZOI Distances

Installation Method	Pile Size (inches)	ZOE Distance (m)					ZOI (km)
		LF Cetacean	MF Cetacean	HF Cetacean	Phocid	Otariid	
Vibratory Install	24	35	10	85	25	10	8.0
	30	25	10	35	10	10	8.0
	36	10	10	10	10	10	8.0
	78	10	10	105	25	10	20.0*
	120	55	10	65	10	10	20.0*
Vibratory Removal	24	105	10	**275****	**55****	10	8.0
	30	25	10	55	10	10	8.0
Impact	24	10	10	10	10	10	1.0

*maximum distance to land vs. 28 km modeled distance
**Shutdown ZOEs (55m for pinnipeds, 10 m Otariid shutdown implemented only if necessary)

1.7.4.3 In-Water Noise Measurements During Construction

During the project, in-water noise measurements of vibratory pile driving and removal, and impact driving may be taken to determine if the ZOEs/ZOIs need to be modified. If the ZOEs/ZOIs are modified, the marine mammal monitoring program will be adjusted to ensure that injury is prevented, and harassment take is adequately monitored. This could result in either a larger, or smaller monitoring effort, as appropriate.

1.7.4.4 Vibratory Pile Driving or Removal Safety Zone/Zone of Exclusion

The purpose of the safety zone/Zone of Exclusion (ZOE) is to ensure that noise-generating activities avoid or limit Level A take.

WSF is proposing a shutdown ZOE of 275 m for cetaceans and 55 m for pinnipeds.

1.7.4.5 Vibratory and Impact Pile Driving Airborne Noise

NMFS has established an in-air noise disturbance threshold of 90 dB_{RMS} (unweighted) for harbor seals, and 100 dB_{RMS} (unweighted) for all other pinnipeds (sea lions).

The project includes vibratory driving/removal of 24-inch diameter steel piles and steel sheet piles. The project also includes vibratory driving of 30- and 36-inch diameter steel piles, and 78- and 120-inch diameter steel shafts. Impact pile driving of 24- and 30-inch diameter steel piles will also be conducted.

In-air thresholds will be reached at the following distances:

- Noise generated during vibratory installation and/or removal of hollow steel piles, H-piles, and sheet piles (96.9 dB at 50 feet) will reach the harbor seal threshold at approximately 34 m/111 ft., and is below the other pinnipeds threshold.
- 24-inch and 30-inch diameter steel pile impact driving (110 dBRMS at 50 feet) will reach the harbor seal threshold at approximately 152 m/500 ft., and the sea lion threshold at approximately 48 m/158 ft.

The nearest documented harbor seal haul out site to the Mukilteo Ferry Terminal is approximately 4 miles northeast on log rafts present in the East Waterway of Port Gardener Harbor (Figure 3-2). The closest documented California sea lion haul out sites to the Mukilteo Ferry Terminal are 3.2 miles northeast on the Everett Harbor buoys (Figure 3-2). The number of California sea lions using the buoys is less than 20 (Jeffries, et al. 2000).

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2.0 Dates, Duration, and Region of Activity

The date(s) and duration of such activity and the specific geographical region where it will occur.

2.1 Dates

Due to National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) in-water work timing restrictions to protect ESA-listed salmonids, planned WSF in-water construction is limited each year to July 15 through February 15. For this project, in-water construction is planned to take place between August 1, 2018 and February 15, 2019.

2.2 Duration

Durations are provided in Table 2-1.

Table 2-1. Durations

Method	Pile Size (inch)	Season 3 Planned	Minutes per Pile	Duration (hours)	Piles per day	Days
Vibratory Drive	24	91	60	91	3	30
	30	16	60	16	3	5.5
	36	6	60	6	3	2
	78	2	60	2	2	1
	120	1	60	1	1	1
Vibratory Removal	24	65	15	16	3	5.5
	30	9	30	5	9	1
Impact Drive (proof)	24	91	15	23	3	30
Total				**160**		**75**

2.3 Region of Activity

The proposed activities will occur at the Mukilteo Ferry Terminal located in the City of Mukilteo, Washington (see Figures 1-1 and 1-2).

3.0 Species and Numbers of Marine Mammals in Area

This section is a combination of items 3 and 4 from NOAA's list of information required for an incidental take authorization. It provides:

The species and numbers of marine mammals likely to be found within the activity area.

A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities.

It also describes the ESA and MMPA status for each species. Possible ESA status designations include:

- Threatened: "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."
- Endangered: "any species which is in danger of extinction throughout all or a significant portion of its range."
- Proposed: *candidate species* that were found to warrant listing as either threatened or endangered and are officially proposed as such in a *Federal Register* notice.
- Delisted: No longer listed under the ESA.
- Unlisted: Not currently listed under the ESA.

Possible MMPA status designations include:

- Strategic: a marine mammal stock for which the level of direct human-caused mortality exceeds the potential biological removal level; which, based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; or which is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA.
- Depleted: the Secretary, after consultation with the Marine Mammal Commission and the Committee of Scientific Advisors on Marine Mammals established under MMPA title II, determines that a species or population stock is below its optimum sustainable population; a State, to which authority for the conservation and management of a species or population stock is transferred under section 109, determines that such species or stock is below its optimum sustainable population; or a species or population stock is listed as a threatened or endangered species under the ESA.
- Non-depleted: a species or population stock is at or above its optimum sustainable population (NMFS 2013a).

3.1 Species Present

Thirteen species of marine mammals may be found in the Mukilteo Ferry Terminal area (Table 3-1).

Table 3-1. Marine Mammal Species Potentially Present in Region of Activity

Species	ESA Status	MMPA Status	Timing of Occurrence	Frequency of Occurrence
Harbor seal	Not listed	Non-depleted	Year-round	Common
Northern Elephant seal	Not listed	Non-depleted	Year-round	Rare
California sea lion	Not listed	Non-depleted	August-April	Common
Steller sea lion	Delisted	Non-strategic	August-April	Rare
Killer whale (Southern Resident)	Endangered	Depleted	September - May	Infrequent
Killer whale (Transient)	Not listed	Depleted	Year-round	Infrequent
Gray whale	Delisted	Unclassified	January-May	Occasional
Humpback whale (Central America DPS)	Endangered	Depleted	Year-round	Rare
Humpback whale (Mexico DPS)	Threatened	Depleted	Year-round	Common
Humpback whale (Hawaii DPS)	Not listed	Depleted	Year-round	Common
Minke whale	Not listed	Non-depleted	September-January	Occasional
Harbor porpoise	Not listed	Non-depleted	May-June peak	Occasional
Dall's porpoise	Not listed	Non-depleted	October-February	Occasional
Long-beaked common dolphin	Not listed	Non-depleted	Year-round	Rare
Bottlenose dolphin	Not listed	Non-depleted	Year-round	Rare

3.2 The Whale Museum Marine Mammal Sightings Data

The Whale Museum (TWM), located in Friday Harbor, San Juan Island, has the most extensive marine mammal sighting database for the Salish Sea (Georgia Basin/Strait of San Juan de Fuca/Puget Sound). WSF requested that TWM analyze sightings data for the project area for the years 2010 to 2016, in the August to February timeframe scheduled for this project.

In the analysis of sightings data, multiple reports of marine mammals in the same region on the same day may possibly be the same individuals; therefore 'whale days' is used for southern resident killer whale (SRKW) sightings, and 'sighting days' is used for other marine mammals, rather than the number of sightings. A whale/sighting day is any day an SRKW/marine mammal is reported in a given area, regardless of the number of times they were reported that day.

Sightings data are assigned to a geographic quadrant, which are grid cells roughly 4.6 kilometers by 4.6 kilometers that were developed for reporting SRKW sightings before GPS units were readily available. Figure 3-1 shows the quadrants in the Mukilteo area, including the quadrants of interest for the project. The Zone of Influence (ZOI; in red) intersects with six quadrants: 381-386.

As sightings are opportunistic and SRKW can travel large distances in a day (approximately100 miles), it is important to analyze this data set across a region, rather than just single quadrants.

The primary area of interest in the analysis is the ZOI quadrants; however, since the project will be conducted in 'Area 2: Puget Sound' of the designated SRKW critical habitat, it is appropriate to include analyses at that geographic scale. Since there is a good chance that whales will be missed within a specific quadrant, a larger area is analyzed as well for comparison to the single quadrants. TWM included waters directly to the north of the quadrants as reports of SRKW travelling through Deception Pass are rare, so the whales most likely would have had to ,pass through the quadrants of concern to reach the more northerly areas. TWM designated this area as "Island County".

Because other marine mammals (to a lesser degree than whales), can also travel across multiple quadrants, a conservative analysis approach was also taken. Marine mammal sightings days reported will also be for the Mukilteo ZOI quadrants and the Island County quadrants.

It should be noted that data for marine mammals other than SRKW, gray, humpback, and transient killer whales (such as pinnipeds, porpoise and minke whale) are collected in an opportunistic fashion. Pinnipeds and porpoise are probably present in the ZOI close to 365 days per year. The sightings data should be considered an absolute minimum number of sightings for those species in the area (TWM 2017).

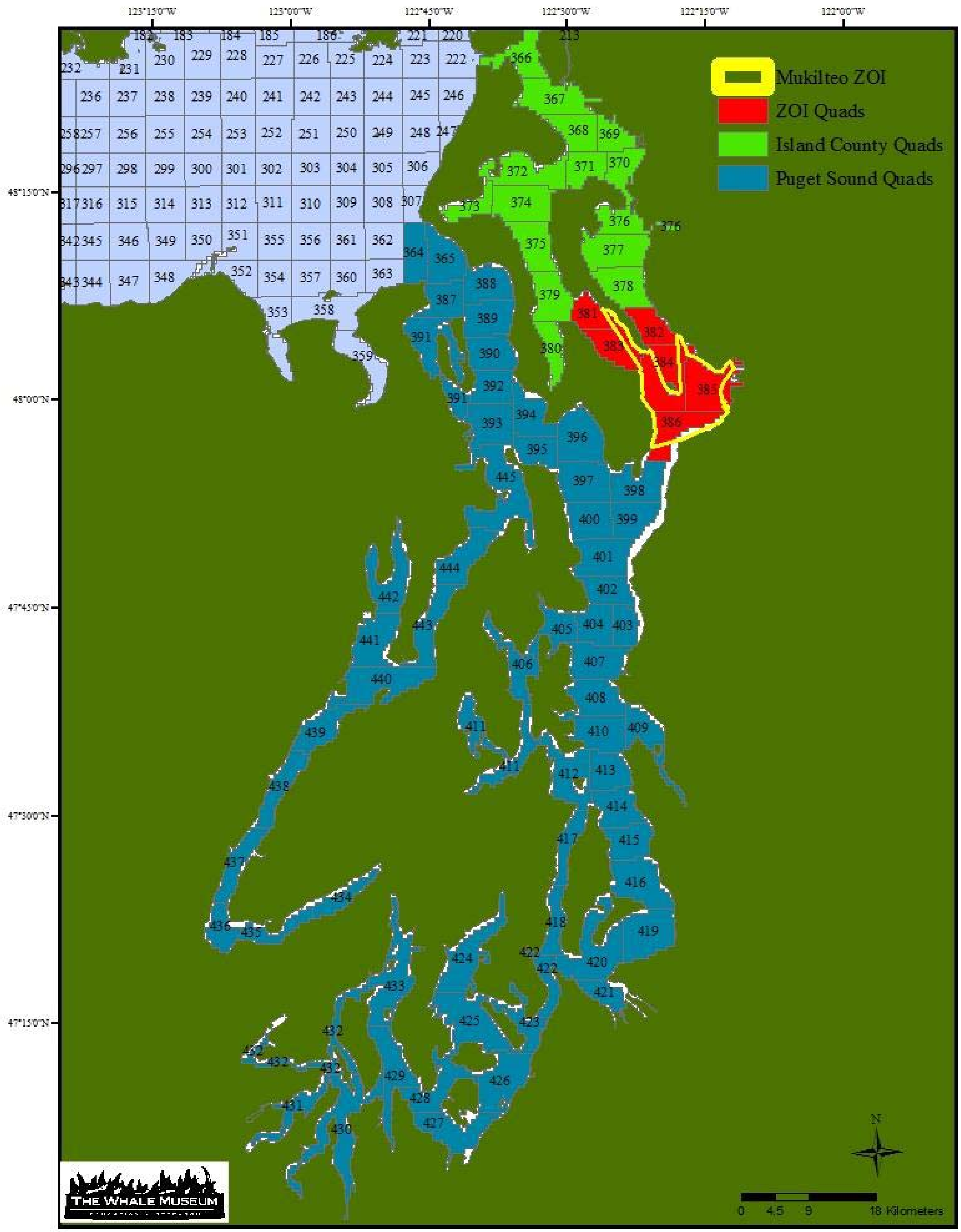

Figure 3-1 ZOI + Area Quads

3.3 Pinnipeds

There are four species of pinnipeds that may be found in the Mukilteo Ferry Terminal area: harbor seal (*Phoca vitulina richardsi*), Northern Elephant seal (*Mirounga angustirostris*), California sea lion (*Zalophus californianus*) and Steller sea lion (*Eumetopias jubatus*).

3.3.1 Harbor Seal

There are three stocks in Washington's inland waters, the Hood Canal, Northern Inland Waters, and Southern Puget Sound stocks. Seals belonging to the Northern Inland Waters Stock are present at the project site. Pupping seasons vary by geographic region. For the northern Puget Sound region, pups are born from late June through August (WDFW 2012). After October 1 all pups in the inland waters of Washington are weaned. Of the pinniped species that commonly occur within the region of activity, harbor seals are the most common and the only pinniped that breeds and remains in the inland marine waters of Washington year-round (Calambokidis and Baird 1994).

3.3.1.1 Numbers

In 1999, Jeffries et al. (2003) recorded a mean count of 9,550 harbor seals in Washington's inland marine waters, and estimated the total population to be approximately 14,612 animals (including the Strait of Juan de Fuca). According to the 2014 Stock Assessment Report, the most recent estimate for the Washington Northern Inland Waters Stock is 11,036 (NMFS 2014). No minimum population estimate is available. However, there are an estimated 32,000 harbor seals in Washington today, and their population appears to have stabilized (Jeffries 2013), so the estimate of 11,036 may be low.

3.3.1.2 Status

The Washington Inland Waters stock of harbor seals is "non-depleted" under the MMPA and "unlisted" under the ESA.

3.3.1.3 Distribution

Harbor seals are the most numerous marine mammal species in Puget Sound. Harbor seals are non-migratory; their local movements are associated with such factors as tides, weather, season, food availability and reproduction (Scheffer and Slipp 1944; Fisher 1952; Bigg 1969, 1981). They are not known to make extensive pelagic migrations, although some long-distance movements of tagged animals in Alaska (108 miles) and along the U.S. west coast (up to 342 miles) have been recorded (Pitcher and McAllister 1981; Brown and Mate 1983; Herder 1983).

Harbor seals haul out on rocks, reefs and beaches, and feed in marine, estuarine and occasionally fresh waters. Harbor seals display strong fidelity for haul out sites (Pitcher and Calkins 1979; Pitcher and McAllister 1981). The nearest documented harbor seal haul out site to the Mukilteo Ferry Terminal is approximately 4 miles northeast on log rafts present in the East Waterway of

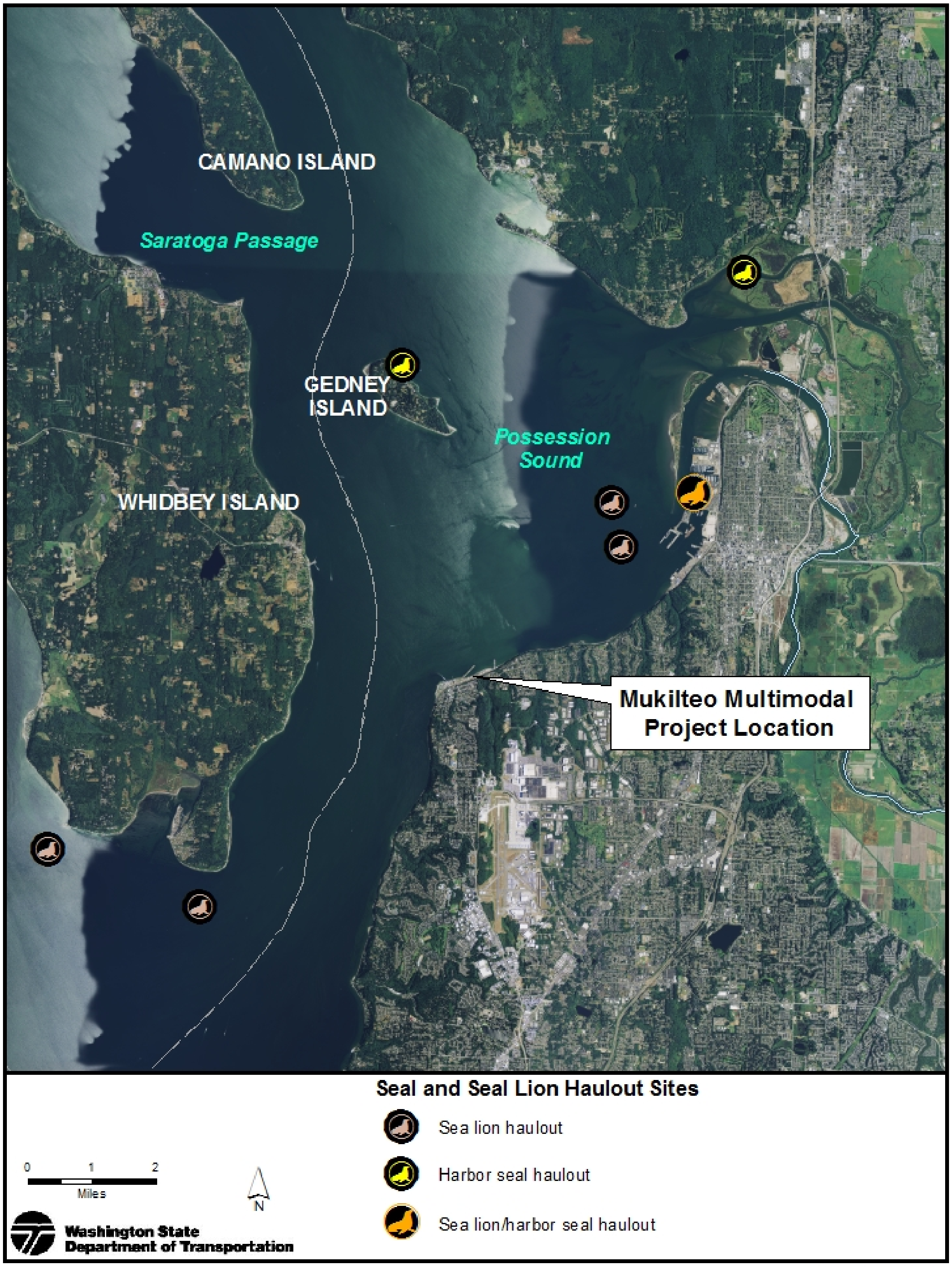

Figure 3-2. Pinniped haul outs in the Mukilteo project vicinity

Port Gardener Harbor (Figure 3-2). The level of use of this haul out during the fall and winter is unknown, but is expected to be much less as air temperatures become colder than water temperatures resulting in seals in general hauling out less (H. Huber pers. comm. 2010).

3.3.1.4 Species Observations and Data

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, 367 harbor seals were observed within the ZOI, with a one day high of 26 individuals on October 8, 2015 (Table 3-2)(WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 1,703 harbor seals were observed within the ZOIs, with a one day high of 72 individuals on October 24, 2017 (Table 3-2)(WSDOT 2018). Provisional Level A harbor seal take is requested within 55 m of pile work. Over 51 days, 150 harbor seals were observed within 55 m (3/day).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum (2017) reported no sightings days for harbor seals in the Mukilteo ZOI quadrants (red) and three sightings days in the Island County quadrants (green) shown in Figure 3-1 (Table 3-2). It should be noted that pinnipeds are not reported at the same rate as large cetaceans, and harbor seals are likely present throughout the year in Puget Sound.

Table 3-2. Harbor Seal Sightings 2010-2018

Source of Sightings	Location	Dates	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Mukilteo Multimodal Project (2015)	Mukilteo ZOI	August-November 2015	34	84	183	31*	-	-	-
Mukilteo Multimodal Project (2017/18)	Mukilteo ZOIs	September 2017-February 2018	-	79*	545	306	497	256	-
The Whale Museum (2017)	Mukilteo ZOI and Island County Quadrants	2010-2016	1	1	2	0	1	0	0

*One week only

From 2012 to 2015, the U.S. Navy collected sightings data of pinnipeds hauled out or swimming in the vicinity of the log rafts and security fences at Naval Station Everett (located 3.5 miles northeast of the Mukilteo Multimodal Project site). In the August to February timeframe scheduled for this project, the Navy reported a monthly average of 103 harbor seals, with a high single survey count of 379 in September 2013 (U.S. Navy 2016) (Figure 3-3).

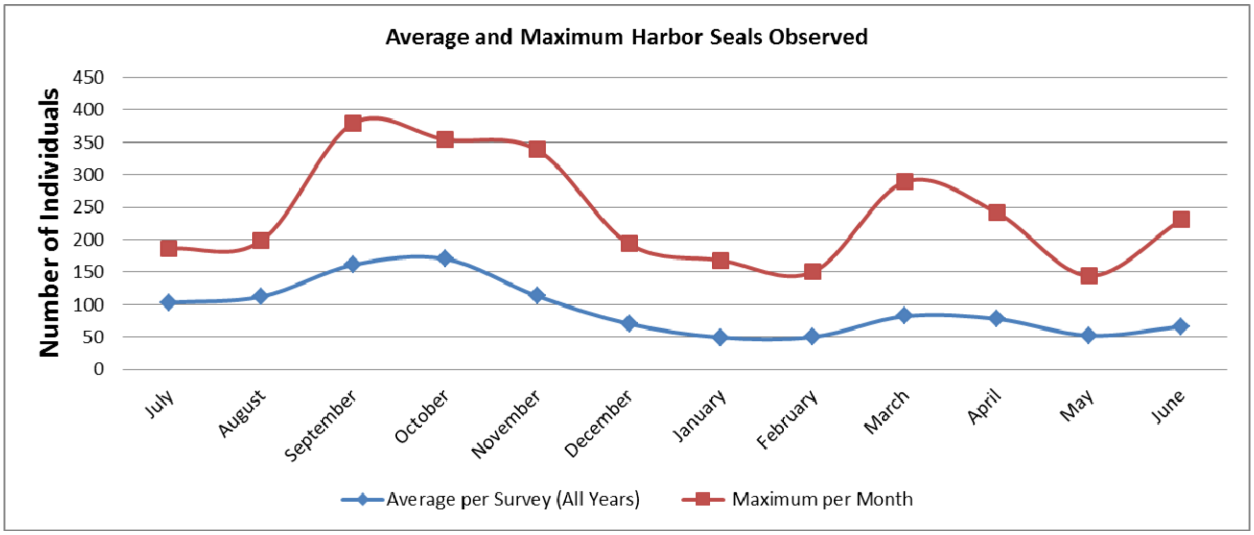

Figure 3-3. Average and maximum harbor seal counts by month at Naval Station Everett, 2012-2015 (U.S. Navy 2016)

According to the NMFS National Stranding Database, there were several confirmed harbor seal strandings in the Snohomish and Island County areas between 2006 and 2015, in the August-February work window scheduled for this project (Figure 3-4) (NMFS 2016a).

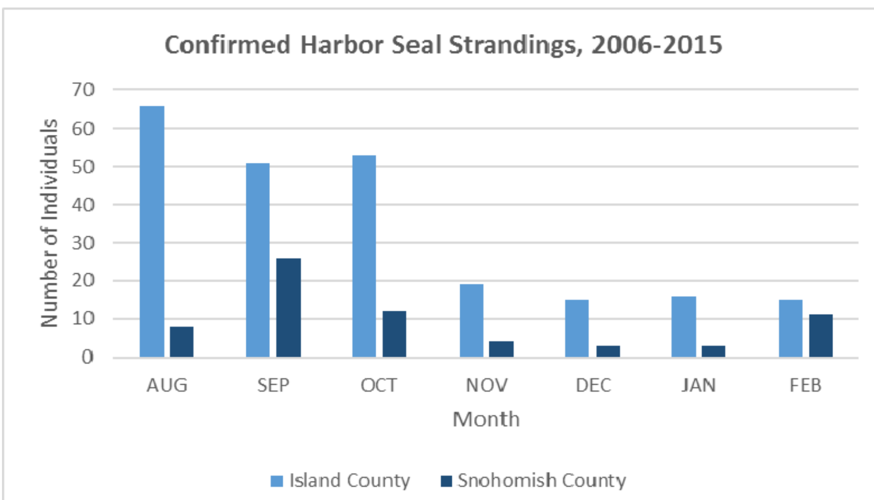

Figure 3-4. Confirmed harbor seal strandings during the August to February work window.

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of harbor seals in the Mukilteo area as a range between 1.22 to 2.21 animals per square kilometer.

3.3.2 Northern Elephant Seal

The California breeding stock of Northern Elephant seal (*Mirounga angustirostris*) may be present near the project site.

3.3.2.1 Numbers

The California stock of Northern Elephant seal minimum population size is estimated very conservatively as 81,368 (NMFS 2015a). In Puget Sound and the Strait of San Juan de Fuca, 10 to 15 Northern Elephant seal pups are born each year on Whidbey, Protection, and Smith Islands, Dungeness Spit and Race Rocks. The population in the Salish Sea appears to be rising (Orca Network 2015a). Using a multiplier of 4.4 (NMFS 2015a) with the maximum pup count of 15, the Salish Sea population could be as large as 66 individuals.

3.3.2.2 Status

The California breeding stock of Northern Elephant seal is not ESA listed, and not considered a “depleted” or “strategic” stock under the MMPA (NMFS 2015a).

3.3.2.3 Distribution

Northern Elephant seals breed and give birth in California (U.S.) and Baja California (Mexico), primarily on offshore islands, from December to March. Males feed near the eastern Aleutian Islands and in the Gulf of Alaska, and females feed further south. Adults return to land between March and August to molt, with males returning later than females. Adults return to their feeding areas again between their spring/summer molting and their winter breeding seasons (NMFS 2015a).

The closest documented Northern Elephant seal haul out is Protection Island (30 miles northwest of the ferry terminal).

Elephant seals also use area beaches as haul outs, such as a female elephant seal that has been coming to a south Whidbey beach to rest while molting each spring for several years, and recently gave birth to a pup. Male elephant seals have also been observed in Puget Sound, as far south as Vashon Island (Miller 2015 personal comm. 4/6/15).

3.3.2.4 Species Observations and Data

WSF Protected Species Observer Burt Miller has made several non-work sightings. On April 6, 2015 a male Northern Elephant seal was sighted near Maury Island (39 miles south of Mukilteo). On August 10, 2017 a Northern Elephant seal was sighted near Maury Island, and another on August 11, 2017 on south side of Alki Point (205 miles south). Possibly the same seal given the location and dates (Miller 2015/2017).

In March of 2015, Orca Network reported a female Northern Elephant seal and pup hauled out on a Whidbey Island beach (13 miles west of Mukilteo), and a male near Shoreline headed north (18 miles south)(Orca Network 2015a).

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, no Northern Elephant seals were observed within the ZOI (WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, no Northern Elephant seals were observed within the ZOIs (WSDOT 2018).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum (2017) reported no sightings days for Northern Elephant seals in the Mukilteo ZOI nor the Island County quadrants. It should be noted that pinnipeds are not reported at the same rate as large cetaceans.

According to the NMFS National Stranding Database, there were two confirmed Northern Elephant seal strandings in the Snohomish and Island County areas between 2006 and 2015, in the August-February work window scheduled for this project (NMFS 2016a).

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of Northern Elephant seals in the Mukilteo area as 0.00001 animals per square kilometer.

3.3.3 California Sea Lion

Washington California sea lions are part of the U.S. stock, which begins at the U.S./Mexico border and extends northward into Canada.

3.3.3.1 Numbers

The minimum population size of the U.S. stock was estimated at 296,750 in 2011. More recent pup counts made in 2011 totaled 61,943, the highest recorded to that date. Estimates of total population size based on these counts are currently being developed (NMFS 2015b). Some 3,000 to 5,000 animals are estimated to move into northwest waters (both Washington and British Columbia) during the fall (September) and remain until the late spring (May) when most return to breeding rookeries in California and Mexico (Jeffries et al. 2000; J. Calambokidis pers. comm. 2008). Peak counts of over 1,000 animals have been made in Puget Sound (Jeffries et al. 2000).

The nearest documented California sea lion haul out sites to the Mukilteo ferry terminal are 3.5 miles northeast on the Everett Harbor buoys (Figure 3-3). The number of California sea lions using the buoys is less than 20 (Jeffries, et al. 2000).

3.3.3.2 Status

California sea lions are not listed as endangered or threatened under the ESA or as depleted under the MMPA. They are not considered a strategic stock under the MMPA, because total human-caused mortality, although unknown, is likely to be well less than the PBR (9,200) (NMFS 2015b).

3.3.3.3 Distribution

California sea lions breed on islands off Baja Mexico and southern California with primarily males migrating north to feed in the northern waters (Everitt et al. 1980). Females remain in the waters near their breeding rookeries off California and Mexico. All age classes of males are seasonally present in Washington waters (Jeffries, et al. 2000).

California sea lions were unknown in Puget Sound until approximately 1979 (Steiger and Calambokidis 1986). Everitt et al. (1980) reported the initial occurrence of large numbers at Port Gardner, Everett (northern Puget Sound) in the spring of 1979. The number of California sea lions using the Everett haul out numbered around 1,000. This haul out remains the largest in the state for sea lions in general and for California sea lions specifically (P. Gearin pers. comm. 2008). Similar sightings and increases in numbers were documented throughout the region after the initial sighting in 1979 (Steiger and Calambokidis 1986), including urbanized areas such as Elliott Bay near Seattle and heavily used areas of central Puget Sound (P. Gearin et al. 1986). In Washington, California sea lions use haul out sites within all inland water regions (Jeffries, et al. 2000). The movement of California sea lions into Puget Sound could be an expansion in range of a growing population (Steiger and Calambokidis 1986).

California sea lions do not avoid areas with heavy or frequent human activity, but rather may approach certain areas to investigate. This species typically does not flush from a buoy or haul out if approached.

3.3.3.4 Species Observations and Data

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, 345 California sea lions were observed within the ZOI, with a one day high of 30 individuals on October 22, 2015 (Table 3-3)(WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 708 California sea lions were observed within the ZOIs, with a one day high of 29 individuals on January 18, 2018 (Table 3-3)(WSDOT 2018). Provisional Level A California sea lion take is requested within 55 m of pile work. Over 51 days, 43 harbor seals were observed within 55 m (1/day).

For the years 2011 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum reported one sightings day for California sea lions in the Mukilteo ZOI quadrants (red) and eight sightings days in the Island County quadrants (green) shown in Figure 3-1 (TWM 2017) (Table 3-3). It should be noted that pinnipeds are not reported at the same rate as large cetaceans.

Table 3-3 California Sea Lion Sightings 2010-2018

Source of Sightings	Location	Dates	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Mukilteo Multimodal Project (2015)	Mukilteo ZOI	August-November 2015	22	113	157	24*	-	-	-
Mukilteo Multimodal Project (2017/18)	Mukilteo ZOIs	September 2017-February 2018	-	54*	139	100	234	181	-
The Whale Museum (2017)	Mukilteo ZOI and Island County Quadrants	2010-2016	0	0	0	1	1	4	3

*One week only

From 2012 to 2015, the U.S. Navy collected sightings data of pinnipeds hauled out or swimming in the vicinity of the log rafts and security fences at Naval Station Everett (located 3.5 miles northeast of the Mukilteo Multimodal Project site). In the August to February timeframe scheduled for this project, the Navy reported a monthly average of 50 California sea lions, with a high single survey count of 132 in October 2014 (U.S. Navy 2016) (Figure 3-4).

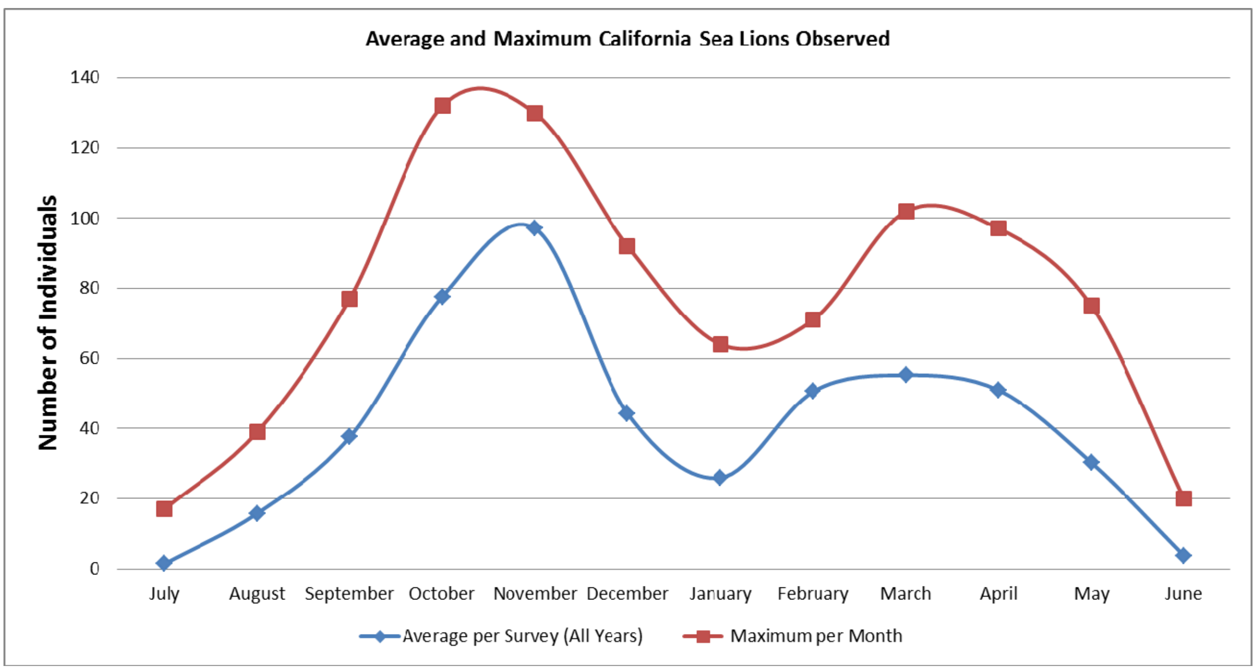

Figure 3-5. Average and maximum California sea lion counts by month at Naval Station Everett, 2012-2015 (U.S. Navy 2016)

According to the NMFS National Stranding Database, there were five confirmed California sea lion strandings in the Snohomish and Island County areas between 2006 and 2015, in the August-February work window scheduled for this project (Figure 3-6) (NMFS 2016a).

Between August and mid-June, the Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of California sea lions in the Mukilteo area ranging between 0.0676 and 0.1266 animals per square kilometer.

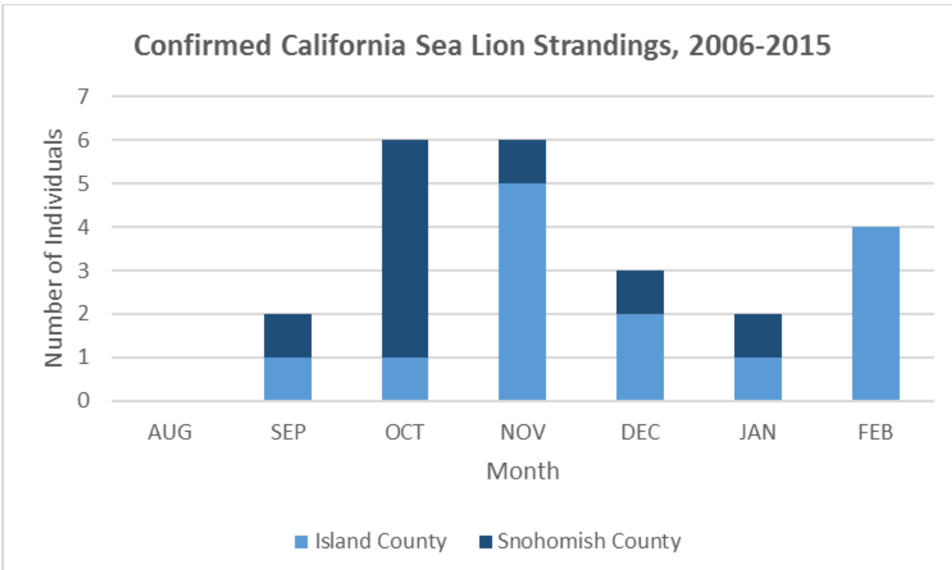

Figure 3-6. Confirmed California sea lion strandings during the August to February work window.

3.3.4 Steller Sea Lion

The Eastern U.S. stock of Steller sea lion may be present near the project site.

3.3.4.1 Numbers

The most recent minimum population estimate for the eastern U.S. stock of Steller sea lions was 41,638 individuals in 2015. The Washington (non-pup) estimate was 1,407 (NMFS 2016b). Within the last several years, a new rookery became established on the outer Washington coast with a confirmed count of 45 pups in 2013, and greater than 100 pups in 2015 (NMFS 2016b).

Steller sea lion numbers in Washington State decline during the summer months, which correspond to the breeding season at Oregon and British Columbia rookeries (approximately late May to early June) and peak during the fall and winter months (Jeffries et al. 2000). A few Steller sea lions can be observed year-round in Puget Sound although most of the breeding age animals return to rookeries in the spring and summer (P. Gearin pers. comm. 2008).

3.3.4.2 Status

The eastern stock of Steller sea lions is classified as "non-strategic" under the MMPA and was "delisted" under the ESA on November 4, 2013 (78 FR 66140).

3.3.4.3 Distribution

Adult Steller sea lions congregate at rookeries in California, Oregon, Washington, and British Columbia for pupping and breeding from late May to early June (Gisiner 1985; NMFS 2016b). Rookeries are usually located on beaches of relatively remote islands, often in areas exposed to wind and waves, where access by humans and other mammalian predators is difficult (WDFW 1993).

For Washington inland waters, Steller sea lion abundances vary seasonally with a minimum estimate of 1,000 to 2,000 individuals present or passing through the Strait of Juan de Fuca in fall and winter months (S. Jeffries pers. comm. 2008). The number of haul out sites has increased in recent years.

3.3.4.4 Species Observations and Data

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, one Steller sea lion was observed within the ZOI on November 3, 2015 (Table 3-4)(WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 7 Steller sea lions were observed within the ZOIs, with a one day high of 2 individuals on November 28, 2017 and December 7, 2017 (Table 3-4)(WSDOT 2018).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum reported no sightings days for Steller sea lions in the Mukilteo ZOI quadrants (red) and four sightings days in the Island County quadrants (green) shown in Figure 3-1 (TWM 2017) (Table 3-4). It should be noted that pinnipeds are not reported at the same rate as large cetaceans.

Table 3-4 Steller Sea Lion Sightings 2010-2018

Source of Sightings	Location	Dates	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Mukilteo Multimodal Project (2015)	Mukilteo ZOI	August-November 2015	0	0	0	1*	-	-	-
Mukilteo Multimodal Project (2017/18)	Mukilteo ZOIs	September 2017-February 2018	-	0*	1	3	3	0	-
The Whale Museum (2017)	Mukilteo ZOI and Island County Quadrants	2010-2016	2	0	0	1	1	0	0

*One week only

According to the NMFS National Stranding Database, there were two confirmed Steller sea lion strandings in the Island County area between 2006 and 2015, in the August-February work window scheduled for this project (NMFS 2016a).

From October through May, the Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of Steller sea lions in the Mukilteo area ranging between 0.0251 and 0.0368 animals per square kilometer.

3.4 Cetaceans

Nine cetacean species may be present in the Mukilteo terminal area; killer whale (Southern Resident and Transient), gray whale, humpback whale, minke whale, harbor porpoise, Dall's porpoise, long-beaked common dolphin, short-beaked common dolphin, and common bottlenose dolphin.

3.4.1 Killer Whale

The Eastern North Pacific Southern Resident (SRKW) and West Coast Transient (Transient) stocks of killer whale may be found near the project site. Killer whales are mid-frequency hearing range cetaceans (Southall et al. 2007).

3.4.1.1 Numbers

Southern Resident Stock

The Southern Residents live in three family groups known as the J, K and L pods. As of September 23, 2017, the stock collectively numbers 76 individuals (Orca Network 2017).

On February 10, 2015, NOAA Fisheries announced a final rule that includes Lolita, a captive killer whale at the Miami Seaquarium, in the endangered species listing for the Southern Resident killer whale population. While technically this raises the total stock to 77, 76 will be used as Lolita is still captive.

West Coast Transient Stock

Transient killer whales generally occur in smaller (less than 10 individuals), less structured pods (NMFS 2013b). According to the Center for Whale Research (CWR 2015), they tend to travel in small groups of one to five individuals, staying close to shorelines, often near seal rookeries when pups are being weaned. The West Coast Transient stock, which includes individuals from California to southeastern Alaska, is has a minimum population estimate of 243 (NMFS 2013b).

3.4.1.2 Status

Southern Resident Stock

The SRKW stock was declared "depleted/strategic" under the MMPA in May 2003 (68 FR 31980). On November 18, 2005, the SR stock was listed as "endangered" under the ESA (70 FR 69903). On November 29, 2006, NMFS published a final rule designating critical habitat for the SR killer whale DPS. Both Puget Sound and the San Juan Islands are designated as core areas of critical habitat under the ESA, excluding areas less than 20 feet deep relative to extreme high water (71 FR 69054). A final recovery plan for Southern Residents was published in January of 2008 (NMFS 2008). On February 23, 2015, NOAA Fisheries announced a 12-month finding on a petition to revise the Critical Habitat Designation for the Southern Resident killer whale distinct population segment is warranted (NMFS 2015c).

West Coast Transient Stock

The West Coast Transient stock is “non-depleted” under the MMPA, and “unlisted” under the ESA (NMFS 2013b).

Washington State Status

In Washington State, all killer whales (*Orcinus orca*) that may be present in Washington waters (Southern Resident, West Coast Transient, and Offshore) were listed as a state candidate species in 2000. In April 2004, the State upgraded their status to a “state endangered species” (WDFW 2004).

3.4.1.3 Distribution

The SRKW and West Coast Transient stocks are both found within Washington inland waters. Individuals of both stocks have long-ranging movements and regularly leave the inland waters (Calambokidis and Baird 1994).

Southern Resident Stock Distribution

Southern Residents are documented in coastal waters ranging from central California to the Queen Charlotte Islands, British Columbia (NMFS 2008). They occur in all inland marine waters. SR killer whales generally spend more time in deeper water and only occasionally enter water less than 15 feet deep (Baird 2000). Distribution is strongly associated with areas of greatest salmon abundance, with heaviest foraging activity occurring over deep open water and in areas characterized by high-relief underwater topography, such as subsurface canyons, seamounts, ridges, and steep slopes (Wiles 2004).

Records from 1976 through 2013 document Southern Residents in the inland waters of Washington during the months of March through June and October through December, with the primary area of occurrence in inland waters north of Admiralty Inlet, located in north Puget Sound (Orca Network 2015b).

Spring/Summer Distribution. Beginning in May or June and through the summer months, all three pods (J, K and L) of Southern Residents are most often located in the protected inshore waters of Haro Strait (west of San Juan Island), in the Strait of Juan de Fuca, and Georgia Strait near the Fraser River.

Fall/Winter Distribution. In fall, all three pods occur in areas where migrating salmon are concentrated such as the mouth of the Fraser River. They may also enter areas in Puget Sound where migrating chum and Chinook salmon are concentrated (Osborne 1999). In the winter months, the K and L pods spend progressively less time in inland marine waters and depart for coastal waters in January or February. The J pod is most likely to appear year-round near the San Juan Islands, and in the fall/winter, in the lower Puget Sound and in Georgia Strait at the mouth of the Fraser River.

3.4.1.4 Southern Resident Species Observations and Data

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, no SRKW were observed within the ZOI (WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 0 SRKW were observed within the ZOIs (WSDOT 2018).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum reported 61 whale days for SRKW in the Mukilteo ZOI quadrants (red) shown in Figure 3-1, with a high of seven whale days in August 2015 of those years (TWM 2017) (Table 3-5).

Table 3-5. SRKW Whale Days by Year/Project Month in Mukilteo ZOI

Year	Aug	Sept	Oct	Nov	Dec	Jan	Feb
2010	0	0	1	2	0	0	0
2011	0	0	1	0	1	0	6
2012	0	1	1	1	2	1	0
2013	0	0	1	1	0	2	0
2014	1	0	1	5	2	2	2
2015	7	2	2	2	0	0	2
2016	0	0	1	3	5	1	2
Totals	**8**	**3**	**8**	**14**	**10**	**6**	**12**
Average	**1.1**	**0.4**	**1.1**	**2.0**	**1.4**	**0.9**	**1.7**

TWM 2017

According to the NMFS National Stranding Database, there were no killer whale strandings in the Mukilteo and Island County areas between 2010 and 2015 (NMFS 2016a).

The Navy Marine Species Density Database (U.S. Navy 2014) estimates that the fall/winter density of Southern Resident killer whales in the Mukilteo area ranges between 0.000091 and 0.000482 animals per square kilometer.

West Coast Transient Stock Distribution

The West Coast Transient stock occurs in California, Oregon, Washington, British Columbia, and southeastern Alaskan waters. Within the inland waters, they may frequent areas near seal rookeries when pups are weaned (Baird and Dill 1995).

West Coast Transients are documented intermittently year-round in Washington inland waters.

3.4.1.5 Transient Species Observations and Data

Transient sightings have become more common since the mid-2000's. Unlike the SRKW pods, Transients may be present in the area for hours as they hunt pinnipeds.

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, 12 transient killer whales were observed: eight on August 13, and four on August 24, 2015 (Table 3-6)(WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 16 transient killer whales were observed within the ZOIs, with a one day high of 4 individuals on October 9, 2017 (Table 3-6)(WSDOT 2018).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum reported 23 sightings days for Transient killer whale in the Mukilteo quadrants (red) shown in Figure 3-1, with nine sightings days occurring in August of those years (TWM 2017) (Table 3-6).

According to the NMFS National Stranding Database, there were no killer whale strandings in the Mukilteo area in 2010-15 (NMFS 2016a).

The Navy Marine Species Density Database (U.S. Navy 2014) estimates that the fall/winter density of Transient killer whales in the Mukilteo area ranges between 0.000575 and 0.003060 animals per square kilometer.

Table 3-6. Transient Killer Whale Sightings 2010-2018

Source of Sightings	Location	Dates	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Mukilteo Multimodal Project (2015)	Mukilteo ZOI	August-November 2015	2	0	0	0*	-	-	-
Mukilteo Multimodal Project (2017/18)	Mukilteo ZOIs	September 2017-February 2018	-	0*	10	6	0	0	-
The Whale Museum (2017)	Mukilteo ZOI Quadrants	2010-2016	9	3	0	2	3	4	2

*One week only

3.4.2 Gray Whale

The Eastern North Pacific gray whale may be found near the project site. Gray whales are low-frequency range cetaceans (Southall et al. 2007).

3.4.2.1 Numbers

The most recent population estimate for the Eastern North Pacific stock is 20,990 individuals (NMFS 2015d). Animals that spend the summer and autumn feeding in coastal waters of the Pacific coast of North America from California to southeast Alaska have been designated as the "Pacific Coast Feeding Group" or PCFG (IWC 2012). This definition was further refined for purposes of abundance estimation, limiting the geographic range to the area from northern California to northern British Columbia, limiting the temporal range to the period from June 1 to November 30, and counting only those whales seen in more than one year within this geographic and temporal range (IWC 2012). The 2012 abundance estimate for the defined range of the PCFG is 209 (Calambokidis *et al*. 2014).

3.4.2.2 Status

The Eastern North Pacific stock of gray whales is "non-depleted" under the MMPA, and was "delisted" under the ESA in 1994 after a 5-year review by NOAA Fisheries.

3.4.2.3 Distribution

Gray whales had a considerably higher number of sighting days within the ZOI quadrants than all other species. This is likely driven by the 'resident' population of gray whales that returns to the Possession Sound and Port Susan area each spring and summer (Calambokidis et al., 2014). The number of sighting days drops considerably when limited to the months of interest (August through February), but gray whales are still the most common marine mammal in the project area followed by transient orcas and humpbacks.

3.4.2.4 Species Observations and Data

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, 0 gray whales were observed within the ZOI (WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 0 gray whales were observed within the ZOIs (Table 3-7)(WSDOT 2018).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum reported 41 sightings days for gray whale in the Mukilteo ZOI quadrants shown in Figure 3-1, with a high of 29 sightings days in February of those years (Table 3-7) (TWM 2017).

Table 3-7. Gray Whale Sightings 2010-2018

Source of Sightings	Location	Dates	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Mukilteo Multimodal Project (2015)	Mukilteo ZOI	August-November 2015	0	0	0	0*	-	-	-
Mukilteo Multimodal Project (2017/18)	Mukilteo ZOIs	September 2017-February 2018	-	0*	0	0	0	0	-
The Whale Museum (2017)	Mukilteo ZOI Quadrants	2010-2016	1	0	0	3	0	8	29
The Whale Museum (2017)	Island County ZOI Quadrants	2010-2016	1	0	0	3	0	8	32

*One week only

According to the NMFS National Stranding Database, there were two confirmed gray whale stranding in the Island County area between 2010 and 2015, in the August-February work window scheduled for this project (NMFS 2016a).

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of gray whales in the Mukilteo area as a range of 0.000015 to 0.0051 animals per square kilometer.

3.4.3 Humpback Whale

The California-Oregon-Washington (CA-OR-WA) stock of humpback whale may be found near the project site. Humpback whales are low-frequency hearing range cetaceans (Southall et al. 2007).

3.4.3.1 Numbers

The stock assessment report abundance estimate is 1,918 individuals. The minimum population estimate is 1,918 (NMFS 2016c).

3.4.3.2 Status

The California-Oregon-Washington stock of humpback whales is “depleted/strategic” under the MMPA, and “endangered” under the Endangered Species Conservation Act of 1969. This protection was transferred to the ESA in 1973. A recovery plan was adopted in 1991(NMFS 1991).

In 2016, NMFS revised the ESA listing for the humpback whale to identify 14 Distinct Population Segments (DPS), and listed one as threatened, four as endangered, and nine others as not warranted for listing. The unlisted Hawaii DPS, the threatened Mexico DPS and the endangered Central American DPS may be present in Puget Sound. When a humpback whale is sighted in Puget Sound, it is 43 percent likely to be from the unlisted Hawaii DPS, 42 percent likely to be from the threatened Mexico DPS, and 15 percent likely to be from the endangered Central American DPS (NMFS 2016c).

3.4.3.3 Distribution

Historically, humpback whales were common in inland waters of Puget Sound and the San Juan Islands (Calambokidis et al. 2004). In the early 1900s, there was a productive commercial hunt for humpbacks in Georgia Strait that was probably responsible for their long disappearance from local waters (Osborne et al. 1988). Commercial hunts ended in the 1960's. Since the mid-1990s, sightings in Puget Sound have increased. Humpback whales are seen in Puget Sound, but more frequent sightings occur in the Strait of Juan de Fuca and near the San Juan Islands. Most sightings are in spring and summer.

Along the U.S. west coast, one stock is currently recognized, which includes animals that appear to be part of two separate feeding groups, a California and Oregon feeding group and a northern Washington and southern British Columbia feeding group. Very few photographic matches between these feeding groups have been documented. Humpbacks from both groups have been photographically matched to breeding areas off Central America, mainland Mexico, and Baja California, but whales from the northern Washington and southern British Columbia feeding group also winter near the Hawaiian Islands and the Revillagigedo Islands off Mexico. Seven 'biologically important areas' for humpback whale feeding are identified off the U.S. west coast, including five in California, one in Oregon, and one in Washington (NMFS 2016c).

3.4.3.4 Species Observations and Data

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, one humpback whale was observed within the ZOI on November 4, 2015 (WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 0 humpback whales were observed within the ZOIs (Table 3-8)(WSDOT 2018).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum reported several sightings days for humpback whale in the Mukilteo ZOI quadrants (red) and the Island County quadrants (green) shown in Figure 3-1, with a high total of eight sightings days in August of those years (Table 3-8)(TWM 2017).

According to the NMFS National Stranding Database, there were no humpback whale strandings in the Mukilteo and Island County areas between 2010 and 2015 (NMFS 2016a).

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of humpback whales in the Mukilteo area as a range between 0 and 0.00014 animals per square kilometer.

Table 3-8. Humpback Whale Sightings 2010-2018

Source of Sightings	Location	Dates	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Mukilteo Multimodal Project (2015)	Mukilteo ZOI	August-November 2015	0	0	0	1*	-	-	-
Mukilteo Multimodal Project (2017/18)	Mukilteo ZOIs	September 2017-February 2018	-	0*	0	0	0	0	-
The Whale Museum (2017)	Mukilteo ZOI Quadrants	2010-2016	4	2	6	5	0	0	0
The Whale Museum (2017)	Island County ZOI Quadrants	2010-2016	4	3	7	6	0	0	0

*One week only

3.4.4 Minke Whale

The California-Oregon-Washington (CA-OR-WA) stock of Minke whale may be found near the project site. Minke whales are low-frequency hearing range cetaceans (Southall et. al. 2007).

The CA-WA-OR stock is considered a resident stock (NMFS 2016d), and includes minke whales within the inland Washington waters of Puget Sound and the San Juan Islands (Dorsey et al. 1990).

3.4.4.1 Numbers

Information on minke whale population and abundance is limited due to difficulty in detection. Conducting surveys for the minke whale is difficult because of their low profiles, indistinct blows, and tendency to occur as single individuals (Green et al. 1992). The minimum population estimate for this stock (369 whales) is based on 2008 and 2014 summer/fall ship surveys in California, Oregon, and Washington waters (Barlow 2016).

Over a 10-year period, 30 individuals were photo-identified in the U.S./Canada trans-boundary area around the San Juan Islands and demonstrated high site fidelity (Dorsey et al. 1990; Calambokidis and Baird 1994). In a single year, up to 19 individuals were photo-identified from around the San Juan Islands (Dorsey et al. 1990).

3.4.4.2 Status

Minke whales are not listed under the ESA and are classified as non-depleted under the MMPA.

3.4.4.3 Distribution

Minke whales are reported in Washington inland waters year-round, although few are reported in the winter (Calambokidis and Baird 1994). Minke whales are relatively common in the San Juan Islands and Strait of Juan de Fuca (especially around several of the banks in both the central and eastern Strait), but are relatively rare in Puget Sound.

3.4.4.4 Species Observations and Data

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring,) minke whales were observed within the ZOI(WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 0 minke whales were observed within the ZOIs (Table 3-9)(WSDOT 2018).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum reported a total of six sightings days for minke whale in the Mukilteo ZOI and Island County quadrants shown in Figure 3-1 (Table 3-9)(TWM 2017).

Table 3-9. Minke Whale Sightings 2010-2018

Source of Sightings	Location	Dates	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Mukilteo Multimodal Project (2015)	Mukilteo ZOI	August-November 2015	0	0	0	0*	-	-	-
Mukilteo Multimodal Project (2017/18)	Mukilteo ZOIs	September 2017-February 2018	-	0*	0	0	0	0	-
The Whale Museum (2017)	Mukilteo ZOI Quadrants	2010-2016	0	0	0	1	0	0	1
The Whale Museum (2017)	Island County ZOI Quadrants	2010-2016	1	1	0	1	0	0	1

*One week only

According to the NMFS National Stranding Database, there were no minke whale strandings in the Mukilteo and Island County areas between 2010 and 2015 (NMFS 2016a).

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of Minke whales in the Mukilteo area as a range between 0.000801 and 0.002 animals per square kilometer.

3.4.5 Harbor Porpoise

The Washington Inland Waters Stock of harbor porpoise may be found near the project site. The Washington Inland Waters Stock occurs in waters east of Cape Flattery (Strait of Juan de Fuca, San Juan Island Region, and Puget Sound). Harbor porpoise are high-frequency hearing range cetaceans (Southall et. al. 2007).

3.4.5.1 Numbers

The Washington Inland Waters Stock mean abundance estimate based on 2002 and 2003 aerial surveys conducted in the Strait of Juan de Fuca, San Juan Islands, Gulf Islands, and Strait of Georgia is 10,682 harbor porpoises (NMFS 2017a). No minimum population estimate is available.

No harbor porpoise were observed within Puget Sound proper during comprehensive harbor porpoise surveys conducted in the 1990s (Osmek et al. 1994). Declines were attributed to gill-net fishing, increased vessel activity, contaminants, and competition with Dall's porpoise.

However, populations have rebounded with increased sightings in central Puget Sound (Carretta et al. 2007) and southern Puget Sound (WDFW 2008). Recent systematic boat surveys of the main basin indicate that at least several hundred and possibly as many as low thousands of harbor porpoise are now present. While the reasons for this recolonization are unclear, it is possible that changing conditions outside of Puget Sound, as evidenced by a tripling of the population in the adjacent waters of the Strait of Juan de Fuca and San Juan Islands since the early 1990s, and the recent higher number of harbor porpoise mortalities in coastal waters of Oregon and Washington, may have played a role in encouraging harbor porpoise to explore and shift into areas like Puget Sound (Evenson, et al. 2016).

3.4.5.2 Status

The Washington Inland Waters Stock of harbor porpoise is "non-depleted" under MMPA, and "unlisted" under the ESA.

3.4.5.3 Distribution

Harbor porpoises are common in the Strait of Juan de Fuca and south into Admiralty Inlet, especially during the winter, and are becoming more common south of Admiralty Inlet.

Little information exists on harbor porpoise movements and stock structure near the Mukilteo area, although it is suspected that in some areas harbor porpoises migrate (based on seasonal shifts in distribution). For instance, Hall (2004) found harbor porpoises off Canada's southern Vancouver Island to peak during late summer, while the WDFW Puget Sound Ambient Monitoring Program (PSAMP) data show peaks in Washington waters to occur during the winter.

Hall (2004) found that the frequency of sighting of harbor porpoises decreased with increasing depth beyond 150 m with the highest numbers observed at water depths ranging from 61 to 100 m. Although harbor porpoises have been spotted in deep water, they tend to remain in shallower shelf waters (<150 m) where they are most often observed in small groups of one to eight animals (Baird 2003).

3.4.5.4 Species Observations and Data

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, seven harbor porpoise were observed within the ZOI, with a one day high of three individuals on November 4, 2015 (Table 3-10)(WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 89 harbor porpoise were observed within the ZOIs, with a one day high of 15 individuals on December 12, 2017 (Table 3-10)(WSDOT 2018).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum reported three sightings days for harbor porpoise in the Island County ZOI quadrants shown in Figure 3-1 (Table 3-10) (TWM 2017). It should be noted that small cetaceans are not reported at the same rate as larger cetaceans.

Table 3-10. Harbor Porpoise Sightings 2010-2018

Source of Sightings	Location	Dates	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Mukilteo Multimodal Project (2015)	Mukilteo ZOI	August-November 2015	3	1	0	3*	-	-	-
Mukilteo Multimodal Project (2017/18)	Mukilteo ZOIs	September 2017-February 2018	-	0*	16	18	47	8	-
The Whale Museum (2017)	Mukilteo ZOI Quadrants	2010-2016	0	0	0	0	0	0	0
The Whale Museum (2017)	Island County ZOI Quadrants	2010-2016	1	0	1	0	1	0	0

*One week only

According to the NMFS National Stranding Database, there were several confirmed harbor porpoise strandings in the Island County area between 2010 and 2015, in the August-February work window scheduled for this project (Figure 3-9) (NMFS 2016a).

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of harbor porpoises in the Mukilteo area as a range between 0.061701 and 0.156 animals per square kilometer.

According to Evenson, et al. (2016), the maximum harbor porpoise density in the Whidbey Basin (which includes the project ZOIs) is 0.79 animals per square kilometer.

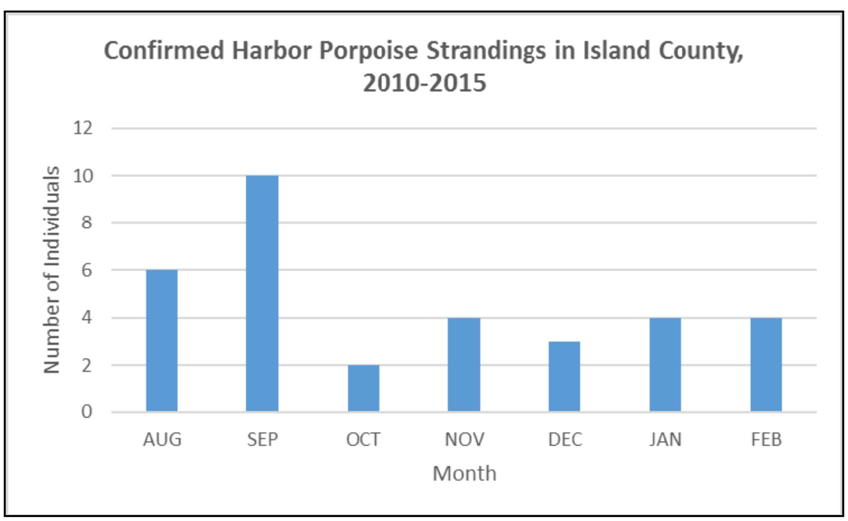

Figure 3-7. Harbor porpoise strandings in the Island County area during the August-February work window (NMFS 2016a).

3.4.6 Dall's Porpoise

The California, Oregon, and Washington Stock of Dall's porpoise may be found near the project site. Dall's porpoise are high-frequency hearing range cetaceans (Southall et. al. 2007).

3.4.6.1 Numbers

The most recent estimate of Dall's porpoise stock abundance is 42,000, based on 2005 and 2008 summer/autumn vessel-based line transect surveys of California, Oregon, and Washington waters (NMFS 2017b). Within the inland waters of Washington and British Columbia, this species is most abundant in the Strait of Juan de Fuca east to the San Juan Islands. The most recent Washington's inland waters estimate is 900 animals (Calambokidis et al. 1997), though sightings have become rarer since then. Prior to the 1940s, Dall's porpoises were not reported in Puget Sound.

3.4.6.2 Status

The California, Oregon, and Washington Stock of Dall's porpoise is "non-depleted" under the MMPA, and "unlisted" under the ESA.

3.4.6.3 Distribution

Dall's porpoises are migratory and appear to have predictable seasonal movements driven by changes in oceanographic conditions (Green et al. 1992, 1993), and are most abundant in Puget Sound during the winter (Nysewander et al. 2005; WDFW 2008). Despite their migrations, Dall's porpoises occur in all areas of inland Washington at all times of year, but with different distributions throughout Puget Sound from winter to summer. The WDFW PSAMP data show peaks in Washington waters to occur during the winter. The average winter group size is three animals (WDFW 2008).

3.4.6.4 Species Observations and Data

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, 0 Dall's porpoise were observed within the ZOI(WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 2 Dall's porpoise were observed within the ZOIs, with a one day high of 2 individuals on November 27, 2017 (Table 3-11)(WSDOT 2018).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum reported six sightings days for Dall's porpoise in the Mukilteo ZOI and Island County quadrants shown in Figure 3-1, with a high of three sightings days in December of those years (Table 3-11) (TWM 2017). It should be noted that small cetaceans are not reported at the same rate as larger cetaceans.

Table 3-11. Dall's Porpoise Sightings 2010-2018

Source of Sightings	Location	Dates	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Mukilteo Multimodal Project (2015)	Mukilteo ZOI	August-November 2015	0	0	0	0*	-	-	-
Mukilteo Multimodal Project (2017/18)	Mukilteo ZOIs	September 2017-February	-	0*	0	2	0	0	-
The Whale Museum (2017)	Mukilteo ZOI and Island County Quadrants	2010-2016	2	1	0	0	3	0	0

*One week only

According to the NMFS National Stranding Database, there was one confirmed Dall's porpoise stranding in the Mukilteo and Island County areas between 2010 and 2015, in the August-February work window scheduled for this project (NMFS 2016a).

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of Dall's porpoises in the Mukilteo area as a range between 0.018858 and 0.047976 animals per square kilometer.

3.4.7 Common Bottlenose Dolphin

The California-Oregon-Washington Offshore stock of Common bottlenose dolphin may be found near the project site. Long-beaked common bottlenose dolphins are mid-frequency hearing range cetaceans (Southall et. al. 2007).

3.4.7.1 Numbers

The most recent shipboard surveys conducted within 300 nautical miles of the coasts of California, Oregon, and Washington were in 2008 and 2014. The minimum population estimate for bottlenose dolphin is 1,255 (NMFS 2017c).

3.4.7.2 Status

The California, Oregon, and Washington Offshore Stock of Common bottlenose dolphin is "non-depleted" under the MMPA, and "unlisted" under the ESA.

3.4.7.3 Distribution

On surveys conducted off California, offshore bottlenose dolphins have been found at distances greater than a few kilometers from the mainland and throughout the Southern California Bight. They have also been documented in offshore waters as far north as about 41° N, and they may range into Oregon and Washington waters during warm-water periods (NMFS 2017c).

3.4.7.4 Species Observations and Data

The earliest documented sighting of Common bottlenose dolphin in Puget Sound was in June 2010, including a stranding in July of 2010, likely of the same dolphin. This was followed by more sightings, and another stranding in mid-November 2010 (CRC 2011). In 2017 and 2018, two bottlenose dolphins were identified as part of the California coastal population. Between September 2017 and March 2018, a group of up to 5-6 individuals was sighted in South Puget Sound (CRC 2017/18). It is assumed that this group is still present in the area.

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, 0 common bottlenose dolphins were observed within the ZOI (Table 3-12)(WSDOT 2016).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 0 common dolphins were observed within the ZOIs (Table 3-12)(WSDOT 2018).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum reported four sightings days for common bottlenose dolphins in the Mukilteo ZOI quadrants shown in Figure 3-1. It should be noted that small cetaceans are not reported at the same rate as larger cetaceans.

Table 3-12. Common Bottlenose Dolphin Sightings 2010-2018

Source of Sightings	Location	Dates	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Mukilteo Multimodal Project (2015)	Mukilteo ZOI	August-November 2015	0	0	0	0	-	-	-
Mukilteo Multimodal Project (2017/18)	Mukilteo ZOIs	September 2017-February	-	0*	0	0	0	0	-
The Whale Museum (2017)	Mukilteo ZOI and Island County Quadrants	2010-2016	0	0	0	0	0	4	0

*One week only

According to the NMFS National Stranding Database, there were no confirmed common bottlenose dolphin strandings in the Mukilteo and Island County areas between 2010 and 2015, in the August-February work window scheduled for this project (NMFS 2016). However, two individuals were found dead in south Puget Sound in 2010, and another was found near the Nisqually National Wildlife Refuge in January 2011 (NMFS 2016a).

The Navy Marine Species Density Database (U.S. Navy 2014) concludes that common bottlenose dolphins are not expected to be present in the Mukilteo area.

3.4.8 Long-beaked Common Dolphin

The California Stock of long-beaked common dolphin may be found near the project site. Common dolphins have not always been identified as long-beaked or short-beaked, and sightings of common dolphins have become more prevalent in Puget Sound. Dolphins are mid-frequency hearing range cetaceans (Southall et. al. 2007).

3.4.8.1 Numbers

Based on the most recent ship line-transect surveys in 2008 and 2014, the minimum population estimate is 68,432 long-beaked common dolphins (NMFS 2017d).

3.4.8.2 Status

The California Stock of long-beaked common dolphin is “non-depleted” under the MMPA, and “unlisted” under the ESA (NMFS 2017d).

3.4.8.3 Distribution

Long-beaked common dolphins are commonly found within about 50 nautical miles of the coast, from Baja California northward to about central California. The species is a rare visitor to Washington’s coastal and inland marine waters (NMFS 2017d).

3.4.8.4 Species Observations and Data

The earliest document sighting of Long-beaked common dolphin in Puget Sound was July 2003. In June 2011, two Long-beaked common dolphins were sighted in South Puget Sound. Sightings continued in 2012, and in 2016-17. Four to twelve sightings were reported regularly, with confirmed sightings of up to 30 individuals. Four to six dolphins have remained in Puget Sound since June 2016 and four animals with distinct markings have been seen multiple times and in every season of the year as of October 2017 (CRC 2017).

From August to November 2015, WSF conducted marine mammal monitoring during tank farm pier removal at the Mukilteo Multimodal Project. During 51 days of monitoring, 0 long-beaked common dolphins were observed within the ZOI (Table 3-13).

From September 2017 to February 2018, WSF conducted marine mammal monitoring during Year Two of the Mukilteo Multimodal Project. During 51 days of monitoring, 0 long-beaked common dolphins were observed within the ZOIs (Table 3-13)(WSDOT 2018).

For the years 2010 to 2016, in the August to February timeframe scheduled for this project, The Whale Museum reported one sighting day for common dolphin in the Mukilteo ZOI and Island County quadrants shown in Figure 3-1. It should be noted that The Whale Museum does not distinguish between long-beaked and short-beaked common dolphins, and that small cetaceans are not reported at the same rate as larger cetaceans.

Table 3-13. Common Dolphin Sightings 2010-2018

Source of Sightings	Location	Dates	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Mukilteo Multimodal Project (2015)	Mukilteo ZOI	August-November 2015	0	0	0	0	-	-	-
Mukilteo Multimodal Project (2017/18)	Mukilteo ZOIs	September 2017-February	-	0*	0	0	0	0	-
The Whale Museum (2017)	Mukilteo ZOI and Island County Quadrants	2010-2016	0	0	0	1	0	0	0

*One week only

According to the NMFS National Stranding Database, there were no confirmed long-beaked common dolphin strandings in the Mukilteo and Island County areas between 2010 and 2015, in the August-February work window scheduled for this project (NMFS 2016a).

The Navy Marine Species Density Database (U.S. Navy 2014) concludes that long-beaked common dolphins are not expected to be present in the Mukilteo area.

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4.0 Status and Distribution of Affected Species or Stocks

A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities.

This section has been combined with Section 3.0.

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5.0 Type of Incidental Take Authorization Requested

The type of incidental taking authorization that is being requested (i.e., takes by harassment only, takes by harassment, injury and/or death), and the method of incidental taking.

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).

Level A is the more severe form of harassment because it may result in injury or death, whereas Level B only results in disturbance *without* the potential for injury. (B. Norberg pers. comm. 2007a).

5.1 Incidental Take Authorization Request

Under Section 101 (a)(5)(D) of the MMPA, WSF requests an IHA from September 1, 2018 through February 15, 2019 for Level B incidental take (behavioral harassment) of the marine mammals described in this application during the terminal construction project at the Mukilteo Ferry Terminal.

The requested authorization is for incidental harassment of any 13 species of marine mammal that might enter the 160 dB ZOI during impact pile driving, and the 121 dB ZOI during active vibratory pile driving or removal activity.

5.2 Method of Incidental Taking

The method of incidental take is Level B acoustical harassment of any marine mammal occurring within the 160 dB ZOI during impact pile driving, and the 121 dB ZOI during active vibratory pile driving or removal activity.

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6.0 Number of Marine Mammals that May Be Affected

By age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking identified in [Section 5], and the number of times such takings by each type of taking are likely to occur.

This section summarizes potential incidental take of marine mammals during the Mukilteo project. Section 6.2 describes the methods used to calculate the estimated ZOI and Section 6.3 describes the potential incidental take for each marine mammal species. Section 6.4 provides the number of marine mammals by species for which take authorization is requested.

Due to impact pile driving, and vibratory pile driving and removal source levels, this IHA application will incidentally take by Level B acoustical harassment small numbers of harbor seal, Northern Elephant seal, California sea lion, Steller sea lion, transient killer whale, gray whale, humpback whale, minke whale, harbor porpoise, Dall's porpoise, common bottlenose dolphin, long-beaked common dolphin, and short-beaked common dolphin. With the exception of harbor seals and California sea lions, it is anticipated that all of the marine mammals that enter a Level B acoustical harassment ZOI will be exposed to pile driving noise only briefly as they are transiting the area. Only harbor seals and California sea lions are expected to forage and haul out in the Mukilteo ZOI with any frequency and could be exposed multiple times during a project.

6.1 Estimated Duration of Pile Driving

Durations are provided in Table 6-1.

6.2 Estimated Zones of Influence/Zones of Exclusion

Distances to ZOIs and ZOEs are provided in Table 6-2.

Table 6-1. Durations

Method	Pile Size (inch)	Season 3 Planned	Minutes per Pile	Duration (hours)	Piles per day	Days
Vibratory Drive	24	91	60	91	3	30
	30	16	60	16	3	6
	36	6	60	6	3	2
	78	2	60	2	2	1
	120	1	60	1	1	1
Vibratory Removal	24	65	15	16	3	6
	30	9	30	5	9	1
Impact Drive (proof)	24	91	15	23	3	30
Total				**160**		**77**

Table 6-2. ZOE/ZOI Distances

Installation Method	Pile Size (inches)	ZOE Distance (m)					ZOI (km)
		LF Cetacean	MF Cetacean	HF Cetacean	Phocid	Otariid	
Vibratory Install	24	35	10	85	25	10	8.0
	30	25	10	35	10	10	8.0
	36	10	10	10	10	10	8.0
	78	10	10	105	25	10	20.0*
	120	55	10	65	10	10	20.0*
Vibratory Removal	24	105	10	**275****	**55****	10	8.0
	30	25	10	55	10	10	8.0
Impact	24	10	10	10	10	10	1.0

*maximum distance to land vs. 28 km modeled distance
**Shutdown ZOEs (55 m pinniped shutdown, 10 m Otaridd shutdown implemented only if necessary)

6.2.1 Zones of Influence

Table 6-2 summarizes each of the following ZOIs:

Table 6-3. Zone of Influence summary.

ZOI	Pile Type	Method	Threshold	Distance to Threshold	ZOI Area (km^2)	Days Present
ZOI-1	24-inch steel	Impact (proofing)	160 dB^{RMS} disturbance	1.0 km	2	30
ZOI-2	24/30/36-inch steel	Vibratory installation or removal	121 dB^{RMS} background	8.0 km	66	45
ZOI-3	78/120-inch steel shafts	Vibratory installation	121 dB^{RMS} background	20.0 km	107	2

6.2.2 Zones of Exclusion/Shutdown Zones

Monitoring ZOEs/Shutdown Zones have been conservatively simplified (55 m for seals/sea lions; 275 m for cetaceans) in order to make PSO monitoring easier to implement during construction. ZOE-3 will be implemented only if there are repeated project interruptions from sea lions between 10 m and 55 m.

Table 6-3. Zone of Influence summary.

ZOI	Pile Type/ Method	Species	Distance to ZOE/Shutdown	Days Present
ZOE-1	All	Cetacean	275 m	77
ZOE-2	All	Pinniped	55 m	77
ZOE-3	All	Otariid	10 m*	77

*Implemented only if necessary

6.2.3 Airborne Zones of Influence

Airborne noises can affect pinnipeds, especially resting seals hauled out on rocks or sand spits. In-air thresholds will be reached at the following distances:

- Noise generated during vibratory installation and/or removal of hollow steel piles, H-piles, and sheet piles (96.9 dB at 50 feet) will reach the harbor seal in-air threshold (90 db_{RMS}) at approximately 34 m/111 ft., and is below the threshold for sea lions.
- 24-inch and 30-inch diameter steel pile impact driving (110 dBRMS at 50 feet) will reach the harbor seal threshold (90 dB_{RMS}) at approximately 152 m/500 ft., and the sea lion threshold (100 dB_{RMS}) at approximately 48 m/158 ft.

The nearest documented harbor seal haul out site to the Mukilteo ferry terminal is 4 miles north on log rafts present in the East Waterway of Port Gardener Harbor (Figure 3-2). The closest documented California sea lion haul out sites to the Mukilteo Ferry Terminal are 3.2 miles northeast on the Everett Harbor buoys (Figure 3-3). The number of California sea lions using the buoys is less than 20 (WDFW 2000).

During vibratory pile driving and removal, temporary in-air disturbance will be limited to harbor seals swimming on the surface through the immediate terminal area, or hauled-out on beaches or boat ramps within 34 m/111ft.

During impact pile driving, temporary in-air disturbance will be limited to harbor seals swimming on the surface through the immediate terminal area, or hauled-out on beaches or boat ramps within 152 m/500 ft., and within 48 m/158 ft. for sea lions (Figure 1-10).

6.3 Estimated Incidental Takes

Incidental take is estimated for each species by estimating the likelihood of a marine mammal being present within a ZOI/ZOE during active pile driving or removal. Expected marine mammal presence is determined by past observations and general abundance near the Mukilteo Project during the construction window. Typically, potential take is estimated by multiplying the area of the ZOI/ZOE by the local animal density. This provides an estimate of the number of animals that might occupy the zone at any given moment.

There are two sources of density estimates available, the U.S. Navy Marine Species Density Report (2015), and the WDFW density estimates for harbor porpoise (2016). These density estimates will be used to calculate takes, unless site-specific data is available that supports a different take estimate approach. This data includes the Mukilteo Project 2017/18 sightings data, local marine mammal data sets (e.g., The Whale Museum, state and federal agencies), opinions from state and federal agencies, observations from local area whale specialists, and best professional judgment.

The calculation for marine mammal exposures is estimated by:

Exposure estimate = N (number of animals) * days of pile driving/removal activity

All estimates are conservative. A summary of underwater noise durations per ZOI is provided in Table 6-1.

6.3.1 Harbor Seal

The harbor seal take estimate is based on the 2017/18 Mukilteo Project sightings data (WSDOT 2017/18). Over 51 days of monitoring, 1,525 harbor seals were observed, an average of 30/day.

Based on a total of 77 pile driving/removal days for the Season 3 of the Mukilteo Project, it is estimated that up to 2,310 harbor seals could be exposed to noise levels that constitute takes. However, because this estimated take exceeds the 20 percent small numbers guideline, take will be limited to a maximum of 2,200 individuals.

WSF is requesting authorization for Level B take of 2,200 harbor seals. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.2 Northern Elephant Seal

The Northern Elephant seal estimate is based on non-projects sightings of two animals south of Mukilteo (Miller 2015/17) and Orca Network reports of two animals to the west of Mukilteo (Orca Network 2015).

Given how rare Northern Elephant seals are in the area, it is unlikely they would be present on a daily basis. Instead it is assumed that one animal may be present in the ZOI once a month during the in-water work window (7 months).

WSF is requesting authorization for Level B take of 7 Northern Elephant seals. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.3 California Sea Lion

The California sea lion take estimate is based on the 2017/18 Mukilteo Project sightings data (WSDOT 2017/18). Over 51 days of monitoring, 707 California sea lions were observed, an average of 14/day.

Based on a total of 77 pile driving/removal days for the Season 3 of the Mukilteo Project, it is estimated that up to 714 California sea lions could be exposed to noise levels that constitute takes.

WSF is requesting authorization for Level B take of 714 California sea lions. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.4 Steller Sea Lion

From October through May, the Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of Steller sea lions in the Mukilteo area ranging between 0.0251 and 0.0368 animals per square kilometer. Based on the highest density estimate, the following number of Steller sea lions may be present in the ZOIs:

- ZOI-1 = 2 km^2 * 0.0368 * 30 = 2 animals
- ZOI-2 = 66 km^2 * 0.0368 * 45 = 109 animals
- ZOI-3 = 107 km^2 * 0.0368 * 2 = 8 animals

WSF is requesting authorization for Level B acoustical harassment of 119 Steller sea lions. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.5 Southern Resident Killer Whale

Due to the status of SRKW, NMFS is limiting Level B harassment to ‘unintentional take’ of 5 percent of the stock per year (Guan 2014). As of September 23, 2017, the SRKW population is 76, and 5 percent of the stock is four individuals. However, WSF is not requesting authorization for Level B acoustical take of SRKW.

To ensure that project take does not result in acoustical take, the following monitoring steps will be implemented (see Appendix B – Monitoring Plan):

- The intent of monitoring is to prevent any take of SRKW.
- If SRKW approach any ZOI during pile driving or removal, work will be paused until the SRKW exit the ZOI.
- If killer whale approach the ZOI during vibratory pile driving and it is unknown whether they are SRKW or Transient, it shall be assumed they are SRKW and work will be paused until the whales exit the ZOI.

6.3.6 Transient Killer Whale

The Transient killer whale take estimate is based on the 2017/18 Mukilteo Project sightings data (WSDOT 2017/18). Over 51 days of monitoring, 16 Transient killer whales were observed, an average of 0.3/day.

Based on a total of 77 pile driving/removal days for the Season 3 of the Mukilteo Project, it is estimated that up to 23 Transient killer whales could be exposed to noise levels that constitute takes.

WSF is requesting authorization for Level B take of 23 Transient killer whales. It is assumed that this number will include multiple harassments of the same individual(s).

The following monitoring steps will be implemented during this project (see Appendix B – Monitoring Plan):

- If positively identified Transients (as identified by Orca Network, NMFS or another qualified source) approach the ZOIs during pile removal or driving, and it is known that SRKW are not in the vicinity (from the same qualified sources) work will continue.
- If the 48 Transient killer whale takes have been used and killer whales approach the ZOIs during pile driving or removal, work shall be paused to avoid take.

6.3.7 Gray Whale

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of gray whales in the Mukilteo area as a range of 0.000015 to 0.0051 animals per square kilometer. Based on the highest density estimate, the following number of gray whales may be present in the ZOIs:

- ZOI-1 = 2 km^2 * 0.0051 * 30 = 1 animal
- ZOI-2 = 66 km^2 * 0.0051 * 45 = 15 animals
- ZOI-3 = 107 km^2 * 0.0051 * 2 = 1 animal

WSF is requesting authorization for Level B acoustical harassment of 48 gray whales. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.8 Humpback Whale

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the fall and winter density of humpback whales in the Mukilteo area as a range between 0.000001 and 0.0051 animals per square kilometer. Based on the highest density estimate, the following number of humpback whales may be present in the ZOIs:

- ZOI-1 = 2 km^2 * 0.0051 * 30 = 1 animal
- ZOI-2 = 66 km^2 * 0.0051 * 45 = 15 animals
- ZOI-3 = 107 km^2 * 0.0051 * 2 = 1 animal

WSF is requesting authorization for Level B acoustical harassment of 48 humpback whales. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.9 Minke Whale

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of Minke whales in the Mukilteo area as a range between 0.000801 and 0.002 animals per square kilometer. Based on the highest density estimate, the following number of Minke whales may be present in the ZOIs:

- ZOI-1 = 2 km^2 * 0.002 * 30 = 0 animals
- ZOI-2 = 66 km^2 * 0.002 * 45 = 6 animals
- ZOI-3 = 107 km^2 * 0.002 * 2 = 1 animal

WSF is requesting authorization for Level B acoustical harassment take of 7 Minke whales. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.10 Harbor Porpoise

The harbor porpoise take estimate is based on a study by Evenson, et al. (2016). According to Evenson, the maximum harbor porpoise density in Whidbey Basin (which includes the project ZOIs) is 0.79 animals per square kilometer. Based on this density estimate, it is assumed that the following number of harbor porpoise may be intermittently in the ZOIs:

- ZOI-1 = 2 km^2 * 0.79 * 30 = 47 animals
- ZOI-2 = 66 km^2 * 0.79 * 45 = 2,346 animals
- ZOI-3 = 107 km^2 * 0.79 * 2 = 169 animals

The potential take is 2,562 harbor porpoises. However, because this estimated take clearly exceeds the 20 percent small numbers guideline, take will be limited to a maximum of 2,136 individuals.

WSF is requesting authorization for Level B acoustical harassment take of 2,136 harbor porpoises. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.11 Dall's Porpoise

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the density of Dall's porpoises in the Mukilteo area as a range between 0 and 0.55179 animal per square kilometer. Based on the higher density estimate, it is assumed that the following number of harbor porpoise may be intermittently in the ZOIs:

- ZOI-1 = 2 km^2 * 0.55179 * 30 = 33 animals
- ZOI-2 = 66 km^2 * 0.55179 * 45 = 1,639 animals
- ZOI-3 = 107 km^2 * 0.55179 * 2 = 118 animals

WSF is requesting authorization for Level B acoustical harassment of 1,790 Dall's porpoises. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.12 Common Bottlenose Dolphin

The Common bottlenose dolphin estimate is based on sightings data from Cascadia Research Collective. Between September 2017 and March 2018, a group of up to 5-6 individuals was sighted in South Puget Sound (CRC 2017/18). It is assumed that this group is still present in the area.

Given how rare Common bottlenose dolphins are in the area, it is unlikely they would be present on a daily basis. Instead it is assumed that one animal may be present in the ZOI once a month during the in-water work window (7 months).

WSF is requesting authorization for Level B take of 7 Common bottlenose dolphins. It is assumed that this number will include multiple harassments of the same individual(s).

6.3.13 Long-beaked Common Dolphin

The Long-beaked Common dolphin estimate is based on sightings data from Cascadia Research Collective. Four to six Long-beaked Common dolphins have remained in Puget Sound since June 2016, and four animals with distinct markings have been seen multiple times and in every season of the year as of October 2017 (CRC 2017).

Given how rare Long-beaked Common dolphins are in the area, it is unlikely they would be present on a daily basis. Instead it is assumed that one animal may be present in the ZOI once a month during the in-water work window (7 months).

WSF is requesting authorization for Level B take of 7 Long-beaked Common dolphins. It is assumed that this number will include multiple harassments of the same individual(s).

6.4 Number of Takes for Which Authorization is Requested

The total number of takes for which for Level B acoustical harassment authorization is requested is presented in the table below:

Table 6-4 Harassment Take Requests

Species	Take Request	Level A	Level B
Harbor Seal	2,200	0	2,200
Northern Elephant Seal	7	0	7
California Sea Lion	714	0	714
Steller Sea Lion	119	0	119
SR Killer Whale	0	0	0
Transient Killer Whale	23	0	23
Gray Whale	48	0	48
Humpback Whale	48	0	48
Minke Whale	7	0	7
Harbor Porpoise	2,562	0	2,562
Dall's Porpoise	1,790	0	1,790
Common Bottlenose Dolphin	7	0	7
Long-beaked Common Dolphin	7	0	7

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7.0 Anticipated Impact on Species or Stocks

The anticipated impact of the activity upon the species or stock of marine mammals.

WSF is requesting authorization for Level B acoustical harassment take of marine mammals as listed in Table 6-1. Any incidental takes will very likely be multiple takes of individuals, rather than single takes of unique individuals. The stock take calculations below assume takes of individual animals, instead of repeated takes of a smaller number; therefore the stock take percentage calculations are very conservative.

These numbers in relation to the overall stock size of each species are summarized in Table 7-1.

If incidental takes occur, it is expected to only result in short-term changes in behavior and potential temporary hearing threshold shift. These takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the stocks of these species. 68,432 long-beaked common dolphins (NMFS 2017c). The minimum population estimate of short-beaked common dolphin is 839,325

Table 7-1 Level B Acoustical Harassment Take Request Percent of Total Stock

Species	Stock Size	Take Request	Take Request % of Stock	20% of Stock
Harbor Seal	11,036	2,200	19.93	2,207
Northern Elephant Seal	81,368	7	0.06	16,274
California Sea Lion	296,750	714	0.24	59,350
Steller Sea Lion	41,638	119	0.29	8,328
SR Killer Whale	76	0	0	16
Transient Killer Whale	243	23	9.5	48
Gray Whale	20,990	48	0.23	4,198
Humpback Whale	1,918	48	2.5	384
Minke Whale	369	7	2.0	73
Harbor Porpoise	10,682	2,136	20.00	2,136
Dall's Porpoise	42,000	1,790	4.26	8,400
Common Bottlenose Dolphin	1,255	7	0.60	251
Long-beaked Common Dolphin	68,432	7	0.01	13,687

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8.0 Anticipated Impact on Subsistence

The anticipated impact of the activity on the availability of the species or stocks of marine mammals for subsistence uses.

Impacts to subsistence are specific to Alaska. There are no relevant subsistence uses of marine mammals implicated by this action.

9.0 Anticipated Impact on Habitat

The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat.

9.1 Introduction

Construction activities will have temporary impacts on marine mammal habitat by through increases in in-water and in-air sound pressure levels from pile driving and removal. Other potential temporary impacts are water quality (increases in turbidity levels) and prey species distribution. Best management practices (BMPs) and minimization practices used by WSF to minimize potential environmental effects from project activities are outlined in Section 11 - Mitigation Measures.

9.2 In-air Noise Disturbance to Haul Outs

The project is scheduled to begin September 1, 2018, and all harbor seal pups are weaned in this region of Puget Sound by October 1. Disturbance of pinnipeds hauled out near the project, and surfacing when swimming within the threshold distances is possible.

During vibratory pile driving and removal, temporary in-air disturbance will be limited to harbor seals swimming on the surface through the immediate terminal area, or hauled-out on beaches or boat ramps within 34 m/111 ft.

During impact pile driving, temporary in-air disturbance will be limited to harbor seals or Northern Elephant seals swimming on the surface through the immediate terminal area, or hauled-out on beaches or boat ramps within 152 m/500 ft., and within 48 m/158 ft. for sea lions.

In-air noise from non-pile driving construction activities is not expected to cause in-air disturbance to pinnipeds, because the Mukilteo Ferry Terminal is currently subject to similar existing levels of in-air noise from ferry, boat, road and other noise sources.

9.3 Underwater Noise Disturbance

NMFS is currently using an in-water noise disturbance threshold of 120 dB_{RMS} for pinnipeds and cetaceans for continuous noise sources, unless the site-specific background noise is higher than 120 dB_{RMS}. In that case, the higher background becomes the threshold. The distance to the Level B acoustical harassment thresholds is described in Section 1.6.4, Attenuation to NMFS Thresholds.

There are several short-term and long-term effects from noise exposure that may occur to marine mammals, including impaired foraging efficiency and its potential effects on movements of prey, harmful physiological conditions, energetic expenditures and temporary or permanent hearing threshold shifts due to chronic stress from noise (Southall et al. 2007). The majority of the research on underwater noise impacts on whales is associated with vessel and navy sonar disturbances and does not often address impacts from pile driving.

The threshold levels at which anthropogenic noise becomes harmful to killer whales are poorly understood (NMFS 2008). Because whale occurrence is occasional near the project site, in-water noise impacts are localized and of short duration, any impact on individual cetaceans will be limited. Because there are no documented haul outs within the immediate project area, pinniped disturbance will be limited to individuals transiting the ZOI. Pile removal and driving will expose marine mammals to potential Level B harassment. The impact pile driving Zone of Exclusion (ZOE) will be monitored, and work ceased if any marine mammals approaches the ZOE.

9.4 Water and Sediment Quality

Short-term turbidity is a water quality effect of in-water work, including pile driving. WSF must comply with state water quality standards during these operations by limiting the extent of turbidity to the immediate project area.

Roni and Weitkamp (1996) monitored water quality parameters during a pier replacement project in Manchester, Washington. The study measured water quality before, during and after pile removal and driving. The study found that construction activity at the site had “little or no effect on dissolved oxygen, water temperature and salinity”, and turbidity (measured in nephelometric turbidity units [NTU]) at all depths nearest the construction activity was typically less than 1 NTU higher than stations farther from the project area throughout construction.

Similar results were recorded during pile removal operations at two WSF ferry facilities. At the Friday Harbor terminal, localized turbidity levels within the regulatory compliance radius of 150 feet (from three timber pile removal events) were generally less than 0.5 NTU higher than background levels and never exceeded 1 NTU. At the Eagle Harbor maintenance facility, within 150 feet, local turbidity levels (from removal of timber and steel piles) did not exceed 0.2 NTU above background levels (WSDOT 2014). In general, turbidity associated with pile installation is localized to about a 25-foot radius around the pile (Everitt et al. 1980).

Cetaceans are not expected to be close enough to the Mukilteo Ferry Terminal to experience turbidity, and any pinnipeds will be transiting the terminal area and could avoid localized areas of turbidity. Therefore, the impact from increased turbidity levels is expected to be discountable to marine mammals.

9.5 Passage Obstructions

Pile driving and removal at the Mukilteo Ferry Terminal will not obstruct movements of marine mammals. Pile work at Mukilteo will occur within 500 feet of the shoreline. A construction barge may be used during the project. The barge will be anchored and/spudded. No dynamic positioning system (DPS) will be used. In a previous concurrence letter for the Vashon Island Dolphin Replacement Project (NMFS 2008b), NMFS stated the following:

> Vessels associated with any project are primarily tug/barges, which are slow moving, follow a predictable course, do not target whales, and should be easily detected by whales when in transit. Vessel strikes are extremely unlikely and any potential encounters with Southern Residents [killer whales] are expected to be sporadic and transitory in nature.

Similarly, vessel strikes are unlikely for the proposed project.

9.6 Conclusions Regarding Impacts on Habitat

The most likely effects on marine mammal habitat from the proposed project are temporary, short duration noise and water quality effects. The direct loss of habitat available to marine mammals during construction due to noise, water quality impacts and construction activity is expected to be minimal. All cetacean species utilizing habitat near the terminal will be transiting the terminal area.

Any adverse effects on prey species during project construction will be short term. Given the large numbers of fish and other prey species in Puget Sound, the short-term nature of effects on fish species and the mitigation measures to protect fish during construction (use of a vibratory hammer when possible, use of a bubble curtain during steel pile impact pile driving, BMPs, conducting work within the approved in-water work window), the proposed project is not expected to have measurable effects on the distribution or abundance of potential marine mammal prey species.

Passage is not expected to be obstructed as a result of the proposed project. Any temporary obstruction due to barge placement will be localized and limited in duration, and a traveling barge is too slow to strike marine mammals.

10.0 Anticipated Impact of Loss or Modification of Habitat

The anticipated impact of the loss or modification of the habitat on the marine mammal populations involved.

The proposed project will not result in a significant permanent loss or modification of habitat for marine mammals or their food sources. The most likely effects on marine mammal habitat for the proposed project are temporary, short duration in-water noise, temporary prey (fish) disturbance, and localized, temporary water quality effects. The direct loss of habitat available to marine mammals during the project is expected to be minimal. These temporary impacts have been discussed in detail in Section 9.0, Anticipated Impact on Habitat.

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11.0 Mitigation Measures

The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

WSF activities are subject to federal, state and local permit regulations. WSF has developed and routinely uses the best guidance available (e.g., BMPs and mitigation measures) to avoid and minimize (to the greatest extent possible) impacts on the environment, ESA species, designated critical habitats and species protected under the MMPA.

The mitigation measures will be employed during all construction activities at the Mukilteo ferry terminal. The language in each mitigation measure is included in the Contract Plans and Specifications and must be agreed upon by the contractor prior to any construction activities. Upon signing the contract, it becomes a legal agreement between the Contractor and WSF. Failure to follow the prescribed mitigation measures is a contract violation.

General mitigation measures used for all construction practices are listed first (Section 11.1, All Construction Activities), followed by specific mitigation measures for pile related activities (Section 11.2, Pile Removal and Installation). The mitigation measures listed under Section 11.1 apply to different activities and are, therefore, listed additional times where appropriate.

11.1 All Construction Activities

All WSF construction is performed in accordance with the current WSDOT Standard Specifications for Road, Bridge, and Municipal Construction. Special Provisions contained in preservation and repair contracts are used in conjunction with, and supersede, any conflicting provisions of the Standard Specifications. Mitigation measures include:

- 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.
- WSF will have a WSF inspector on site during construction. The role of the inspector is to ensure contract compliance. The inspector and the contractor will have a copy of the Contract Plans and Specifications on site and will be aware of all requirements. The inspector will also be trained in environmental provisions and compliance.
- WSF will obtain Hydraulic Project Approval (HPA) from WDFW as appropriate and the contractor will follow the conditions of the HPA. HPA requirements will be listed in the contract specifications, and will be a legal requirement of the contract.
- 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:
- The 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.

- 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.
- 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."
- The contractor shall maintain, at the job site, the applicable spill response equipment and material designated in the SPCC plan.
- 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.
- No petroleum products, chemicals or other toxic or deleterious materials shall be allowed to enter surface waters.
- WSF will comply with water quality restrictions imposed by the Washington State Department of Ecology (Ecology) (Chapter 173-201A WAC), which specify a mixing zone beyond which water quality standards cannot be exceeded. Compliance with Ecology's standards is intended to ensure that fish and aquatic life are being protected to the extent feasible and practicable.
- Wash water resulting from washdown of equipment or work areas shall be contained for proper disposal, and shall not be discharged into state waters unless authorized through a state discharge permit.
- Equipment that enters the surface water shall be maintained to prevent any visible sheen from petroleum products appearing on the water.
- 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.
- No cleaning solvents or chemicals used for tools or equipment cleaning shall be discharged to ground or surface waters.
- The contractor shall regularly check fuel hoses, oil drums, oil or fuel transfer valves, fittings, etc. for leaks, and shall maintain and store materials properly to prevent spills.

11.2 Timing Windows

Timing restrictions are used to avoid in-water work when ESA-listed salmonids are most likely to be present. The combined work window for in-water work for the Mukilteo ferry terminal is July 16 through February 15. Actual construction activities are planned to take place from September 1, 2018 and February 15, 2019.

11.3 Pile Removal BMPs

The following pile removal mitigation measures are proposed by WSF to reduce impacts on marine mammals to the lowest extent practicable. For WSF's Construction Minimization Measures, see WSF Biological Assessment Reference Section 2.3. Additional BMPs that will be incorporated into the project include:

- Hydraulic water jets will not be used to remove piles.
- Marine mammal monitoring during vibratory pile removal will be employed for the Level B ZOI (see Appendix B, Marine Mammal Monitoring). WSF will conduct briefings with the construction supervisors and the crew, and marine mammal observer(s) prior to the start of pile removal to discuss marine mammal monitoring protocol and requirement to halt work.
- The crane operator will be instructed to remove piles slowly to minimize turbidity in the water as well as sediment disturbance.
- The operator will "wake up "the pile to break the bond with surrounding sediment by vibrating the pile slightly prior to removal. Waking up the pile avoids pulling out large blocks of sediment and usually results in little to no sediment attached to the pile during withdrawal.
- The work surface on the barge deck or pier will include a containment basin for pile and any sediment removed during pulling. The basin will be constructed of durable plastic sheeting with sidewalls supported by hay bales or a support structure to contain all sediment. The containment basin shall be removed and disposed of in accordance with applicable federal and state regulations.
- The work surface shall be cleaned by properly disposing of sediment or other residues along with cut-off piling.
- Upon removal from the substrate the pile shall be moved immediately from the water into the containment basin. The pile shall not be shaken, hosed-off, stripped or scraped off, left hanging to drip or any other action intended to clean or remove adhering material from the pile.
- Water quality will be monitored during pile removal. Work barges and dredged material disposal barges will not be allowed to ground out or rest on the substrate, or be over or within 25 feet of vegetated shallows (except where such vegetation is limited to state-designated noxious weeds).
- Barges will not be anchored over vegetated shallows for more than 24 hours.
- Demolition and construction materials shall not be stored where high tides, wave action, or upland runoff can cause materials to enter surface waters.

11.4 Pile Driving BMPs

BMPs to be employed during pile installation include:

- Marine mammal monitoring during vibratory or impact pile installation will be employed for the Level B ZOI (see Appendix B, Marine Mammal Monitoring). WSF will conduct briefings with the construction supervisors and the crew, and marine mammal observer(s) prior to the start of pile removal to discuss marine mammal monitoring protocol and requirement to halt work.
- The vibratory hammer method will be used to the extent possible to drive steel piles to minimize noise levels.
- A bubble curtain or other noise attenuation device will be employed during impact installation or proofing of steel piles unless the piles are driven in the dry.
- The contractor will be required to retrieve any floating debris generated during construction. Any debris in the containment boom will be removed by the end of the work day or when the boom is removed, whichever occurs first. Retrieved debris will be disposed of at an upland disposal site.
- Steel, plastic/steel, concrete, or ACZA-treated wood piling will be used. No creosote-treated timber piling will be used.
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11.5 Safety Zone/Zone of Exclusion

The purpose of the safety zone/Zone of Exclusion (ZOE) is to ensure that noise-generating activities are shut down before Level A (injury) take occurs from cetaceans entering a relevant ZOE while vibratory or impact pile driving is active.

Monitoring ZOEs/Shutdown Zones have been conservatively simplified (55 m for seals/sea lions; 275 m for cetaceans) in order to make PSO monitoring easier to implement during construction. ZOE-3 will be implemented only if there are repeated project interruptions from sea lions between 10 m and 55 m.

Table 11-3. Zone of Influence summary.

ZOI	Pile Type/ Method	Species	Distance to ZOE/Shutdown	Days Present
ZOE-1	All	Cetacean	275 m	77
ZOE-2	All	Pinniped	55 m	77
ZOE-3	All	Otariid	10 m*	77

*Implemented only if necessary

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12.0 Arctic Subsistence Uses, Plan of Cooperation

Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit either a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses. A plan must include the following:

(i) A statement that the applicant has notified and provided the affected subsistence community with a draft plan of cooperation;

(ii) A schedule for meeting with the affected subsistence communities to discuss proposed activities and to resolve potential conflicts regarding any aspects of either the operation or the plan of cooperation;

(iii) A description of what measures the applicant has taken an/or will take to ensure that proposed activities will not interfere with subsistence whaling or sealing; and

(iv) What plans the applicant has to continue to meet with the affected communities, both prior to and while conducting activity, to resolve conflicts and to notify the communities of any changes in the operation.

This section is not applicable. The proposed activities will take place in Washington State, specifically in Puget Sound. No activities will take place in or near a traditional Arctic subsistence hunting area.

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13.0 Monitoring and Reporting Plan

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding.

13.1 Coordination

WSF will conduct briefings with the construction supervisors and the crew, and marine mammal observer(s) prior to the start of pile driving and removal to discuss marine mammal monitoring protocol and requirement to halt work.

Prior to the start of pile driving, the Orca Network and/or Center for Whale Research will be contacted to find out the location of the nearest marine mammal sightings. Daily sightings information can be found on the Orca Network Twitter site (https://twitter.com/orcanetwork), which will be checked several times a day.

The Orca Sightings Network consists of a list of over 600 (and growing) residents, scientists, and government agency personnel in the U.S. and Canada. Sightings are called or emailed into the Orca Network and immediately distributed to other sighting networks including: the Northwest Fisheries Science Center of NOAA Fisheries, the Center for Whale Research, Cascadia Research, the Whale Museum Hotline and the British Columbia Sightings Network.

'Sightings' information collected by the Orca Network includes detection by hydrophone. The SeaSound Remote Sensing Network is a system of interconnected hydrophones installed in the marine environment of Haro Strait (west side of San Juan Island) to study orca communication, in-water noise, bottomfish ecology and local climatic conditions. A hydrophone at the Port Townsend Marine Science Center measures average in-water sound levels and automatically detects unusual sounds. These passive acoustic devices allow researchers to hear when different marine mammals come into the region. This acoustic network, combined with the volunteer (incidental) visual sighting network allows researchers to document presence and location of various marine mammal species.

With this level of coordination in the region of activity, WSF will be able to get real-time information on the presence or absence of whales before starting any pile removal or driving.

13.2 Visual Monitoring

WSF has developed a monitoring plan that will collect sighting data for each marine mammal species observed during pile removal activities. Monitoring for marine mammal presence will take place 30 minutes before, during and 30 minutes after pile removal.

Marine mammal behavior, overall numbers of individuals observed, frequency of observation and the time corresponding to the daily tidal cycle will also be included. Qualified marine mammal observers will be present on site during pile installation and removal. A monitoring plan is provided in Appendix B.

13.3 Reporting Plan

WSF will provide NMFS with a draft monitoring report within 90 days of the conclusion of monitoring. This report will detail the monitoring protocol, summarize the data recorded during monitoring and estimate the number of marine mammals that may have been harassed.

If comments are received from the Regional Administrator on the draft report, a final report will be submitted to NMFS within 30 days thereafter. If no comments are received from NMFS, the draft report will be considered to be the final report.

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14.0 Coordinating Research to Reduce and Evaluate Incidental Take

Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects.

In-water noise generated by pile removal and driving at the project site is the primary issue of concern relative to local marine mammals. WSF has conducted research on sound propagation from vibratory and impact hammers, and plans on continuing that research to provide data and new technologies for future ferry terminal projects. Impact and vibratory noise will be monitored during the project, in order to collect further data.

As described in Section 13, WSF will coordinate with local marine mammal sighting networks (Orca Network and/or the Center for Whale Research) to gather information on the location of whales prior to initiating pile removal. Marine mammal monitoring will be conducted to collect information on presence of marine mammals within the ZOIs for this project.

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