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

Seattle Multimodal Project at Colman Dock
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 providing pile driving data, and Shane Guan of NMFS for analyzing the data to provide site specific threshold zones for this project.

Cover: Southern Resident Killer Whales with Seattle skyline (October 2013) ***(NOAA Northwest Fisheries Science Center, Candace Emmons)***

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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 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 Seattle Multimodal Project at Colman Dock, 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 eleven marine mammal species (harbor seal, California sea lion, Steller sea lion, northern elephant seal, killer whale (Southern Resident and Transient), gray whale, humpback whale, Minke whale, harbor porpoise, Dall's porpoise and long-beaked common dolphin) that may occur in the vicinity of the project.

1.2 Project Setting and Land Use

The Seattle Ferry Terminal at Colman Dock, serving State Route 519, is located on the downtown Seattle waterfront, in King County, Washington. The terminal services vessels from the Bainbridge Island and Bremerton routes, and is the most heavily used terminal in the WSF system. The Seattle terminal is located in Section 6, Township 24 North, Range 4 East, and is adjacent to Elliott Bay, a tributary to Puget Sound (Figure 1-2). Land use in the area is highly urban, and includes business, industrial, the Port of Seattle container loading facility, residential, the Pioneer Square Historic District and local parks.

1.3 Project Description

WSF is proposing to preserve the Seattle Ferry Terminal at Colman Dock (Figure 1-2). The project will reconfigure the dock while maintaining approximately the same vehicle holding capacity as current conditions. Project sheets are provided in Appendix F.

The reconfiguration would increase total permanent overwater coverage (OWC) by about 5,400 square feet (SF) (about 1.7% more than existing overwater coverage at the site), due to the new walkway from the King County Passenger Only Ferry (POF) facility to Alaskan Way and new stairways and elevators from the POF to the upper level of the terminal. The additional 5,400 SF will be mitigated by removing a portion of Pier 48, a condemned timber structure.

The project will remove the northern timber trestle and replace a portion of it with a new concrete trestle (Figure 1-3). The area from Marion Street to the north edge of the property will not be rebuilt and will become, after demolition, a new area of open water. A section of fill contained behind a bulkhead underneath the northeast section of the dock will also be removed. WSF will construct a new steel and concrete trestle from Columbia Street northward to Marion Street.

Construction of the reconfigured dock will narrow (reduce) the OWC along the shoreline (at the landward edge) by 180 linear feet at the north end of the site, while 30 linear feet of new trestle would be constructed along the shoreline at the south end of the site. The net reduction of OWC in the nearshore zone is 150 linear feet.

The project includes demolition of the existing terminal building and construction of a new terminal building. The new terminal building will be located along the west edge of the dock, spanning all three slips to handle passenger traffic more efficiently, and will connect to the Marion Street Overpass by an elevated deck.

The project includes reconstruction of the vehicle transfer span and the passenger overhead loading (OHL) structures of Slip 3, including new hydraulic systems. The new OHL would be wider than the existing OHL, to accommodate the increased walk-on passenger volumes.

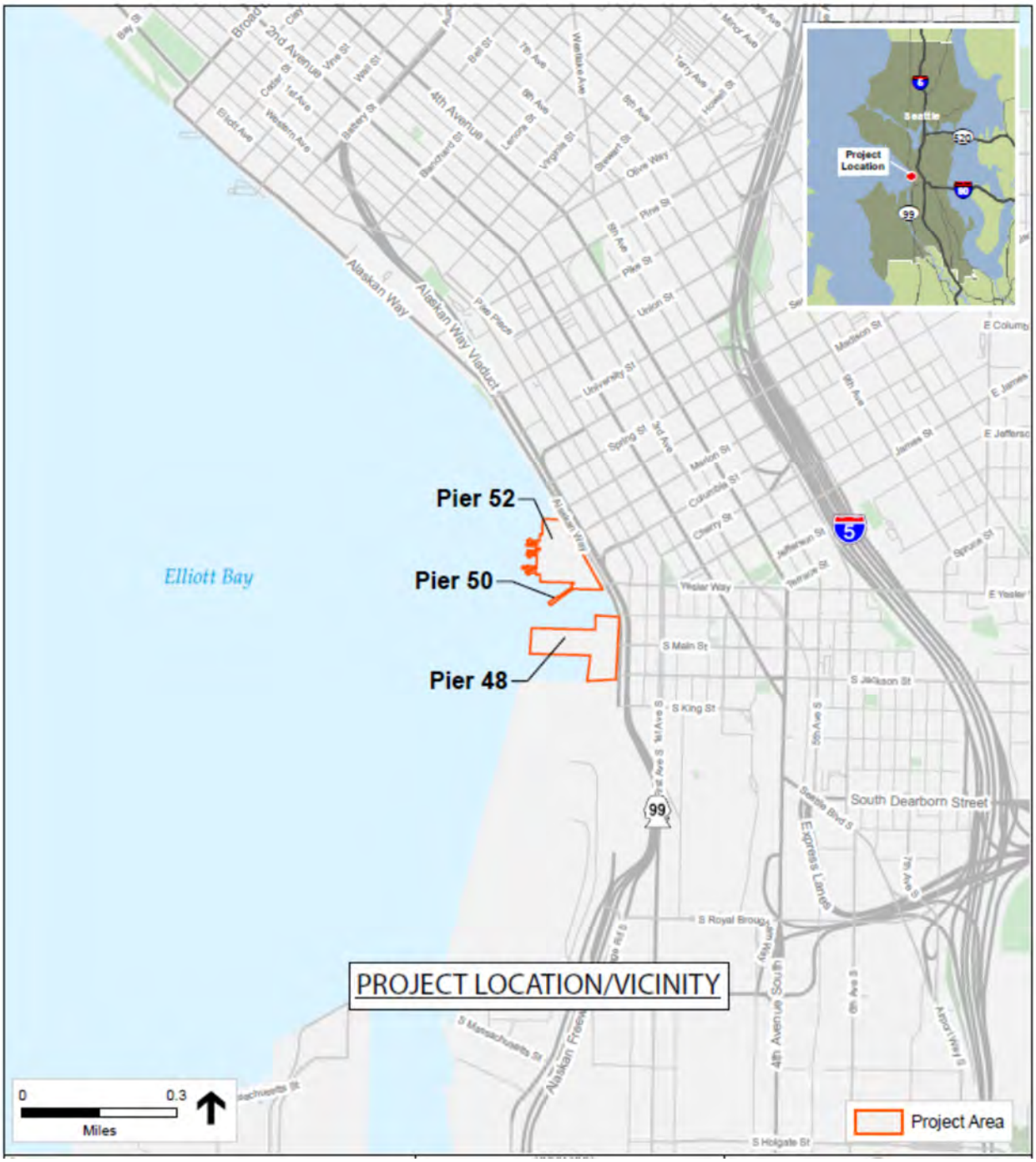

Figure 1-2 Location of Seattle Ferry Terminal

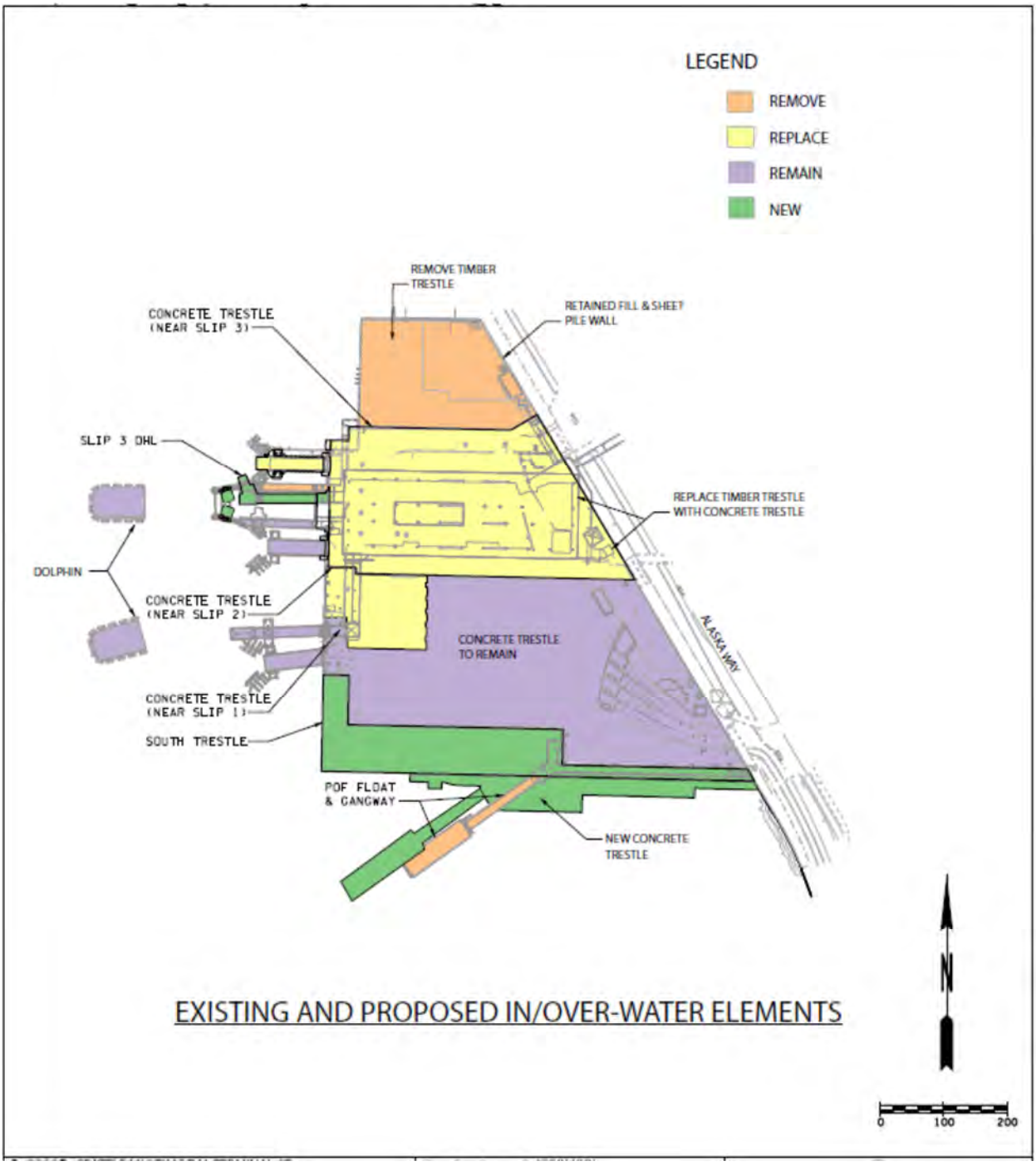

Figure 1-3 Existing/Proposed Construction Elements

The project will maintain the current POF functions on site, and address safety concerns related to pedestrian/vehicle conflicts at Yesler Street. A new covered pier, sized to accommodate POF passenger waiting and connected by a new overhead pedestrian bridge to the terminal building and the Marion Street Overpass, would be constructed along the south side of Colman Dock

Sediment beneath the terminal has been contaminated by the creosote-treated piles and other chemicals discharged to the environment over the years. A cap was installed to cover contaminated sediment on the south half of the site prior to trestle expansion in 1990. WSF proposes to place a new sediment cap to the north and south of the current cap during construction of the project to contain existing contamination.

Stormwater management will be improved by the addition of Filterra treatment units in the southern portion of the terminal, which will remove oil and suspended solids.

The effects of the project were analyzed pursuant to the National Environmental Policy Act and the federal co-lead agencies, FTA and FHWA, issued a finding of no significant impact (FONSI) on November 5, 2015. During the NEPA process, the project underwent formal Endangered Species Act (ESA) consultation with National Oceanographic and Atmospheric Administration (NOAA) Fisheries and the U.S. Fish and Wildlife Service. NOAA Fisheries issued a Biological Opinion on March 20, 2014 and USFWS issued a Biological Opinion on February 18, 2014. An ESA re-initiation is now in process, primarily due to a change in pile type from concrete to steel, and is expected to be complete in the spring of 2017.

The construction will take approximately five years, beginning in mid-2017. The terminal will be kept in operation during the construction.

1.4 Project Purpose and Need

The purpose of the Seattle Multimodal Project at Colman Dock is to preserve the transportation function of an aging, deteriorating and seismically-deficient facility to continue providing safe and reliable service. The project will also address existing safety concerns related to conflicts between vehicles and pedestrian traffic and operational inefficiencies.

Key project elements include:

- Replacing and re-configuring the timber trestle portion of the dock;
- Replacing the main terminal building;
- Reconfiguring the dock layout to provide safer and more efficient operations;
- Replacing the vehicle transfer span and the overhead loading structures of Slip 3;
- Replacing vessel landing aids;
- Maintaining a connection to the Marion Street pedestrian overpass;
- Moving the current passenger only ferry (POF) slip temporarily to the north to make way for south trestle construction, and then constructing a new POF slip in the south trestle area.

- Mitigating for additional 5,400 square feet of overwater coverage;
- Capping contaminated sediments.

1.4.1 In-water Construction Details

In-water construction for the 2017/18 season includes the following pile driving and removal (Table 1-1):

Table 1-1 In-water Construction*

Structures	Pile Type/Number
South Trestle Terminal Building Foundation POF Slip (temporary and permanent)	(205) 36-inch steel piles (17) 30-inch piles Up to (101) 24-inch temporary steel piles (4) 36-inch existing steel piles removed (3) 30-inch existing steel piles removed (2) 24-inch existing steel piles removed
Pier 48 Mitigation (demolition)	(215) 14-inch timber piles removed

*Numbers in parentheses indicate total quantity.

In-water construction methods include:

- The 14-inch timber piles will be removed with a vibratory hammer.
- The 24-inch temporary piles will be installed and removed with a vibratory hammer (no proofing).
- Permanent trestle and foundation 30- and 36-inch steel piles will be installed with a vibratory hammer, and then proofed with an impact hammer for the last 25-35 feet.
- Temporary and permanent passenger only ferry slip 30- and 36-inch steel piles will be installed with a vibratory hammer, and then proofed with an impact hammer for the last 25-35 feet.

1.5 Pile Driving and Removal Techniques

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

1.5.1 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 1-4 Vibratory Hammer Driving a Steel Pile

1.5.2 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 1-5 Impact Hammer Driving a Steel Pile

1.6 Sound Levels

Under the NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Guidance), dual criteria are used to assess marine mammal hearing injury (Level A harassment) as a result of noise exposure (NMFS 2016a). The dual criteria under the Guidance provide onset thresholds in instantaneous peak SPLs (L_{pk}) as well as 24-hr cumulative SELs ($\boldsymbol{L_E}$) that could cause permanent hearing threshold shifts (PTS) to marine mammals of different hearing groups. The peak SPL is the highest positive value of the noise field, log transformed to decibel (dB) in reference to 1 micropascal (µPa).

$$\boldsymbol{L_{pk}} = \max\left\{10\log_{10}\left(\frac{\boldsymbol{p(t)}}{\boldsymbol{p_{ref}}}\right)^2\right\} \qquad (1)$$

where $\boldsymbol{p(t)}$ is acoustic pressure in pascal or micropascal, and $\boldsymbol{p_{ref}}$ is reference acoustic pressure equals to 1 µPa.

The cumulative SEL is the total sound exposure over the entire duration of a given day's pile driving activity, specifically, pile driving occurring within a 24-hr period.

$$\boldsymbol{L_E} = 10\log_{10}\left(\int_{t_1}^{t_2}\left(\frac{\boldsymbol{p(t)}}{\boldsymbol{p_{ref}}}\right)^2 \boldsymbol{dt}\right) \qquad (2)$$

where $\boldsymbol{p(t)}$ is acoustic pressure in pascal or micropascal, $\boldsymbol{p_{ref}}$ is reference acoustic pressure equals to 1 µPa, $\boldsymbol{t_1}$ is marks the beginning of the time, and $\boldsymbol{t_2}$ the end of time.

For onset of Level B harassment, NMFS continuous to use the root-mean-square (rms) sound pressure level (SPL_{rms}) at 120 dB re 1 µPa and 160 dB re 1 µPa at the received levels from non-impulse (vibratory pile driving and removal) and impulse sources (impact pile driving) underwater, respectively. The SPL_{rms} for pulses (such as those from impact pile driving) should contain 90% energy of the pulse energy, and is calculated by

$$\boldsymbol{SPL_{rms}} = 10\log_{10}\left(\frac{1}{\boldsymbol{T}}\int_{t_1}^{t_2}\left(\frac{\boldsymbol{p(t)}}{\boldsymbol{p_{ref}}}\right)^2 \boldsymbol{dt}\right) \qquad (3)$$

where $\boldsymbol{p(t)}$ is acoustic pressure in pascal or micropascal, $\boldsymbol{p_{ref}}$ is reference acoustic pressure equals to 1 µPa, $\boldsymbol{t_1}$ is marks the beginning of the time, and $\boldsymbol{t_2}$ the end of time. In the case of an impulse noise, $\boldsymbol{t_1}$ is marks the onset of the 5% of the total energy window, and $\boldsymbol{t_2}$ the time of 95% of the accumulated energy window. Table 1-2 summarizes the current NMFS marine mammal take criteria.

Table 1-2 Current Acoustic Exposure Criteria for Non-explosive Sound Underwater

Hearing Group	PTS Onset Thresholds		Behavioral Thresholds	
	Impulsive	Non-impulsive	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	$L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	$L_{E,LF,24h}$: 199 dB	$L_{rms,flat}$: 160 dB	$L_{rms,flat}$: 120 dB
Mid-Frequency (MF) Cetaceans	$L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	$L_{E,MF,24h}$: 198 dB		
High-Frequency (HF) Cetaceans	$L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	$L_{E,HF,24h}$: 173 dB		
Phocid Pinnipeds (PW) (Underwater)	$L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	$L_{E,PW,24h}$: 201 dB		
Otariid Pinnipeds (OW) (Underwater)	$L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	$L_{E,OW,24h}$: 219 dB		

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure (Lpk) has a reference value of 1 µPa, and cumulative sound exposure level (LE) has a reference value of 1µPa2s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

1.6.1 Source Levels

The project includes vibratory removal of 14-in timber piles, vibratory driving and removal of 24-in steel piles, vibratory driving of 30- and 36-in steel piles, and impact pile driving of 30- and 36-in steel piles. In February of 2016, WSDOT conducted a test pile project at Colman Dock in order to gather data to select the appropriate piles for the Colman Project. The test pile project measured impact pile driving of 24- and 36-in steel piles. The measured results from the Colman Project are used here to provide source levels for the prediction of isopleths ensonified over thresholds for the Seattle project. The results show that the SPL_{rms} for impact pile driving of 36-in steel pile is 189 dB re 1 µPa at 14 m from the pile (WSDOT 2016b). This value is also used for impact driving of the 30-in steel piles.

The source level of vibratory pile driving of 30-in and 36-in steel piles is based on test pile driving at the Port Townsend Ferry Terminal in 2010. Recordings of vibratory pile driving were made at a distance of 10 m from the pile. The results show that the SPL_{rms} for vibratory pile driving of a 30-in pile was 177 dB re 1 µPa, and vibratory pile driving of a 36-in pile was 159 dB re 1 µPa (Laughlin 2010a). The more conservative 177 dB re 1 µPa shall be used for both pile sizes.

Up to three pile installation crews may be active during the day within the project footprint. Each crew will use one vibratory and one impact hammer, and it is possible that more than one vibratory or impact hammer may be active at the same time for pile driving and/or removal for the 24-, 30-, and 36-inch piles. Overlapping noise fields created by multiple hammer use are handled differently for impact and vibratory hammers. When more than one impact hammer is being used close enough to another impact hammer, the cumulative acoustic energy is accounted for by including all hammer strikes. When more than one vibratory hammer is being used close enough to another vibratory hammer to create overlapping noise fields, additional sound levels are added to account for the overlap, creating a larger ZOI. A simplified nomogram method (Kinsler et al. 2000) is proposed to account for multiple noise source levels addition for multiple vibratory hammers, as shown in Table 4. Using this method, the source levels of 24-, 30-, and 36-in piles during vibratory pile driving are adjusted to 182 dB re 1 µPa.

Table 1-3 Multiple Sound Level Addition

When two sound levels differ by	Add the following to the higher level
0-1 dB	3 dB
2-3 dB	2 dB
4-9 dB	1 dB
> 10 dB	0 dB

For vibratory pile removal, vibratory pile driving data were used as proxies because we conservatively consider noises from pile removal would be the same as those from pile driving. The source level of vibratory removal of 14-inch timber piles were based on measurements conducted at the Port Townsend Ferry Terminal during vibratory removal of a 12-inch timber pile by WSDOT (Laughlin 2011). The recorded source level is 152 dB re 1 µPa at 16 m from the pile. In the absence of spectrum of timber pile vibratory driving, frequency weighting adjustment (FWA) of NMFS exposure guidance (NMFS 2016a) was used to determine these zones. These source levels are used to compute the Level A ensonified zones and to estimate the Level B harassment zone by impact pile driving where the broadband SPL_{rms} is 160 dB re 1 µPa. For Level A harassment zones, zones calculated using cumulative SEL are all larger than using SPL_{peak}, therefore, only zones from cumulative SEL for Level A harassment are used.

1.6.2 Estimating Injury Zones

Calculation and modeling of applicable ensonified zones are based on source measurements of comparable types and sizes of piles driven by different methods (impact vs. vibratory hammers) either during the Colman test pile driving or at a different location within the Puget Sound. As

mentioned earlier, isopleths for injury zones are based or peak SPL (L_{pk}) and cumulative SEL (L_E) dual criteria, whichever zone is larger.
For peak SPL (L_{pk}), distances to marine mammal injury thresholds were calculated using a simple geometric spread using a transmission loss coefficient of 15:

$$\boldsymbol{SL_{Measure}} = \boldsymbol{EL} + 15\log_{10}\left(\boldsymbol{R} - \boldsymbol{D_{Measure}}\right) \quad (4)$$

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

For cumulative SEL ($\boldsymbol{L_E}$), 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 and 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 strike (for impact pile driving) or 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 impact pile driving, broadband PSDs were generated from SPL_{rms} time series of a total of 270 strikes with a time window that contains 90% of pulse energy. 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 impact pile driving, cumulative exposures ($\boldsymbol{E_{sum}}$) 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:

$$\boldsymbol{E_{sum}} = \sum_{\boldsymbol{i}=1}^{\boldsymbol{N}} \boldsymbol{p}_{\boldsymbol{rms,i}}^{2} \tau_{\boldsymbol{i}} \boldsymbol{N_s} \quad (5)$$

where $\boldsymbol{p_{rms,i}}$ is the rms pressure, τ is the rms pulse duration for the specific strike, $\boldsymbol{N_s}$ is the anticipated number of strikes needed to install one pile, and $\boldsymbol{N}$ is the number of total piles to be installed.

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:

$$\boldsymbol{E_{sum}} = \sum_{\boldsymbol{i}=1}^{\boldsymbol{N}} \boldsymbol{E}_{1\boldsymbol{s},\boldsymbol{i}} \Delta \boldsymbol{t_i} \quad (6)$$

where $\boldsymbol{E}_{1\boldsymbol{s}}$ is the 1-second noise exposure, and $\Delta \boldsymbol{t}$ is the duration need to install 1 pile by vibratory piling.

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

$$TL(f) = 15\log_{10}(R) + \alpha(f)R/1000 \qquad (7)$$

where $a(f)$ 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.

1.6.3 Approach to Estimate Behavioral Zones

As mentioned earlier, isopleths to Level B behavioral zones are based on root-mean-square SPL (SPL_{rms}) that are specific for impulse (impact pile driving) and non-impulse (vibratory pile driving) sources. Distances to marine mammal behavior thresholds were calculated using a simple geometric spread the same way as Eq. (4).

For Level B harassment zones from vibratory pile driving of 30" and 36" piles, the ensonified zones are calculated based on practical spreading of back-calculated source level of 36" pile driving adjusted for 3 hammers by adding 5 dB. The result show that the 120 dB re 1 µPa is at 13.6 km. For Level B harassment zone from vibratory pile driving of 24" piles, WSDOT conducted site measurements during Seattle Colman test pile driving project using 24" steel piles. The results show that underwater noise cannot be detected at a distance of 5 km (3 miles) (WSDOT 2016a). Since this measurement was based on pile driving using 1 hammer, the Level B zone for 24" steel pile is adjusted up by factor in a 5 dB difference (see above) using the following equation, based on the inverse law of acoustic propagation (i.e., dB difference in transmission loss is the inverse of distance difference in logarithm):

$$\left|dB_{difference}\right| = 15 \times \log 10\left(\frac{R_{3\text{-hammer}}}{R_{1\text{-hammer}}}\right) \qquad (5)$$

where $dB_{difference}$ is the 5 dB difference, $R_{3\text{-hammer}}$ is the distance from the pile where piling noise is no longer audible, and $R_{1\text{-hammer}}$ is the measured distance from the pile where piling noise is no longer audible, which is 5 km. The result show that when using 3 vibratory hammers piling concurrently, the distance from the pile where pile noise is no longer audible is 11 km. A summary of the measured and modeled harassment zones is provided in Table 5.

Table 5. Distances to Harassment Zones:

Pile type, size & pile driving method	Injury zone (m)					Underwater ZOI (m)
	LF cetacean	MF cetacean	HF cetacean	Phocid	Otariid	
Vibratory 14" timber	8	0.7	11.9	4.9	0.3	1000
Vibratory 24" steel	255	65	1365	115	10	11000
Vibratory 30" & 36" steel	285	65	1455	125	10	13600
Impact 30" & 36" steel	1845	75	2835	465	35	1200

1.6.4 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 removal of 14-inch timber, vibratory driving/removal of 24-inch steel, or vibratory driving of 36-inch steel piles. Based on in-air measurements at the WSF Coupeville Ferry Terminal, vibratory driving of a 30-inch steel pile generated a maximum of 97 dB_{RMS} (unweighted) @ 15 m/50 ft. (Laughlin 2010b). It is assumed that in-air noise generated during vibratory driving or removal of all other project piles will generate the same source level (96.9 dB_{RMS}).

Based on in-air measurements during the Seattle Test Pile Project, impact pile driving of a 36-inch steel pile generated 111 dB dB_{RMS} (unweighted) @ 15m/50 ft. (WSDOT 2016b). It is assumed that in-air noise generated during impact driving of 30-inch diameter steel piles will generate the same source level (111 dB_{RMS}).

1.6.5 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).

Assuming the use of three hammers, 5 dB will be added to each in-air source level (Table 1-6). In-air thresholds will be reached at the following distances (Figure 1-9):

- Noise generated during vibratory installation and/or removal of hollow steel piles (103 dB_{RMS} (97 dB+ 5 dB) @ 15 m/50 ft. (WSDOT 2016)) will reach the harbor seal threshold at approximately 61 m/200 ft., and the other pinnipeds threshold at approximately 20 m/65 ft.
- 30- and 36-inch diameter steel pile impact driving (116 dB_{RMS} (111 dB+ 5 dB) @ 15 m/50 ft.) will reach the harbor seal threshold at approximately 305 m/1,000 ft., and the other pinnipeds threshold at approximately 98 m/320 ft.

The nearest documented harbor seal haulout to the Seattle Ferry Terminal is 10.6 km/6.6 miles west on Blakely Rocks (Figure 3-2), though harbor seals also make use of docks, buoys and beaches in the area. The nearest documented California sea lion haulout sites are 3 km/2 miles southwest of the Seattle Ferry Terminal (Figure 3-2), although sea lions also make use of docks and buoys in the area.

Figure 1-6 In-air construction noise threshold areas for pinnipeds

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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 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 16 through February 15. For this project, in-water construction is planned to take place between August 1, 2017 and February 15, 2018.

2.2 Duration

The total worst-case duration for pile installation and removal is 130 days (Table 2-1).

Table 2-1 In-water Construction Durations

Method	Pile type	Pile size (inch)	Pile driving/removal events	Piles per day	Duration (days)	Duration (minutes/day)
Vibratory removal	Timber	14	215	20	11	300
Vibratory removal	Steel	24	2	2	1	30
Vibratory driving	Steel	24*	101	16	7	320
Vibratory removal	Steel	24*	101	16	7	320
Vibratory driving	Steel	30	17	8	3	160
Vibratory driving	Steel	36	205	8	26	160
Impact driving	Steel	30	14	8	2	320
Impact driving	Steel	36	201	8	26	320
Total			856		83	

*temporary

2.3 Region of Activity

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

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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

Eight species of marine mammals may be found in the Seattle 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
California Sea Lion	Not listed	Non-depleted	August-April	Common
Steller Sea Lion	Delisted	Strategic/Depleted	August-April	Common
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	Endangered	Depleted	September-May	Occasional
Harbor Porpoise	Not listed	Non-depleted	May-June peak	Occasional
Dall's Porpoise	Not listed	Non-depleted	October-February	Occasional

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 2015, 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 Seattle area, including the quadrants of interest for the project. The modeled Zone of Influence (ZOI; in red) intersects with the majority of three quadrants: 408-10.

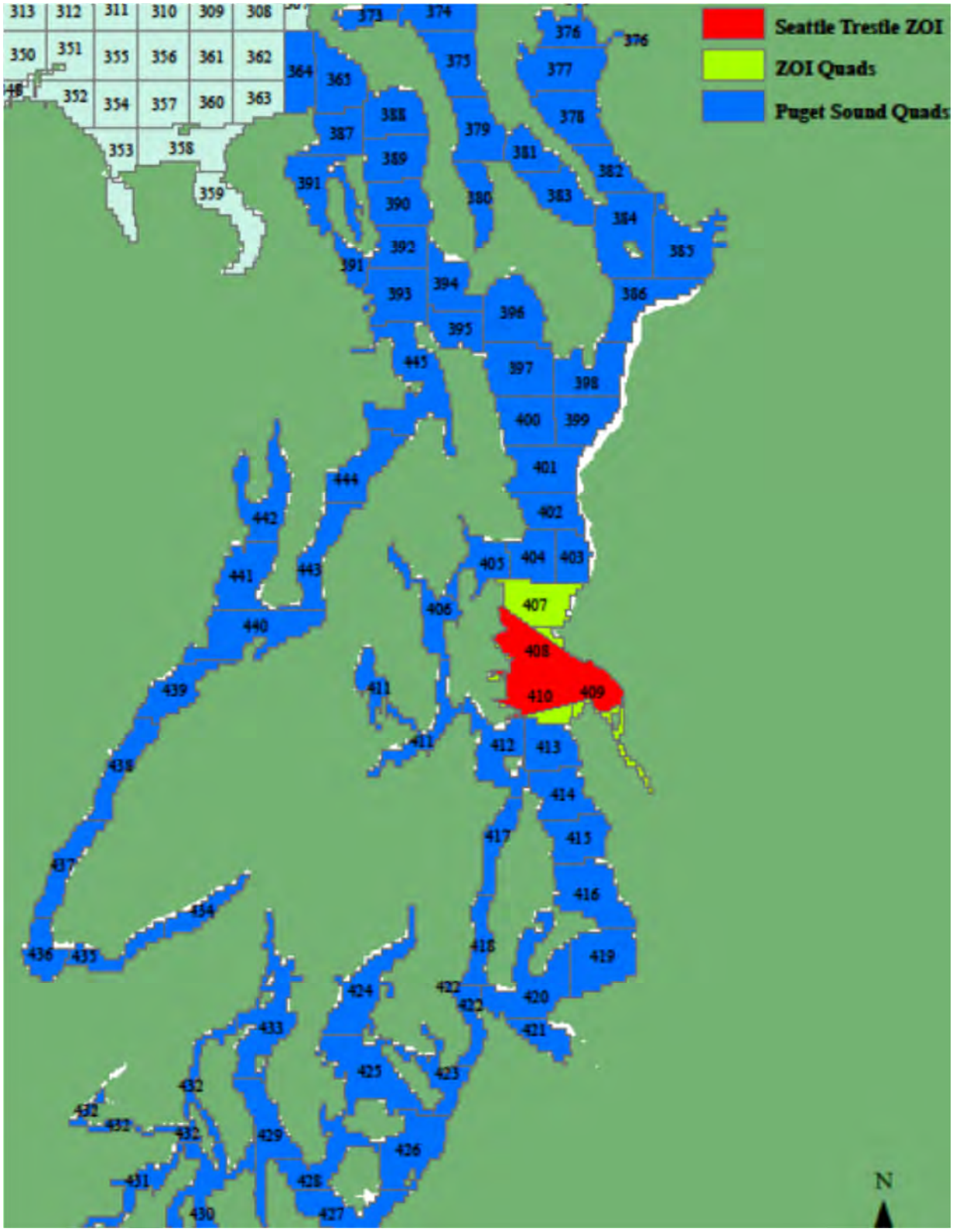

Figure 3-1 ZOI + Area Quads

As sightings are opportunistic and SRKW can travel large distances in a day (~100 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 quadrant; 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 quadrant.

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 Seattle ZOI quadrant and adjacent 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) 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 2015).

3.3 Pinnipeds

There are three species of pinnipeds that may be found in the Seattle Ferry Terminal area: harbor seal (***Phoca vitulina richardsi***), 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 central and southern Puget Sound region, pups are born from late June through September (WDFW 2009.). 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 1994a).

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 (SAR), the most recent estimate for the Washington Northern Inland Waters Stock is 11,036 (NMFS 2014a). 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 haulout sites (Pitcher and Calkins 1979; Pitcher and McAllister 1981).

The nearest documented harbor seal haulout to the Seattle Ferry Terminal is 10.6 km/6.6 miles west on Blakely Rocks (Figure 3-2), though harbor seals also make use of docks, buoys and beaches in the area. The level of use of this haulout 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). Harbor seals are known to haulout on docks and beaches throughout the project area.

Density and Sightings

U.S. Navy Density Report
In the timeframe scheduled for this project, the report estimates the density of harbor seal in the Seattle area as a range between 0.550001 and 1.219000 animals/km^2 (U.S. Navy 2014).

WSF Projects
During the 2012 Seattle Slip 2 Batter Pile project, 6 harbor seals were observed during this one day project in the area that corresponds to the upcoming project ZOIs (WSF 2012).

During the 2016 Seattle Test Pile project, 56 harbor seals were observed over 10 days in the area that corresponds to the upcoming project ZOIs. The maximum number sighted during one day was 13 (WSF 2016).

Seattle Aquarium Project
During the 2012 Seattle Aquarium Pier 60 project, 281 harbor seals were observed over 29 days in the area that corresponds to the upcoming project ZOIs (Figure 3-3). The maximum number sighted during one day was 5 (HiKARI 2012).

Elliott Bay Seawall Project
According to the City of Seattle Elliott Bay Seawall Project (EBSP) Season 1and 2 Annual Reports and the preliminary Season 3 data, 299 harbor seals were observed over 155 days in the area that corresponds to the upcoming project ZOIs (Seattle 2014/2015/2016).

The Whale Museum
For the years 2008 to 2014, in the August to February timeframe scheduled for this project, The Whale Museum (2016) reported 2 sightings days for harbor seals in the red and green quadrants shown in Figure 3-1. 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.

Figure 3-2 Pinniped haulouts in the Seattle project vicinity

NMFS Stranding Data

From the years 2010-2014, in the timeframe scheduled for this project, there were 129 confirmed harbor seal strandings in the area that corresponds to the upcoming project ZOIs (Table 3-2) (NMFS 2016b). Strandings were highest in September and October, which corresponds with the expected mortality rate (12-26%) of seal pups (Steiger et.al. 1989), though some adults were also included in the strandings.

Figure 3-3 Elliot Bay Seawall Project ZOI and Monitoring

Table 3-2 Harbor Seal Strandings 2010-2014

Year	Aug	Sept	Oct	Nov	Dec	Jan	Feb
2010	3	5	9	1	2	2	1
2011	5	10	8	1	4	6	2
2012	1	2	4	1	2	1	1
2013	3	6	8	8	7	2	1
2014	3	9	5	4	0	0	2
Totals	12	32	34	15	15	11	7

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 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).

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).

3.3.3.2 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 (WDFW 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 haulout numbered around 1,000. This haulout 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 haulout sites within all inland water regions (WDFW 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 haulout if approached.

The nearest documented California sea lion haulout sites are 3 km/2 miles southwest of the Seattle Ferry Terminal (Figure 3-2), although sea lions also make use of docks and other buoys in the area.

Density and Sightings

U.S. Navy Density Report
In the timeframe scheduled for this project, the report estimates the density of California sea lion in the Seattle area as a range between 0.067601 and 0.12660 animals/ km^2 (U.S. Navy 2014).

WSF Projects

During the 2012 Seattle Slip 2 Batter Pile project, 15 California sea lions were observed during this one-day project in the area that corresponds to the upcoming project ZOIs (WSF 2012).

During the 2016 Seattle Test Pile project, 12 California sea lions were observed over 10 days in the area that corresponds to the upcoming project ZOIs. The maximum number sighted during one day was 4 (WSF 2016).

Seattle Aquarium Project
During the 2012 Seattle Aquarium Pier 60 project, 382 California sea lions were observed over 29 days in the area that corresponds to the upcoming project ZOIs. The maximum number sighted during one day was 37 (HiKARI 2012).

Elliott Bay Seawall Project
According to the City of Seattle Elliott Bay Seawall Project (EBSP) Season 1and 2 Annual Reports and the preliminary Season 3 data, 970 California sea lions were observed over 155 days in the area that corresponds to the upcoming project ZOIs. The maximum number sighted during one day was 47 (Seattle 2014/2015/2016).

The Whale Museum
For the years 2008 to 2014, in the August to February timeframe scheduled for this project, The Whale Museum (2016) reported one sightings day for California sea lions in the red and green quadrants shown in Figure 3-1. It should be noted that pinnipeds are not reported at the same rate as large cetaceans.

NMFS Stranding Data
From the years 2010-2013, in the timeframe scheduled for this project, there were 3 California sea lion strandings in the area that corresponds to the upcoming project ZOIs (NMFS 2016b).

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 eastern U.S. stock of Steller sea lions is estimated to be within the range of 60,131 and 74,448 based on pup counts, and a Washington minimum population estimate of 1,749 (NMFS 2014b). In Washington 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).

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 (WDFW 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 are "depleted/strategic" under the MMPA and were "delisted" under the ESA on November 4, 2013 (78 FR 66140).

3.3.4.3 Distribution

Adult Steller sea lions congregate at rookeries in Oregon, California, and British Columbia for pupping and breeding from late May to early June (Gisiner 1985). 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 haulout sites has increased in recent years.

The nearest documented Steller sea lion haulout sites are 15 km/9 miles southwest of the Seattle Ferry Terminal (Figure 3-2).

Density and Sightings

U.S. Navy Density Report
In the timeframe scheduled for this project, the report estimates the density of Steller sea lion in the Seattle area as a range between 0.025101 and 0.036800 animals/ km^2 (U.S. Navy 2014).

WSF Projects
During the 2012 Seattle Slip 2 Batter Pile project, 0 Steller sea lions were observed during this one day project in the area that corresponds to the upcoming project ZOIs (WSF 2012).

During the 2016 Seattle Test Pile project, 0 Steller sea lions were observed over 10 days in the area that corresponds to the upcoming project ZOIs (WSF 2016).

Seattle Aquarium Project
During the 2012 Seattle Aquarium Pier 60 project, 60 Steller sea lions were observed over 29 days in the area that corresponds to the upcoming project ZOIs. The maximum number sighted during one day was 25 (HiKARI 2012).

However, volunteers, not professional biologists were used to gather this data, and may have misidentified California sea lions as Steller sea lions. In addition, over three seasons the Elliott Bay Seawall Project, using professional biologists; saw only 1 Steller sea lion (see below). Therefore, the 60 observations will be discounted.

Elliott Bay Seawall Project
According to the City of Seattle Elliott Bay Seawall Project (EBSP) Season 1and 2 Annual Reports and the preliminary Season 3 data, 1 Steller sea lion was observed over 155 days in the area that corresponds to the upcoming project ZOIs (Seattle 2014/2015/2016).

The Whale Museum
For the years 2008 to 2014, in the August to February timeframe scheduled for this project, The Whale Museum (2016) reported 0 sightings days for Steller sea lion in the red and green quadrants shown in Figure 3-1. It should be noted that pinnipeds are not reported at the same rate as large cetaceans.

NMFS Stranding Data

From the years 2010-2013, in the timeframe scheduled for this project, there was 1 Steller sea lion stranding in the area that corresponds to the upcoming project ZOIs (NMFS 2016b).

3.4 Cetaceans

Seven cetacean species may be present in the Seattle Ferry Terminal area; Southern Resident and Transient killer whale (***Orcinus orca***), gray whale (***Eschrichtius robustus***), humpback whale (***Megaptera novaeangliae***), Minke whale (***Balaenoptera acutorostrata scammoni***), harbor porpoise (***Phocoena phocoena***), Dall's porpoise (***Phocoenoides dalli***) and long-beaked common dolphin (***Delphinus capensis***).

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 December 2016, the stock collectively numbered 78 individuals (J Pod=24, K Pod=19, L Pod=35) (CWR 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 79, 78 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, though pods as large as 12 have occasionally been observed in Puget Sound. 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 2013c). 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.

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 2008a). On February 24, 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 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 1994a).

Southern Resident Stock Distribution

Southern Residents are documented in coastal waters ranging from central California to the Queen Charlotte Islands, British Columbia (NMFS 2008a). 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).

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 pods spend will over 50% of the winter months on the outer coast (NMFS 2014c). 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.

SRKW Density and Sightings

U.S. Navy Density Report
In the timeframe scheduled for this project, the report estimates the density of SRKW whales in the Seattle area as a range between 0.001461 and 0.020240 animals/ km^2 (U.S. Navy 2014).

WSF Projects
During the 2012 Seattle Slip 2 Batter Pile project, 0 SRKW were observed during this one day project in the area that corresponds to the upcoming project ZOIs (WSF 2012).

During the 2016 Seattle Test Pile project, 0 SRKW were observed over 10 days in the area that corresponds to the upcoming project ZOIs (WSF 2016).

Seattle Aquarium Project

During the 2012 Seattle Aquarium Pier 60 project, 27 orcas were observed over 29 observation days in the area that corresponds to the upcoming project ZOIs (HiKARI 2012). However, the orcas were not identified as SRKW or transients.

Elliott Bay Seawall Project

According to the City of Seattle Elliott Bay Seawall Project (EBSP) Season 1and 2 Annual Reports and the preliminary Season 3 data, 2 killer whales were observed over 155 days in the area that corresponds to the upcoming project ZOIs (Seattle 2014/2015/2016). By cross-referencing with the Orca Network sightings archives, and noting that J pod was in the San Juan Islands, it is assumed that the 2014 sighting was a transient (Orca Network 2014). Preliminary Season 3 data did not provide a sightings date for the killer whale observed in 2015/16, but given that it was a single whale, it is assumed to be a transient also. The current assumption is that 0 SRKW were observed over the 155 days.

The Whale Museum

For the years 2010 to 2014, in the August to February timeframe scheduled for this project, The Whale Museum reported 72 whale days for SRKW in the red quadrants shown in Figure 3-1, with a high of 14 whale days in December of those years (Table 3-3) (TWM 2015).

Table 3-3. SRKW Whale Days by Year/Project Month

Year	Aug	Sept	Oct	Nov	Dec	Jan	Feb
2010	0	0	3	1	0	0	0
2011	0	0	1	2	0	1	6
2012	3	0	6	2	4	3	5
2013	1	2	2	2	10	3	1
2014	0	0	4	3	0	3	2
Totals	**4**	**2**	**16**	**10**	**14**	**10**	**14**
Average	**0.8**	**0.4**	**3.2**	**2.0**	**2.8**	**2.0**	**2.8**

TWM 2015

NMFS Stranding Data

From the years 2010-2013, in the timeframe scheduled for this project, there were 0 SRKW strandings in the area that corresponds to the upcoming project ZOIs (NMFS 2016b).

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.

Transient Density and Sightings

U.S. Navy Density Report

In the timeframe scheduled for this project, the report estimates the density of transient killer whales in the Seattle area as a range between 0.000575 and 0.002373 animals/ km^2 (U.S. Navy 2014).

WSF Projects

During the 2012 Seattle Slip 2 Batter Pile project, 0 transients were observed during this one-day project in the area that corresponds to the upcoming project ZOIs (WSF 2012).

During the 2016 Seattle Test Pile project, 0 transients were observed over 10 days in the area that corresponds to the upcoming project ZOIs (WSF 2016). However, on February 5, 2016, a pod of up to 7 transients were reported in the area that corresponds to the upcoming project ZOIs (Orca Network Archive Report 2016). The Test Pile project observers were monitoring a small concrete impact driving ZOE/ZOI and were not in position to see the transients that day.

Seattle Aquarium Project

During the 2012 Seattle Aquarium Pier 60 project, 27 orcas were observed over 29 observation days in the area that corresponds to the upcoming project ZOIs (HiKARI 2012). However, the orcas were not identified as SRKW or transients.

Elliott Bay Seawall Project

According to the City of Seattle Elliott Bay Seawall Project (EBSP) Season 1and 2 Annual Reports and the preliminary Season 3 data, 2 killer whales were observed over 155 days in the area that corresponds to the upcoming project ZOIs (Seattle 2014/2015/2016). By cross-referencing with the Orca Network sightings archives, and noting that J pod was in the San Juan Islands at the time of the sightings, it is assumed that these 2 sightings were transients (Orca Network 2014).

The Whale Museum

For the years 2008 to 2014, in the August to February timeframe scheduled for this project, The Whale Museum reported 13 whale days for transients in the red quadrants shown in Figure 3-1, with a high of 14 whale days in December of those years (Table 3-4) (TWM 2015).

Table 3-4. Transient Killer Whale Sightings Days 2008-2014

Aug	Sept	Oct	Nov	Dec	Jan	Feb
2	2	0	2	0	5	2

TWM 2015

NMFS Stranding Data

From the years 2010-2013, in the timeframe scheduled for this project, there were 0 transient strandings in the area that corresponds to the upcoming project ZOIs (NMFS 2016b).

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). Within Washington waters, gray whale sightings reported to Cascadia Research and the Whale Museum between 1990 and 1993 totaled over 1,100 (Calambokidis et al. 1994b). Abundance estimates calculated for the small regional area between Oregon and southern Vancouver Island, including the San Juan Area and Puget Sound, suggest there were 137 to 153 individual gray whales from 2001 through 2003 (Calambokidis et al. 2004a). Forty-eight individual gray whales were observed in Puget Sound and Hood Canal in 2004 and 2005 (Calambokidis 2007).

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. In 2001 NOAA Fisheries received a petition to relist the stock under the ESA, but it was determined that there was not sufficient information to warrant the petition (Angliss and Outlaw 2007).

3.4.2.3 Distribution

Although typically seen during their annual migrations on the outer coast, a regular group of gray whales annually comes into the inland waters at Saratoga Passage and Port Susan (south Whidbey Island area) from March through May to feed on ghost shrimp (Weitkamp et al. 1992; Calambokidis pers. comm. 2006). The size of the group is 10-12 individuals, and some are arriving as early as January and staying into July (Orca Network 2015b). During this time frame they are also seen in the Strait of Juan de Fuca, the San Juan Islands, and areas of Puget Sound, although the observations in Puget Sound are highly variable between years (Calambokidis et al. 1994b). The average tenure within Washington inland waters is 47 days and the longest stay was 112 days (J. Calambokidis pers. comm. 2008).

Density and Sightings

U.S. Navy Density Report

In the timeframe scheduled for this project, the report estimates the density of gray whales in the Seattle area as a range between 0.000002 and 0.000510 animals/ km^2 (U.S. Navy 2014).

WSF Projects

During the 2012 Seattle Slip 2 Batter Pile project, 0 gray whales were observed during this one-day project in the area that corresponds to the upcoming project ZOIs (WSF 2012).

During the 2016 Seattle Test Pile project, 0 gray whales were observed over 10 days in the area that corresponds to the upcoming project ZOIs (WSF 2016).

Seattle Aquarium Project

During the 2012 Seattle Aquarium Pier 60 project, 0 gray whales were observed over 29 days in the area that corresponds to the upcoming project ZOIs (HiKARI 2012).

Elliott Bay Seawall Project

According to the City of Seattle Elliott Bay Seawall Project (EBSP) Season 1and 2 Annual Reports and the preliminary Season 3 data, 0 gray whales were observed over 155 days in the area that corresponds to the upcoming project ZOIs (Seattle 2014/2015/2016).

The Whale Museum

For the years 2008 to 2014, in the August to February timeframe scheduled for this project, The Whale Museum reported 4 sightings days for gray whale the red quadrants shown in Figure 3-1, with a high of 2 whale days in August of those years (Table 3-5) (TWM 2015).

Table 3-5. Gray Whale Sightings Days 2008-2014

Aug	Sept	Oct	Nov	Dec	Jan	Feb
2	0	0	1	0	1	0

TWM 2015

NMFS Stranding Data

From the years 2010-2013, in the timeframe scheduled for this project, there were 0 gray whale strandings in the area that corresponds to the upcoming project ZOIs (NMFS 2016b).

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 SAR abundance estimate is 1,918 individuals. The minimum population estimate is 1,918 (NMFS 2014d).

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).

3.4.3.3 Distribution

Historically, humpback whales were common in inland waters of Puget Sound and the San Juan Islands (Calambokidis et al. 2004b). 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.

This stock calves and mates in coastal Central America and Mexico and migrates up the coast from California to southern British Columbia in the summer and fall to feed (NMFS 1991; Marine Mammal Commission 2003; Carretta et al. 2007b). 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.

Density and Sightings

U.S. Navy Density Report
In the timeframe scheduled for this project, the report estimates the density of humpback whales in the Seattle area as a range between 0.000010 and 0.00070 animals/ km^2 (U.S. Navy 2014).

WSF Projects
During the 2012 Seattle Slip 2 Batter Pile project, 0 humpback whales were observed during this one-day project in the area that corresponds to the upcoming project ZOIs (WSF 2012).

During the 2016 Seattle Test Pile project, 0 humpback whales were observed over 10 days in the area that corresponds to the upcoming project ZOIs (WSF 2016).

Seattle Aquarium Project
During the 2012 Seattle Aquarium Pier 60 project, 0 humpback whales were observed over 29 days in the area that corresponds to the upcoming project ZOIs (HiKARI 2012).

Elliott Bay Seawall Project
According to the City of Seattle Elliott Bay Seawall Project (EBSP) Season 1and 2 Annual Reports and the preliminary Season 3 data, 2 humpback whales were observed (both in one day) over 155 days in the area that corresponds to the upcoming project ZOIs (Seattle 2014/2015/2016).

The Whale Museum
For the years 2008 to 2014, in the August to February timeframe scheduled for this project, The Whale Museum reported 6 sightings days for humpback whale the red quadrants shown in Figure 3-1, with a high of 3 whale days in August of those years (TWM 2015) (Table 3-6).

Table 3-6. Humpback Whale Sightings Days 2008-2014

Aug	Sept	Oct	Nov	Dec	Jan	Feb
3	1	1	1	0	0	0

TWM 2015

NMFS Stranding Data
From the years 2010-2013, in the timeframe scheduled for this project, there were 0 humpback whale strandings in the area that corresponds to the upcoming project ZOIs (NMFS 2016b).

3.4.4 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).

3.4.4.1 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 2011b). No minimum population estimate is available.

No harbor porpoise were observed within Puget Sound proper during comprehensive harbor porpoise surveys (Osmek et al. 1994) or Puget Sound Ambient Monitoring Program (PSAMP) surveys conducted in the 1990s (WDFW 2008). Declines were attributed to gill-net fishing, increased vessel activity, contaminants, and competition with Dall's porpoise.

However, populations appear to be rebounding with increased sightings in central Puget Sound (Carretta et al. 2007b) and southern Puget Sound (D. Nysewander pers. comm. 2008; WDFW 2008; WDFW/Cascadia 2016). Recent systematic 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 (Hanson, et. al. 2011; WDFW/Cascadia 2016).

3.4.4.2 Status

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

3.4.4.3 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 Seattle area, although it is suspected that in some areas harbor porpoises migrate (based on seasonal shifts in distribution). Hall (2004; pers. comm. 2008) found harbor porpoises off Canada's southern Vancouver Island to peak during late summer, while the Washington State Department of Fish and Wildlife's (WDFW) Puget Sound Ambient Monitoring Program (PSAMP) data show peaks in Washington waters to occur during the winter (Figure 3-4).

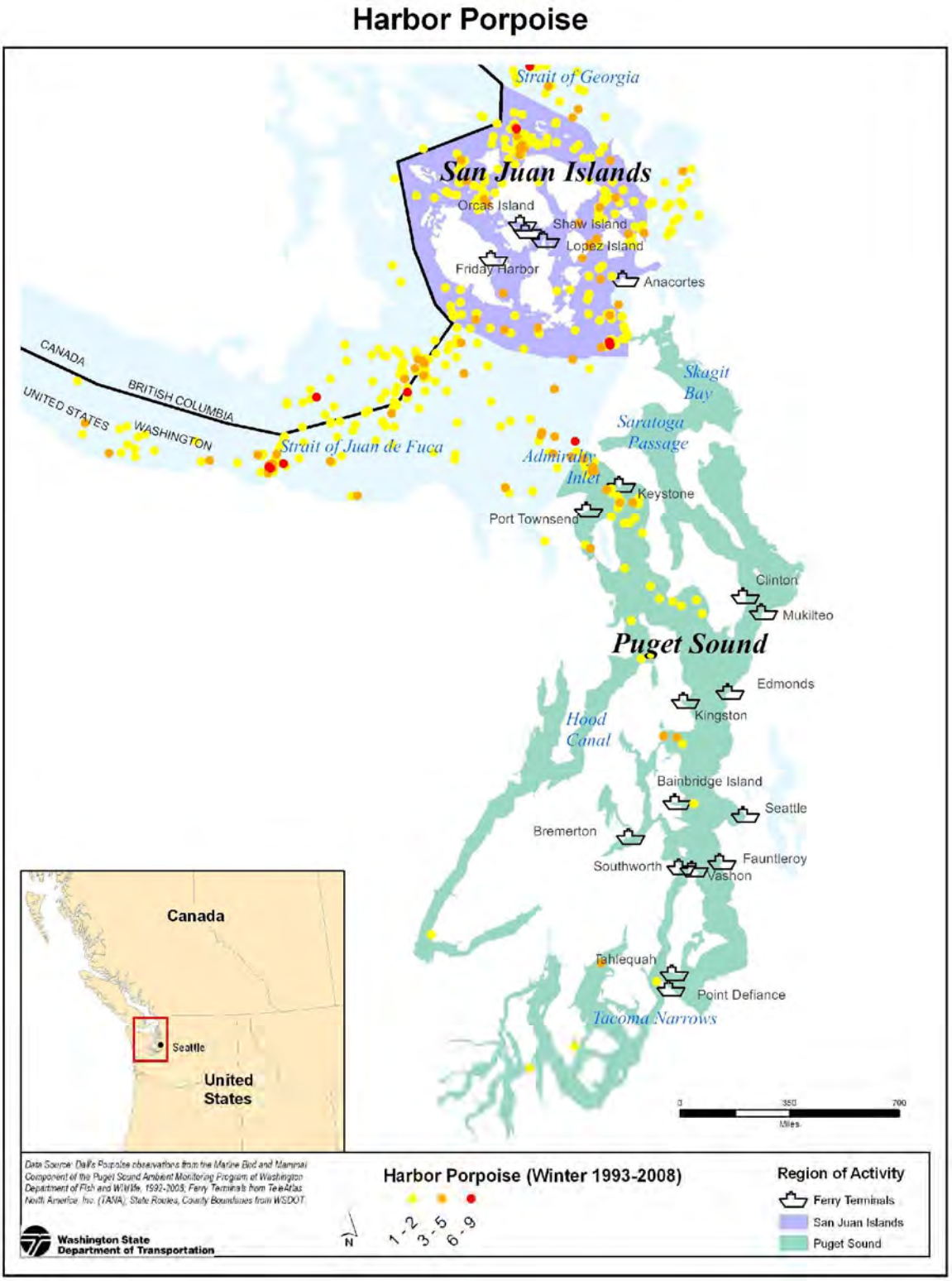

Figure 3-4. Harbor Porpoise Winter Sightings (groups) (WDFW 2008)

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). Water depths within the Seattle ZOIs range from 0 to 186 m/611 ft., with the majority of the ZOIs <150 m.

Density and Sightings

U.S. Navy Density Report

In the timeframe scheduled for this project, the report estimates the density of harbor porpoise in the Seattle area as a range between 0.061701 and 0.156000 animals/ km^2 (U.S. Navy 2014).

WDFW Aerial Surveys

The Washington State Department of Fish and Wildlife (WDFW) has carried out annual winter aerial marine bird surveys for Washington inner marine water every year from 1994 to the present (excluding 2007). In addition to marine birds, all marine mammal observations have been recorded. The survey results were used to estimate the winter mean densities of harbor porpoise by basin. The density of harbor porpoise in the Seattle area is estimated as a range between 0 and 0.58 (WDFW/Cascadia 2016).

WSF Projects

During the 2012 Seattle Slip 2 Batter Pile project, 0 harbor porpoise were observed during this one day project in the area that corresponds to the upcoming project ZOIs (WSF 2012).

During the 2016 Seattle Test Pile project, 0 harbor porpoise were observed over 10 days in the area that corresponds to the upcoming project ZOIs (WSF 2016).

Seattle Aquarium Project

During the 2012 Seattle Aquarium Pier 60 project, 5 harbor porpoise were observed over 29 days in the area that corresponds to the upcoming project ZOIs, with a maximum of 3 observed in one day (HiKARI 2012).

Elliott Bay Seawall Project

According to the City of Seattle Elliott Bay Seawall Project (EBSP) Season 1and 2 Annual Reports and the preliminary Season 3 data, 1 harbor porpoise was observed over 155 days in the area that corresponds to the upcoming project ZOIs (Seattle 2014/2015/2016).

The Whale Museum

For the years 2008 to 2014, in the August to February timeframe scheduled for this project, The Whale Museum reported 1 sightings day for harbor porpoise in the red quadrants shown in Figure 3-1 (Table 3-8) (TWM 2015).

Table 3-7. Harbor Porpoise Sightings Days 2008-2014

Aug	Sept	Oct	Nov	Dec	Jan	Feb
0	0	0	0	0	0	1

TWM 2015

NMFS Stranding Data
From the years 2010-2013, in the timeframe scheduled for this project, there were 3 harbor porpoise strandings in the area that corresponds to the upcoming project ZOIs (NMFS 2016b).

3.4.5 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).

3.4.5.1 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 2011c). 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 (WDFW/Cascadia 2016). Prior to the 1940s, Dall's porpoises were not reported in Puget Sound.

3.4.5.2 Status

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

3.4.5.3 Distribution

Dall's porpoises are migratory and appear to have predictable seasonal movements driven by changes in oceanographic conditions (Green et al. 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 (Calambokidis pers. comm. 2006), 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 (Figure 3-5). The average winter group size is three animals (WDFW 2008).

Density and Sightings

U.S. Navy Density Report
In the timeframe scheduled for this project, the report estimates the density of Dall's porpoise in the Seattle area as a range between 0.018858 and 0.047976 animals/ km^2 (U.S. Navy 2014).

WSF Projects
During the 2012 Seattle Slip 2 Batter Pile project, 0 Dall's porpoise were observed during this one-day project in the area that corresponds to the upcoming project ZOIs (WSF 2012).

During the 2016 Seattle Test Pile project, 0 Dall's porpoise were observed over 10 days in the area that corresponds to the upcoming project ZOIs (WSF 2016).

Seattle Aquarium Project
During the 2012 Seattle Aquarium Pier 60 project, 1 Dall's porpoise was observed over 29 days in the area that corresponds to the upcoming project ZOIs, with a maximum of 3 observed in one day (HiKARI 2012).

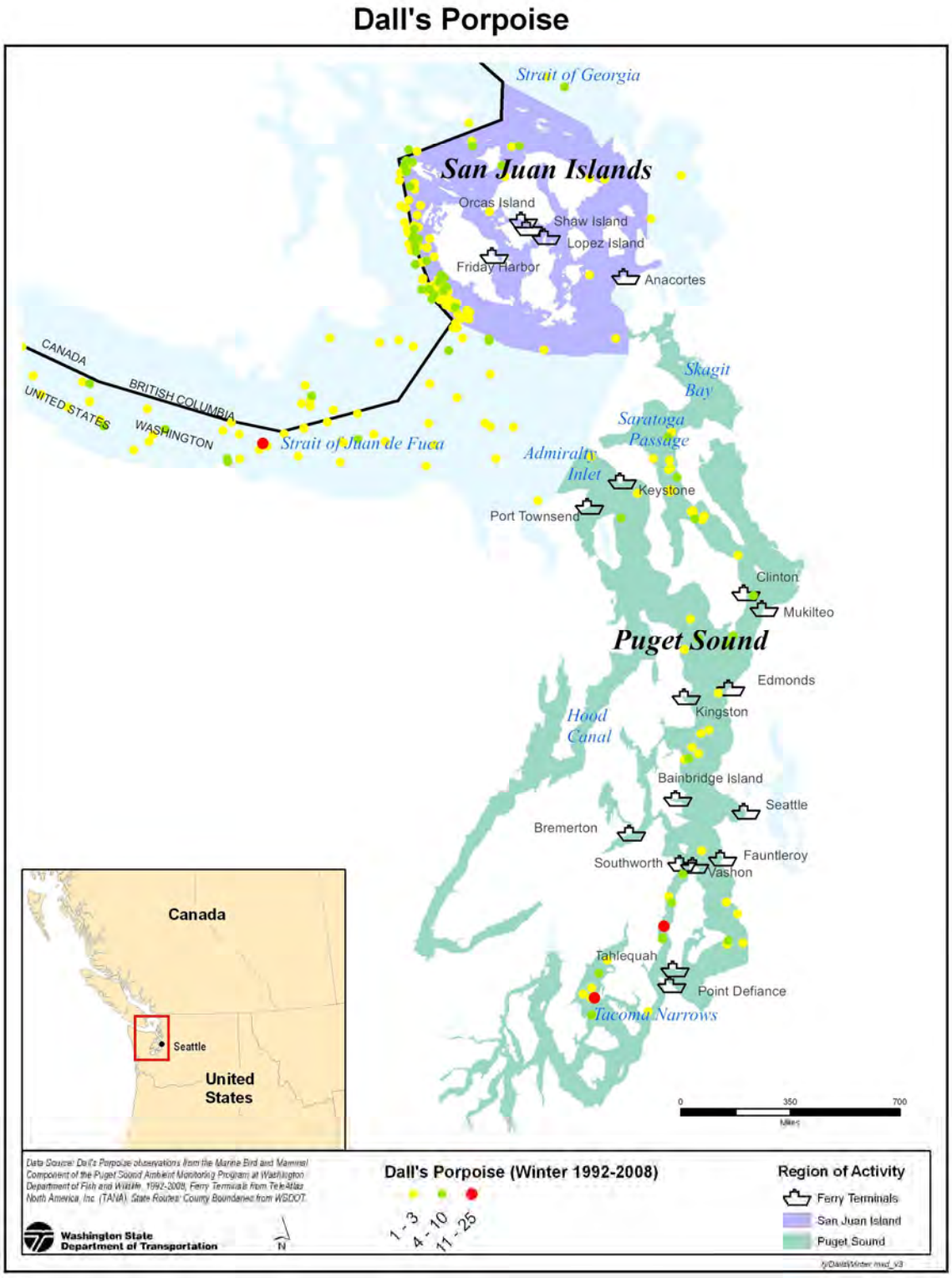

Figure 3-5. Dall's Porpoise Winter Sightings (groups) (WDFW 2008)

Elliott Bay Seawall Project

According to the City of Seattle Elliott Bay Seawall Project (EBSP) Season 1and 2 Annual Reports and the preliminary Season 3 data, 0 Dall's porpoise was observed over 155 days in the area that corresponds to the upcoming project ZOIs (Seattle 2014/2015/2016).

The Whale Museum

For the years 2008 to 2014, in the August to February timeframe scheduled for this project, The Whale Museum reported 0 sightings days for Dall's porpoise in the red quadrants shown in Figure 3-1 (TWM 2015).

NMFS Stranding Data

From the years 2010-2013, in the timeframe scheduled for this project, there were 0 Dall's porpoise strandings in the area that corresponds to the upcoming project ZOIs (NMFS 2016b).

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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.

Harassment is the primary means of take expected to result from these activities. Except with respect to certain activities not pertinent here, 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].

As described previously in the Effects section, Level B Harassment is expected to occur and is proposed to be authorized in the numbers identified below. As described below, a small number of takes by Level A Harassment are being proposed to be authorized. The death of a marine mammal is also a type of incidental take. However, no mortality is anticipated or proposed to be authorized to result from this activity.

5.1 Incidental Take Authorization Request

Under Section 101 (a)(5)(D) of the MMPA, WSF requests an IHA from September 1, 2016 through February 15, 2017 for Level B and A take of 8 species of marine mammals described in this application during the terminal construction project at the Seattle Ferry Terminal.

The scheduled pile-driving and pile-removal activities discussed in this application will occur between August 1, 2017 and February 15, 2016.

5.2 Method of Incidental Taking

The method of incidental take is Level A and Level B acoustical take during active 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 Seattle 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 the impact pile driving, and vibratory pile driving and measures to remove 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, southern resident killer whale, transient killer whale, gray whale, humpback whale, Minke whale, Bryde's whale, harbor porpoise, Dall's porpoise, common bottlenose dolphin, Risso's dolphin, long-beaked common dolphin, and Pacific white-sided 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 Seattle ZOIs with any frequency and could be exposed multiple times during the project.

6.1 Estimated Duration of Pile Driving

The total worst-case duration for pile installation and removal is 83 days (Table 2-1). Durations are summarized in Table 6-1.

6.2 Estimated Takes

Incidental take is estimated for each species by estimating the likelihood of a marine mammal being present within a Level A or Level B harassment zone during active pile driving or removal. The Level A calculation includes a duration component, along with an assumption (which can lead to overestimates in some cases) that animals within the zone stay in that area for the whole duration of the pile driving activity within a day. For all marine mammal species except harbor seals, California sea lions, Transient killer whale and humpback whales, estimated takes are calculated based on ensonified area for a specific pile driving activity multiplied by the marine mammal density in the action area, multiplied by the number of pile driving (or removal) days. Marine mammal density data are from the U.S. Navy Marine Species Density Report. Harbor seal and California sea lion takes are based on observations during marine mammal monitoring off Seattle, since these data provide the best information on distribution and presence of these species that are often associated to haulouts nearby. Transient killer whale takes are based on reports of whale presence in the area (see below).

6.2.1 Harbor Seal

Harbor seal take estimate is based on local seal abundance information off the Seattle area from WSDOT's Seattle Slip 2 Batter Pile Project in 2012. Marine mammal visual monitoring during the Batter Pile Project indicates that a maximum of 6 harbor seals were observed in one day in the general area of the Colman Dock project (WSDOT 2012). Based on a total of 83 pile driving days for the WSDOT Seattle Colman Dock project, it is estimated that up to 498 harbor seals could be exposed to noise levels constitute takes. Since that 28 days would involve impact pile driving of 30" and 36" steel piles with Level A zones beyond shutdown zones, 168 harbor seals exposed during these 28 days would experience Level A harassment.

WSF is requesting authorization for Level A/B take of 498 harbor seals. It is assumed that this number will include multiple harassments of the same individual(s).

6.2.2 California Sea Lion

California sea lion take estimate is based on local sea lion abundance information from the City of Seattle's Elliott Bay Sea Wall Project (City of Seattle 2014). Marine mammal visual monitoring during the Sea Wall Project indicates that up to 15 sea lions were observed in the general area of the Colman Dock project at any given time (City of Seattle 2014).

Based on a total of 83 pile driving days for the WSDOT Seattle Colman Dock project, it is estimated that up to 1,245 California sea lions could be exposed to noise levels constitute takes. Since the Level A zones of otarrids are all very small (<35m), no sea lions would be taken by Level A harassment. Therefore, all California sea lion takes estimated here are Level B harassment.

WSF is requesting authorization for Level A take of 1,245 California sea lions. It is assumed that this number will include multiple harassments of the same individual(s).

6.2.3 Steller Sea Lion

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the maximum density of Steller sea lions in the Seattle area as 0.036800 animals per square kilometer. Since the Level A zones of otarrids are all very small (<35m), no sea lions would be taken by Level A harassment. Therefore, all Steller sea lion takes estimated here are Level B harassment.

Based on this density estimate, the following number of Steller sea lions may be present in the Level B zones:

- Timber Removal = 0.036800 animals * 5.4197192 km^2 * 11 days of pile activity = 2.194
- 24" Steel Vibratory = 0.036800 animals * 58.33884 km^2 * 15 days of pile activity = 32.203
- 30/36" Steel Vibratory = 0.036800 animals * 74.29093 km^2 * 29 days of pile activity = 79.283

The potential take based on the Navy estimate is 114 Steller sea lions.

6.2.4 Southern Resident Killer Whale

Due to the status of SRKW, WSF is not requesting any take. If SRKW approach the any of the zones during pile driving or removal, work will be paused until the SRKW exit the Zone.

6.2.5 Transient Killer Whale

On February 5, 2016, a pod of up to 7 transients were reported in the area that corresponds to the upcoming project zones (Orca Network Archive Report 2016). Therefore, WSF is requesting authorization for Level B acoustical harassment of 7 Transient killer whales.

6.2.6 Gray Whale

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the maximum density of gray whales in the Seattle area as 0.00510 animals per square kilometer. Based on this density estimate, the following number of gray whales may be present in the zones:

Level A:

- Timber Removal = 0.00510 animals * 0.000154 km^2 * 11 days of pile activity = 0
- 24" Steel Vibratory = 0.00510 animals * 0.153311 km^2 * 15 days of pile activity = 0.0117
- 30/36" Steel Vibratory = 0.00510 animals * 0.189384 km^2 * 28 days of pile activity = 0.027
- 30/36" Steel Impact = 0.00510 animals * 4.129836 km^2 * 28 days of pile activity = 0.589

Level B:

- Timber Removal = 0.00510 animals * 5.419792 km^2 * 11 days of pile activity = 0.304
- 24" Steel Vibratory = 0.00510 animals * 58.338838 km^2 * 15 days of pile activity = 4.47
- 30/36" Steel Vibratory = 0.00510 animals * 78.209934 km^2 * 29 days of pile activity = 11.6
- 30/36" Steel Impact = 0.00510 animals * 1.926124 km^2 * 28 days of pile activity = 0.28

WSF is requesting authorization for Level A take of 1 and Level B take of 16 gray whales, for a total of 17 takes. It is assumed that this number will include multiple harassments of the same individual(s).

6.2.7 Humpback Whale

For the years 2008 to 2014, in the August to February timeframe scheduled for this project, The Whale Museum reported 3 sightings days for humpback whale in the red quadrants shown in Figure 3-1 (TWM 2015). Therefore, WSF is requesting authorization for Level A take of 1 and Level B take of 2 humpback whales, for a total of 3 takes.

6.2.8 Harbor Porpoise

According to Evenson, et al. (2016), the maximum harbor porpoise density in central Puget Sound (which includes the project ZOIs) is 0.58 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:

Level A:

- Timber Removal = 0.58 animals * 0.013273 km^2 * 11 days of pile activity = 0.085
- 24" Steel Vibratory = 0.58 animals * 2.547906 km^2 * 15 days of pile activity = 22.166
- 30/36" Steel Vibratory = 0.58 animals * 2.678940 km^2 * 29 days of pile activity = 45.06
- 30/36" Steel Impact = 0.58 animals * 8.190639 km^2 * 28 days of pile activity = 133.11

Level B:

- Timber Removal = 0.58 animals * 5.419792 km^2 * 11 days of pile activity = 34.578
- 24" Steel Vibratory = 0.58 animals * 58.338838 km^2 * 15 days of pile activity = 507.549
- 30/36" Steel Vibratory = 0.58 animals * 74.290934 km^2 * 29 days of pile activity = 1,249.574
- 30/36" Steel Impact = 0.58 animals * 1.926124 km^2 * 28 days of pile activity = 31.208

WSF is requesting authorization for Level A take of 200 and Level B take of 1,824 for a total of 2,024 harbor porpoise takes. It is assumed that this number will include multiple harassments of the same individual(s).

6.2.9 Dall's Porpoise

The Navy Marine Species Density Database (U.S. Navy 2014) estimates the maximum density of Dall's porpoises in the Seattle area as 0.047976 animals per square kilometer. Based on this density estimate, it is assumed that the following number of Dall's porpoise may be intermittently in the ZOIs:

Level A:

- Timber Removal = 0.047976 animals * 0.013273 km^2 * 11 days of pile activity = 0.674
- 24" Steel Vibratory = 0.047976 animals * 2.547906 km^2 * 15 days of pile activity = 1.834
- 30/36" Steel Vibratory = 0.047976 animals * 2.678940 km^2 * 29 days of pile activity = 1.928
- 30/36" Steel Impact = 0.047976 animals * 8.190639 km^2 * 28 days of pile activity = 11.003

Level B:

- Timber Removal = 0.047976 animals * 5.419792 km^2 * 11 days of pile activity = 2.860
- 24" Steel Vibratory = 0.047976 animals * 58.338838 km^2 * 15 days of pile activity = 42
- 30/36" Steel Vibratory = 0.047976 animals * 74.290934 km^2 * 29 days of pile activity = 103.361

- 30/36" Steel Impact = 0.047976 animals * 1.926124 km^2 * 28 days of pile activity = 2.587

WSF is requesting authorization for Level A take of 16 and Level B take 151 for a total of 167 Dall's porpoise takes. It is assumed that this number will include multiple harassments of the same individual(s).

The Level A take total was further adjusted by subtracting animals expected to occur within the 160 m exclusion zone, where pile driving activities are suspended when an animal is observed in or approaching the zone. Further, the number of Level B takes was adjusted to exclude those already counted for Level A takes.

A summary of estimated marine mammal takes is listed in Table 6.

Table 6-1 Estimated Take Levels

Species	Estimated Level A take	Estimated Level B take	Estimated total take
Pacific harbor seal	168	330	498
California sea lion	0	1245	1245
Steller sea lion	0	114	114
Killer whale, transient	0	7	7
Killer whale, Southern Resident	0	0	0
Gray whale	1	15	16
Humpback whale	1	2	3
Harbor porpoise	200	1824	2024
Dall's porpoise	16	151	167

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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 of individuals; 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.

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	498	4.40	2,207
California Sea Lion	296,750	1,245	0.42	59,350
Steller Sea Lion	67,290	114	0.17	13,458
Killer Whale, Transient	243	0	2.88	49
Killer Whale, SR	83	7	0	17
Gray Whale	20,990	16	0.08	4,198
Humpback Whale	1,918	3	0.16	384
Harbor Porpoise	10,682	2,024	19.11	2,136
Dall's Porpoise	42,000	167	0.40	8,400

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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.

8.1 Subsistence Harvests by Northwest Treaty Indian Tribes

Historically, Pacific Northwest Native American tribes were known to hunt several species of marine mammals including, but not limited to harbor seals, Steller sea lions, northern fur seals, gray whales and humpback whales. More recently, several Pacific Northwest Native American tribes have promulgated tribal regulations allowing tribal members to exercise treaty rights for subsistence harvest of harbor seals and California sea lions (Carretta et al. 2007a).

The Makah Indian Tribe (Makah) has specifically passed hunting regulations for gray whales. However, the directed take of marine mammals (not just gray whales) for ceremonial and/or subsistence purposes was enjoined by the Ninth Circuit Court of Appeals in rulings against the Makah in 2002, 2003 and 2004 (Norberg pers. comm. 2007b; NMFS 2005). Currently, there are no authorized ceremonial and/or subsistence hunts for marine mammals in Puget Sound or the San Juan Islands (Norberg pers. comm. 2007b) with the possible exception of some coastal tribes who may allow a small number of directed take for subsistence purposes.

8.1.1 Harbor Seals

Tribal subsistence takes of this stock may occur, but no data on recent takes are available (NMFS 2014a). No impacts on the availability of the species or stocks to the Pacific Northwest treaty tribes are expected as a result of the proposed project.

8.1.2 California Sea Lions

Tribal subsistence takes of this stock may occur, but no data on recent takes are available (NMFS 2015d). No impacts on the availability of the species or stock to the Pacific Northwest treaty tribes are expected as a result of the proposed project.

8.1.3 Gray Whales

The Makah ceased whaling in the 1920s after commercial whaling decimated the Eastern North Pacific gray whale population (NMFS 2005). On June 16, 1994, gray whales were removed from the endangered species list after a determination that the population had "recovered to near its estimated original population size and is neither in danger of extinction throughout all or a significant portion of its range, nor likely to again become endangered within the foreseeable future throughout all or a significant portion of its range" (59 FR 31094).

On May 5, 1995, the Makah formally notified the U.S. Government of its interest in resuming treaty ceremonial and subsistence harvest of Eastern North Pacific gray whales, asking the Department of Commerce to represent them in seeking approval from the International Whaling Commission (IWC) for an annual quota (NMFS 2005). On October 18, 1997, the IWC approved

an aboriginal subsistence quota of 620 Eastern North Pacific gray whales (with an annual cap of 140) for the Russian Checotah people and the Makah (Angliss and Outlaw 2007; NMFS 2007b). The Makah successfully hunted one Eastern North Pacific gray whale on May 17, 1999 (NMFS 2005).

Whaling by the Makah was halted on December 20, 2002, when the Ninth Circuit Court of Appeals ruled that an environmental impact statement rather than an environmental assessment should have been prepared under the National Environmental Protection Act and that the Makah must comply with the process prescribed in the MMPA for authorizing take of marine mammals otherwise prohibited by a moratorium. This was further upheld by rulings in 2003 and 2004 (NMFS 2005). At a 2007 meeting of the IWC (59th Annual Meeting in Anchorage, Alaska), an aboriginal subsistence quota for gray whales was again approved for natives in Russia and 20 whales (four per year for 5 years) for the Makah. However, under the Ninth Circuit Court ruling the Makah must first obtain a waiver of the MMPA take moratorium before harvesting under their IWC quota (Norberg pers. comm. 2007b).

In February 2005, NMFS received a request from the Makah for a waiver of the MMPA take moratorium to resume limited hunting of Eastern North Pacific gray whales. A draft environmental impact statement (DEIS) to examine the alternatives for a decision to approve or deny the waiver was released for public comment in May 2008, but later terminated in May 2012 to begin developing a new DEIS because of substantial new scientific information. In March 2015 the new DEIS was released, and is currently in public comment (NMFS 2015e).

However, any future hunts by the Makah would occur along the outer coast of Washington, not in the Puget Sound area. Therefore, the proposed activities would not interfere with any future hunt.

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 increased 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, 2017, 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 61 m/200 ft., and within 20 m/65 ft. for all other pinnipeds.

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 305 m/1000 ft., and within 98 m/320 ft. for all other pinnipeds.

In-air noise from non-pile driving construction activities is not expected to cause in-air disturbance to pinnipeds, because the Seattle 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 2008b). Because whale occurrence is occasional near the project site, in-water noise impacts are localized and of short duration, any impact on individual cetaceans and pinnipeds will be limited.

Pile removal and driving will expose marine mammals to potential Level B harassment. The impact pile driving Zones of Exclusion (ZOEs) will be monitored, and work ceased if any pinniped approaches ZOE-1, or any cetacean approaches ZOE-2. Because there are no documented haul outs within the immediate project area, in-air pinniped disturbance will be limited to individuals transiting the construction area, or hauled out on nearby docks.

9.4 Water and Sediment Quality

Short-term turbidity is a water quality effect of most in-water work, 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 Ferry 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 (WSF 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 Seattle 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 Seattle Ferry Terminal will not obstruct movements of marine mammals. Pile work at Seattle will occur within 500 ft. of the shoreline leaving 11 km/7 miles of Puget Sound for marine mammals to pass. Construction barges will be used during the project. The barges 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 using 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 Seattle 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 pile driving activities at the Seattle 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

WSF performs all construction 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.
- AWSF inspector will be 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 have knowledge of the environmental provisions and compliance of the project.
- WSF will obtain Hydraulic Project Approval (HPA) from WDFW as appropriate and the contractor will follow the conditions of the HPA. HPA requirements will assumed as part of the contract document.
- 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 SPCC plan is submitted to the Project Engineer prior to the commencement of any construction activities. The contractor maintains a copy of the SPCC plan, along with any updates, at the work site.

- 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 Seattle Ferry Terminal is July 16 through February 15. Actual construction activities are planned to take place from August 1, 2017 and February 15, 2018.

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:

- The vibratory hammer method will be used to remove timber piles to minimize noise levels.
- 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 Section 11.5, Marine Mammal Monitoring).
- 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, which could cause the pile to break apart during the removal process, and usually results in little to no sediment attached to the pile during withdrawal.
- Extraction equipment will be kept out of the water, above the water line, to prevent creosote release into the water that could occur if the pile is pinched by extraction equipment below the water line.
- Piling will not be broken off intentionally by twisting, bending, or other deformation, to minimize any potential release of creosote into the water column.
- Treated wood will be contained during and after removal to preclude sediments and contaminated materials from entering the aquatic environment.
- 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.
- Holes left when removing piling will be filled with clean sand or gravel. Sand or gravel used as fill material will be obtained from a commercial source that is free of contaminants.
- During removal of creosote-treated piles, containment booms and absorbent booms (or other oil-absorbent fabric) will be placed around the perimeter of the work area to capture wood debris, oil, and other materials that could inadvertently be released into marine waters. All accumulated debris will be collected daily and disposed of at an approved upland site.

- Removed creosote-treated piles will be disposed of in a manner that precludes their further use. Piles will be cut into manageable lengths (four feet or less) for transport and disposal in an approved upland location that meets the liner and leachate standards contained in the Washington Administrative Code (WAC), Chapter 173-304, Minimum Functional Standards. No reuse of treated wood will occur.
- 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:

- 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.
- Creosote-treated timber piling shall be replaced with non-creosote-treated piling.
- 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.

11.5 Safety Zone/Zone of Exclusion

For Level A harassment zones that exceeds 160 m from the source, WSF will establish a 160-m exclusion zone for all marine mammals. For Level A harassment zones that are smaller than 160 m from the source, WSF will establish exclusion zones that correspond to the Level A harassment distances, but not less than 10 m.

Table 11-1 Exclusion Zones

Pile type, size & pile driving method	Exclusion zone (m)				
	LF cetacean	MF cetacean	HF cetacean	Phocid	Otariid
14” timber pile, vibratory	10	10	12	10	10
24” steel pile, vibratory	255	65	160	115	10
30” & 36” steel pile, vibratory	285	65	160	125	10
30” & 36” steel pile, impact	160	75	160	160	35

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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 pier removal to discuss marine mammal monitoring protocol and requirement to halt work.

Prior to starting any pile driving or removal activity, 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 removal. A monitoring plan is provided in Appendix E.

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. Marine mammal sightings will be shared with Orca Network and The Whale Museum.

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Appendix A

Seattle Test Pile Project Report

Appendix B

Seattle Test Pile Vibratory Pile Monitoring Technical Memo

Appendix C

Seattle Test Pile Marine Mammal Monitoring Report

Appendix D

Compendium of Background Sound Levels for Ferry Terminals in Puget Sound

Appendix E

Marine Mammal Sightings Report for Puget Sound and the Seattle Trestle Project Zones of Influence

Appendix F
Seattle Multimodal Project
Marine Mammal Monitoring Plan

Appendix G
Project Sheets

Appendix F
Project Sheets