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

# Vashon Trestle Seismic Retrofit

## Washington State Department of Transportation
## Ferries Division

**December 16, 2014**

Submitted To:

National Marine Fisheries Service
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*Cover*: Southern Resident Killer Whales and a Washington State Ferry in the Seattle/Vashon Island area (October 2012) *(Orca Network, Howard Garrett).*

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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 (Figure 1-1) 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 seismic retrofit of the trestle at the Vashon ferry terminal, and is the subject of this Incidental Harassment Authorization (IHA) request. The proposed project will occur in marine waters that support several marine mammal species. The Marine Mammal Protection Act of 1972 (MMPA) prohibits the taking of marine mammals, which is defined as to "harass, hunt, capture or kill, or attempt to harass, hunt, capture or kill," except under certain situations. Section 101 (a)(5)(D) allows for the issuance of an IHA, provided an activity results in negligible impacts on marine mammals and would not adversely affect subsistence use of these animals.

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

## 1.2 Project Purpose and Need

The purpose of the project is to ensure the safe and reliable function of the Vashon Terminal in case of a significant earthquake. The project will upgrade the seismic condition of the trestle by replacing part of the existing trestle in the nearshore, and installing seismic bracing along the perimeter of the remaining trestle.

## 1.3 Project Setting and Land Use

The Vashon Ferry Terminal, serving State Route 160, is located at the north end of Vashon Island, in King County, Washington. The terminal is part of what is known as the Triangle Route between West Seattle (Fauntleroy terminal), Vashon Island and the Kitsap Peninsula (Southworth terminal). The Vashon terminal is located in Section 6, Township 23 North, Range 3 East, and is adjacent to Colvos Passage to the west and south, and the East Passage to the east, both tributary to Puget Sound (Figure 1-2). Land use in the area is a mix of residential, business, small scale agriculture and Blake Island State Park, and local parks.

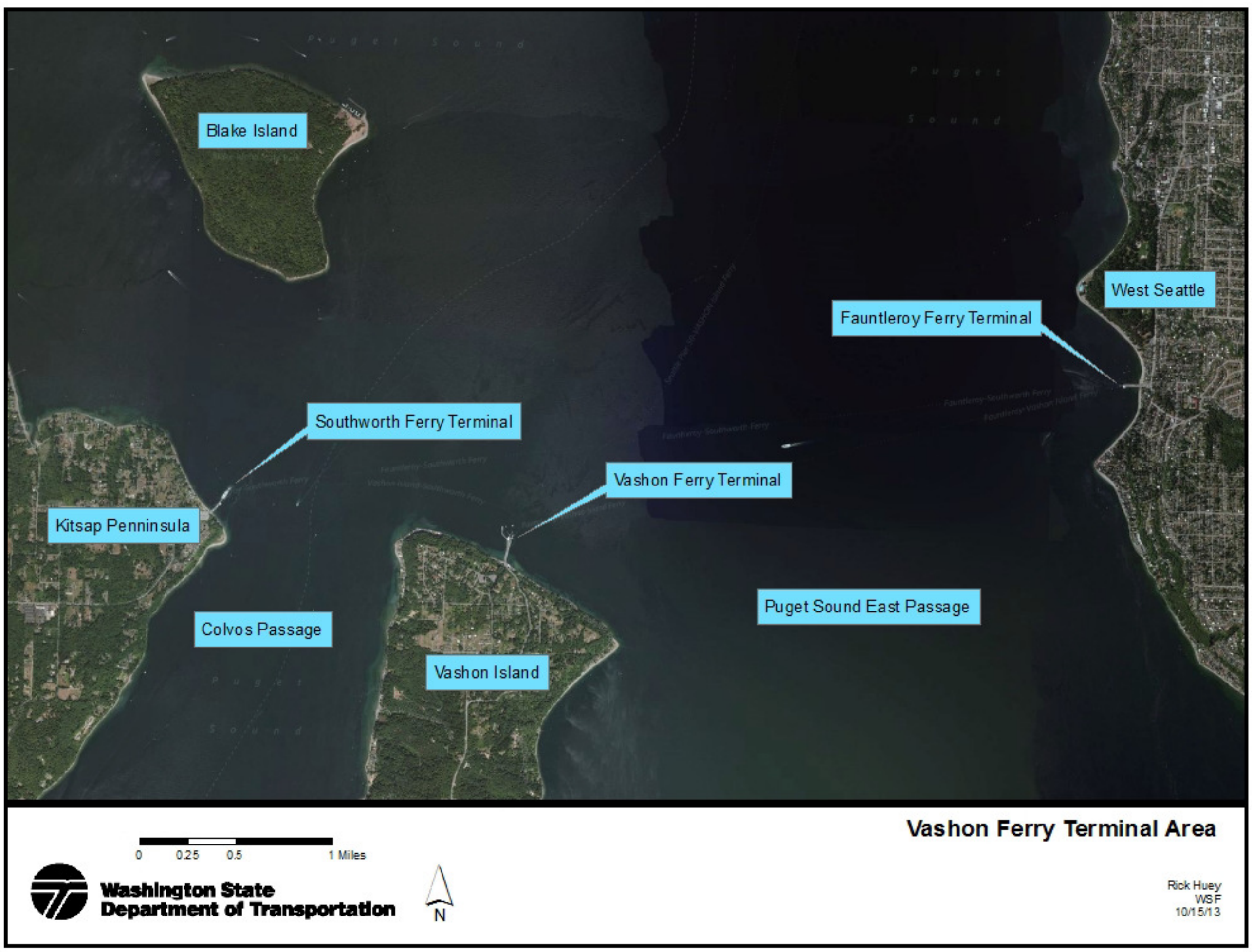


**Figure 1-2 Vashon Ferry Terminal Location**

## 1.4 Project Description

WSF is proposing to replace part of the existing Vashon Ferry Terminal trestle in the nearshore area and install seismic bracing along the perimeter of the remaining trestle (Figure 1-3/Appendix A: Vashon Project Sheets).

***Project Description***

Approximately 210-linear feet of the existing trestle in the nearshore will be replaced. Existing decking, 67 13-inch diameter creosote-treated timber piles and 39 30-inch diameter concrete-jacketed creosote-treated timber piles will be removed with a vibratory hammer. Fifty-three 24-inch diameter permanent hollow steel piles will be installed with a vibratory hammer for approximately the first 40 feet, and driven with an impact hammer for (approximately) the final 10 feet. Approximately forty-four 13-inch diameter temporary untreated timber piles will be installed with an impact hammer, to support the weight of a crane that will sit on the trestle to drive the permanent steel piles.

Seismic bracing will be installed at up to 11 locations, and will consist of a maximum of 66 24-inch diameter hollow steel piles installed with an impact hammer. Seismic bracing piles will be connected with concrete caps that tie each cluster of piles together.

Approximately fifty-two temporary 24-inch diameter hollow steel piles will be required to support temporary false-work and work trestles necessary to install the seismic braces concrete caps. Each work trestle will consist of approximately 6 piles. These piles will be driven with a vibratory hammer, and then proofed with an impact hammer to ensure they will bear the weight of the false-work and concrete caps.

<u>Test Pile</u>

A test pile project will also be implemented as part of the overall project. In October 2014, the University of Washington (funded by WSDOT/FHWA) completed an impact pile driving test project in Tacoma, WA. The goal of the project was to test noise attenuation and drivability.

Two types of piles were tested, double walled and Mandrel. A double walled pile is designed to attenuate by striking the internal pile, which then pulls the outer attenuation pile down during impacting. When driving is complete, both piles remain in the ground. The Mandrel pile functions in similar way, but is designed so that the internal Mandrel pile can be removed and reused to drive the next pile.

The noise attenuation result of the double walled and Mandrel piles was a reduction of 20dB, which is significantly greater than the usual 8-12 dB provided by bubble curtains.
Drivability was good, however, Tacoma soils were soft compared to glacial till soils common at many WSF terminals. Therefore a test pile is proposed to take place during the Vashon Seismic Retrofit project. The goal is to test the drivability of these piles in harder soils, and to test the rate of noise attenuation.

One double walled, one Mandrel and one control pile (three total) will be driven to the east of the Vashon trestle (see attached Sheets 2 and 4) during the Seismic Retrofit project in 2015 or 2016.

The location shown on the sheet is approximate, as construction staging may require that it be moved. All test piles are 30-inch hollow steel. The control pile will use a bubble curtain for attenuation. No unattenuated strikes will be allowed. The test will take place in water –10 to –25 feet MLLW. Piles will be driven approximately 40 ft. into the sediment. The test should be complete in one day, though two days are proposed in case of complications.

Piles will be impact driven and removed with a vibratory hammer. It is possible that some or all of the piles will not be able to be removed. In that case, the pile(s) will be cut below the mudline, and filled with sand to the natural grade.

***Construction Sequence***

The following construction sequence is anticipated:

- For the nearshore partial trestle replacement, work will proceed in stages as the crane advances away from the shore:
  - impact drive temporary timber piles,
  - vibratory/impact drive permanent 24- inch diameter hollow steel piles,
  - advance to next section,
  - temporary timber piles, and existing timber and concrete-jacketed timber piles will either be removed with a vibratory hammer as the crane advances away from shore, or will be removed after all permanent steel piles are installed, as the crane retreats towards the shore.


Figure 1-3 Partial Trestle Rebuild/Seismic Braces/Test Piles

- When the partial trestle replacement is complete:
  - 67 13-inch diameter existing timber piles and 39 30-inch diameter existing concrete-jacketed timber piles will have been removed with a vibratory hammer.
  - 44 temporary 13-inch diameter timber piles will have been installed with an impact hammer, and removed with a vibratory hammer.
  - 53 permanent 24-inch hollow steel piles will have been installed with a vibratory and impact hammer.
- The seismic braces will be installed sequentially:
  - Vibratory drive/impact proof temporary 24-inch diameter hollow steel piles,
  - impact drive permanent 24-inch diameter hollow steel piles,
  - construct temporary false-work and concrete cap,
  - remove false-work,
  - remove temporary 24-inch diameter hollow steel piles with a vibratory hammer,
  - advance to next brace location.
- When the seismic braces are complete:
  - 52 temporary 24-inch diameter hollow steel piles will have been installed using a vibratory hammer/proofed with an impact hammer, and removed with a vibratory hammer.
  - 66 permanent 24-inch diameter hollow steel piles will have been installed with an impact hammer.
- The test pile will be done toward the end of the project, but before the in-water work window has closed (February 15, 2016):
  - 3 30-inch diameter hollow steel piles will be installed using an impact hammer, and removed with a vibratory hammer.
  - If the piles cannot be removed, they will be cut at the mudline and covered with sand.

### *Durations*

The number of days it will take to complete the partial trestle replacement and install the seismic bracings depends on the difficulty in penetrating the substrate during pile installation. It is assumed that only one vibratory or impact hammer will be in operation at a time. Durations are conservative, and the actual amount of time to install and remove piles will likely be less. Duration estimates of each of the pile driving/removal elements follow:

- For the partial trestle replacement:
  - Impact driving of temporary timber piles will take approximately 30 minutes per pile, with 3 piles installed per day over 17 days.
  - Vibratory driving of each permanent 24-inch steel pile will take approximately 60 minutes, followed by approximately 30 minutes of impact driving (approximately 600 strikes per pile), with 2-5 piles installed per day over 27 days.
  - Vibratory removal of temporary timber piles, and existing timber and concrete-jacketed timber piles will take approximately 30 minutes per pile, with 5-10 piles removed per day over 30 days.
- For the seismic braces:
  - Vibratory driving of each temporary 24-inch steel pile will take approximately 20 minutes, followed by approximately 10 minutes of impact proofing (approximately 60 strikes per pile), with 2-4 piles installed per day over 28 days.
  - Impact driving of permanent 24-inch steel piles will take approximately two hours per pile, requiring approximately 3,000 strikes per pile, with approximately 2-4 piles installed per day over 28 days.
  - Vibratory removal of temporary 24-inch steel piles will take approximately 30 minutes pile, with up to 3-10 piles removed per day over 20 days.
- For the test pile:
  - Impact driving of each 30-inch steel pile will take approximately 40 minutes, (approximately 3,000 strikes per pile), with 3 piles installed over 1-2 days.
  - Vibratory removal of each pile will take approximately 40 minutes per pile, over 1-2 days.

The maximum anticipated number of days for pile driving is 100. The maximum anticipated number of days for pile removal is 50. Summary tables for the partial trestle rebuild (Table 1-1) and seismic bracing (Table 1-2) are provided below:

**Table 1-1 Partial Trestle Rebuild Pile Summary**

| Size | Install or Remove/ Pile Type | Number of Piles | Hammer Noise Type | Duration (Minutes per Pile) | Duration (Hours) | Duration (Days) |
|---|---|---|---|---|---|---|
| 13-inch | Install timber (temporary) | 44 | Impact | 30 | 22 | 17 |
| 24-inch | Install steel (permanent) | 53 | Vibratory/ Impact | 60/30 | 80 (53/27) | 27 |
| 13-inch | Remove timber (temporary) | 44 | Vibratory | 10 | 7 | 10 |
| 13-inch | Remove timber (existing) | 67 | Vibratory | 10 | 11 | 11 |
| 30-inch | Remove concrete-jacketed timber (existing) | 39 | Vibratory | 10 | 7 | 9 |
| 30-inch | Install steel (test piles) | 3 | Impact | 40 | 2 | 2 |
| 30-inch | Remove steel (test piles) | 3 | Vibratory | 40 | 2 | 2 |
| Totals | | 53 permanent installed<br>106 existing removed | | | 127 | 72 |

**Table 1-2 Seismic Bracing Pile Summary**

| Size | Install or Remove/ Pile Type | Number of Piles | Hammer Type | Duration (Minutes per Pile) | Duration (Hours) | Duration (Days) |
|---|---|---|---|---|---|---|
| 24-inch | Install steel (temporary) | 52 | Vibratory/ Impact | 20/10 | 26 (17/9) | 28 |
| 24-inch | Install steel (permanent) | 66 | Impact | 120 | 132 | 28 |
| 24-inch | Remove steel (temporary) | 52 | Vibratory | 30 | 26 | 20 |
| Totals | | 66 permanent installed | | | 184 | 76 |

**Table 1-3 Test Pile Summary**

| Size | Install or Remove/ Pile Type | Number of Piles | Hammer Noise Type | Duration (Minutes per Pile) | Duration (Hours) | Duration (Days) |
|---|---|---|---|---|---|---|
| 30-inch | Install steel (test piles) | 3 | Impact | 40 | 2 | 1 |
| 30-inch | Remove steel (test piles) | 3 | Vibratory | 40 | 2 | 1 |
| Totals | | 3 installed and removed | | | 4 | 2 |

In-water construction at the Vashon terminal is planned to begin in September 2015. The on-site work will last approximately 210 calendar days, with actual pile driving and removal taking place a maximum of 315 hours over 152 days. All work at the terminal will occur in water depths between +14 and -24 feet MLLW.

## 1.5 Project Elements

The proposed project has two elements involving noise production that may impact 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 1-9). 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 2-4 shows a pile being driven with an impact hammer.

Figure 1-5 Impact Hammer Driving a Steel Pile

## 1.6 Sound Levels

### 1.6.1 Reference Underwater Vibratory Sound Source Levels

The project includes vibratory driving and removal of 24-inch hollow steel piling, and vibratory removal of 13-inch timber piles and 30-inch concrete-jacketed timber piles.

Based on in-water measurements at the WSF Friday Harbor Ferry Terminal, vibratory pile driving of a 24-inch steel pile generated 162 dB RMS measured at 10 meters (Laughlin 2010a).

No data is available for vibratory removal of 24-inch steel piles or 30-inch concrete-jacketed timber piles, so it shall be conservatively assumed that vibratory removal of both pile types will produce the same source level as vibratory driving (162 dB RMS).

During the 2010 Port Townsend Vibratory Test Pile, vibratory removal of a 30" pile generated 171dB$_{RMS}$ measured at 10 m (Laughlin 2010b).

In-water measurements for vibratory driving of 13-inch timber piling are not available. Vibratory driving of 12-inch timber piling generated a maximum 152 dB RMS measured at 16 meters (WSF 2014). The source level for 13-inch timber piles shall be assumed to be the same as 12-inch timber piles.

### 1.6.2 Reference Underwater Impact Sound Source Levels

The project includes impact driving and proofing of 24-inch hollow steel piling, and impact driving of 13-inch timber piling. A bubble curtain will be used to attenuate steel pile impact driving noise.

Based on in-water measurements during the WSF Bainbridge Island Ferry Terminal, impact pile driving of a 24-inch steel pile generated 170 dB RMS (overall average), with the highest measured at 189 dB RMS measured at 10 meters (Laughlin 2005).

Based on the 2009 Vashon Test Pile, source levels for impact driving of 30-inch steel test piles are 210 dB$_{PEAK}$, 181 dB$_{SEL}$, and 189 dB$_{RMS}$ measured at 16 m (Pile P-8 Unmitigated) (WSDOT 2010).

In-water measurements for impact driving of 13-inch timber piling are not available. Impact driving of 12-inch timber piling generated 170 dB RMS (WSF 2014). The source level for 13-inch timber piles shall be assumed to be the same as 12-inch timber piles. A bubble curtain will not be used during impact driving of timber piles.

### 1.6.3 Background Noise

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

For example, 120 $dB_{RMS}$ is the threshold value for Level B acoustical harassment of marine mammals exposed to continuous noise sources. However, if background noise levels exceed 120 $dB_{RMS}$, for example 130 $dB_{RMS}$, then animals would not be exposed to "harassment level" sounds at less than 130 $dB_{RMS}$ as those sounds no longer dominate; they are essentially part of the background. In this example, the 130 $dB_{RMS}$ isopleth becomes the new project threshold for Level B take of marine mammals.

In-water background noise data taken with the functional hearing group of relevant species is available for the Vashon Ferry Terminal area (Table 1-4). This data was collected and plotted as a Cumulative Distribution Function (CDF) during daytime hours per NMFS guidelines (NMFS 2009).

**Table 1-4 Test Pile Summary**

| Frequency Range | Functional Hearing Group | Species | Vashon 50% CDF (dB) |
|---|---|---|---|
| 7 Hz to 20 kHz | Low-frequency Cetaceans | Gray, Humpback whale | 128 |
| 75 Hz to 20 kHz | Pinnipeds | Seals, sea lions | 125 |
| 150 Hz to 20 kHz | Mid-frequency Cetaceans | Killer whale | 122 |
| 200 Hz to 20 kHz | High-frequency Cetaceans | Harbor, Dall's porpoise | 121 |

Laughlin 2013

### 1.6.4 Underwater Transmission Loss

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

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

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

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

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

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

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

### 1.6.5 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 24-inch steel vibratory pile driving. Based on in-air measurements at the Coupeville Ferry Terminal, vibratory driving of a 30-inch steel pile generated a maximum of 96.9 $dB_{RMS}$ (unweighted) @ 50 ft. (Laughlin 2010c).

No unweighted in-air data is available for 13-inch timber or 30-inch concrete-jacketed timber vibratory pile removal. The source levels shall be conservatively assumed to be the same as vibratory driving of 30-inch steel piles (96.9 $dB_{RMS}$).

Based on in-air measurements at the WSF Port Townsend Ferry Terminal, impact pile driving of a 24-inch steel pile generated 110 dB $dB_{RMS}$ (unweighted) @ 50 ft. (Laughlin 2013). No unweighted data is available for impact pile driving of 30-inch steel piles, so it shall be assumed to be the same as 24-inch steel piles.

No unweighted in-air data is available for 13-inch timber impact pile driving. The source level shall be conservatively assumed to be the same as impact driving of 24-inch steel piles (110 dB $dB_{RMS}$.

### 1.6.6 Attenuation to NMFS Thresholds

NMFS has established disturbance and injury noise thresholds for marine mammals (Table 1-5). Determining the area(s) exceeding each threshold level (the zone of influence [ZOI]/zone of exclusion [ZOE]) is necessary to estimate the number of animals for the Level B acoustical harassment take request, and to establish a monitoring area. No Level A take is requested for this project.

**Table 1-5 Marine Mammal Injury and Disturbance Thresholds for Underwater and Airborne Noise**

| Marine Mammals | Airborne Noise from Marine Construction Activity<br>Level at which Pinniped Haul-out Disturbance has been Documented | Vibratory Pile Driving Disturbance Threshold | Impact Pile Driving Disturbance Threshold | Injury Threshold |
|---|---|---|---|---|
| Cetaceans | N/A | 120 $dB_{RMS}$ | 160 $dB_{RMS}$ | 180 $dB_{RMS}$ |
| Pinnipeds | 90 $dB_{RMS}$ (unweighted) for harbor seals<br>100 $dB_{RMS}$ (unweighted) for all other pinnipeds<br>re: 20 µPa | 120 $dB_{RMS}$ | 160 $dB_{RMS}$ | 190 $dB_{RMS}$ |

#### 1.6.6.1 Vibratory Pile Driving and Removal (Underwater Noise)

To simplify this analysis, the conservative 121 $dB_{RMS}$ underwater background will be used to establish the vibratory driving ZOI.

The NOAA/NMFS practical spreading model (sound transmission loss of 4.5 dB per doubling distance) was used to determine the distance where underwater sound will attenuate to the 121 $dB_{RMS}$ background level. The ZOIs are defined below, and shown in Figure 1-6 and 1-7:

- 162 $dB_{RMS}$ @ 10 meters (24-inch steel vibratory pile driving/removal, 30-inch concrete-jacketed timber removal) = 5.5 km/3.4 miles = ZOI-1
- 152 dB RMS @ 16 meters (13-inch timber piling removal) = 2.0 km/1.2 miles = ZOI-2
- 171 dBRMS @ 10 meters (30-inch test pile removal) = 21.5 km/13.4 miles = ZOI-3

During the project, in-water measurements of vibratory pile driving and removal will be taken to determine if the vibratory ZOIs need to be modified.

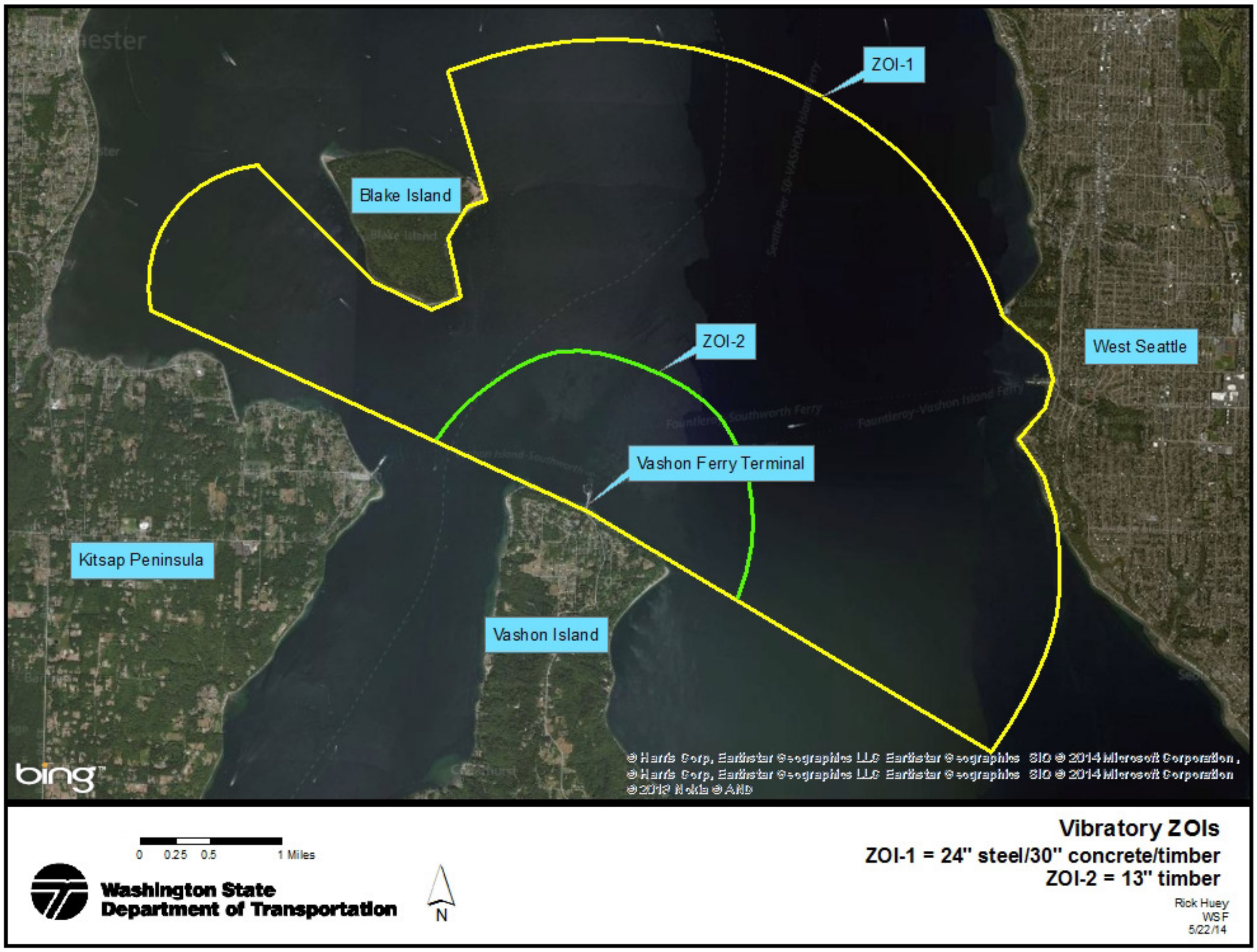


**Figure 1-6 Vibratory ZOIs (121 dB underwater background)**

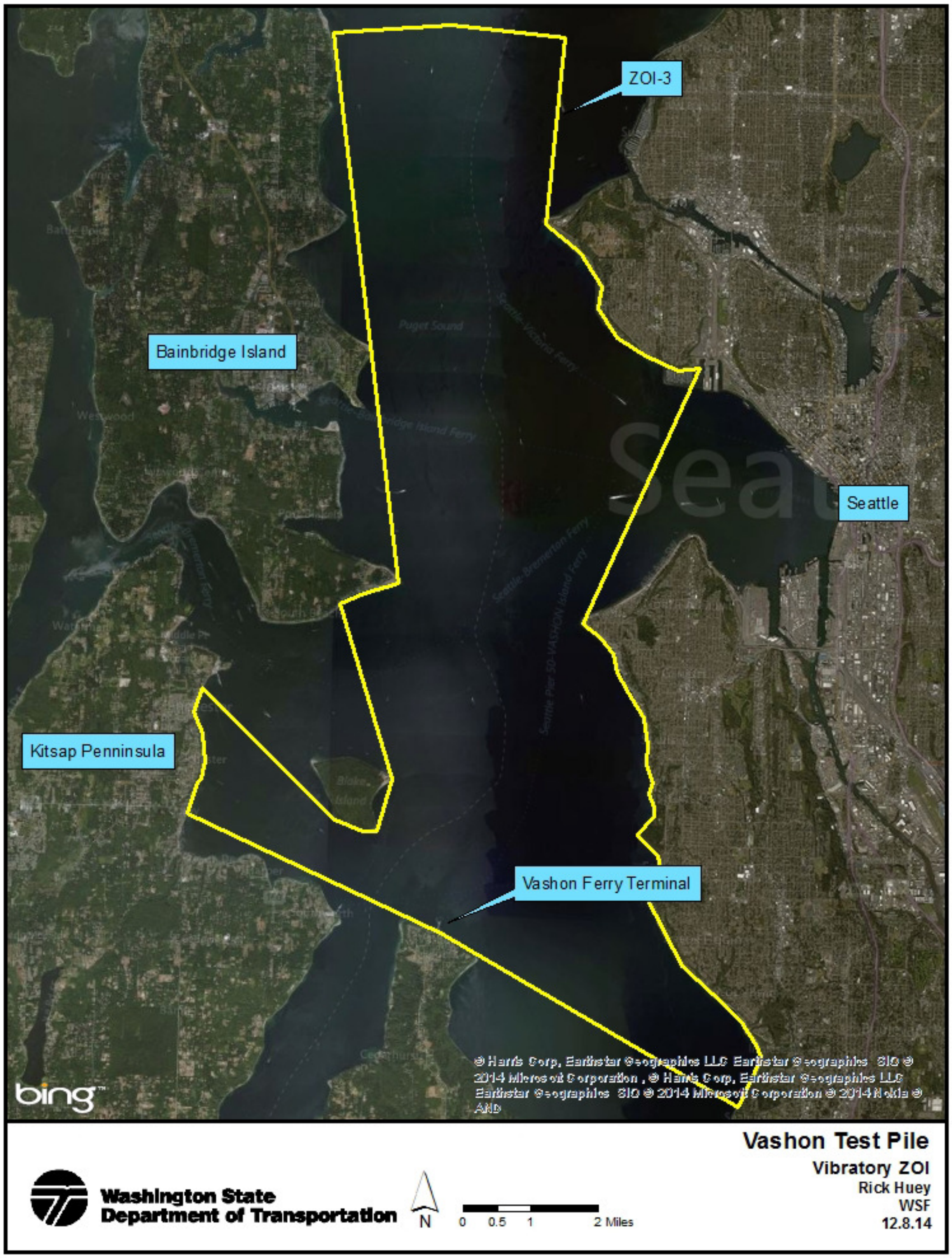


**Figure 1-7 Test Pile ZOI (121 dB underwater background)**

#### 1.6.6.2 Impact Pile Driving (Underwater Noise)

WSDOT has deployed bubble curtains at multiple locations, with noise attenuation ranging from 0-32 dB, and an overall average attenuation of 12 dB (WSDOT 2011). Assuming a more conservative range of 8-10 dB reduction, a worst-case noise level for impact driving of 30-inch steel test piles will be 179-181 dB RMS (189-10/8) at 16 m.

Using the NOAA/NMFS practical spreading loss model:

- the 190 dBRMS pinniped injury threshold is reached within 4.0 m/13 ft.
- the 180 dBRMS cetacean injury threshold is reached within 19 m/62 ft.
- the 160 dBRMS harassment threshold is reached within 402 m/1,319 ft. = ZOI-4

The more conservative cetacean injury zone (19 m/62 ft.) will be used to set the 30-inch steel Zone of Exclusion (ZOE). The 30-inch steel impact ZOE and ZOI (excluding land) are shown in Figure 1-8 for one representative pile.

A worst case noise level for 24-inch steel piles will be 179-181 dB RMS (189-10/8) at 10 m.

Using the NOAA/NMFS practical spreading loss model:

- the 190 dBRMS pinniped injury threshold is reached within 3.0 m/10 ft.
- the 180 dBRMS cetacean injury threshold is reached within 12 m/39 ft.
- the 160 dBRMS harassment threshold is reached within 251 m/824 ft. = ZOI-5

The more conservative cetacean injury zone (12 m/39 ft.) will be used to set the 24-inch steel Zone of Exclusion (ZOE). The 24-inch steel impact ZOE and ZOI (excluding land) are shown in Figure 1-8 for one representative pile.

During the project, in-water measurements of impact pile driving will be taken to determine if the impact ZOI/ZOE needs to be modified.

Impact driving of 12-inch timber piling generated 170 dB RMS, which is below the injury threshold, but above the 160 dBRMS harassment threshold, which is reached within 46 m/152 ft. No bubble curtain is used for driving timber piles. The 13-inch timber impact ZOI-6 is shown in Figure 1-8 for one representative pile.

#### 1.6.6.3 Safety Zone/Zone of Exclusion

The purpose of the safety zone/Zone of Exclusion (ZOE) is to ensure that noise-generating activities are shut down before Level A (injury) take occurs from cetaceans entering a 180 dB ZOI or a pinniped entering a 190 dB ZOI while impact pile driving is active.

During impact hammering Level A take (for cetaceans) can occur out to 12 m/39 ft. (the distance to the 180 dB isopleth). During impact hammering of 24-inch steel piles, a 12 m/39 ft. radius safety zone/ZOE will be fully monitored and impact hammering will shut down at the approach of any marine mammal to this zone (see Section 11.2.4, Marine Mammal Monitoring). A 12 m/39 ft. radius will be monitored for 30-inch steel piles. There is no Level A take during vibratory hammering, because source energy levels do not exceed the 180 dB cetacean or the 190 dB pinniped injury thresholds.

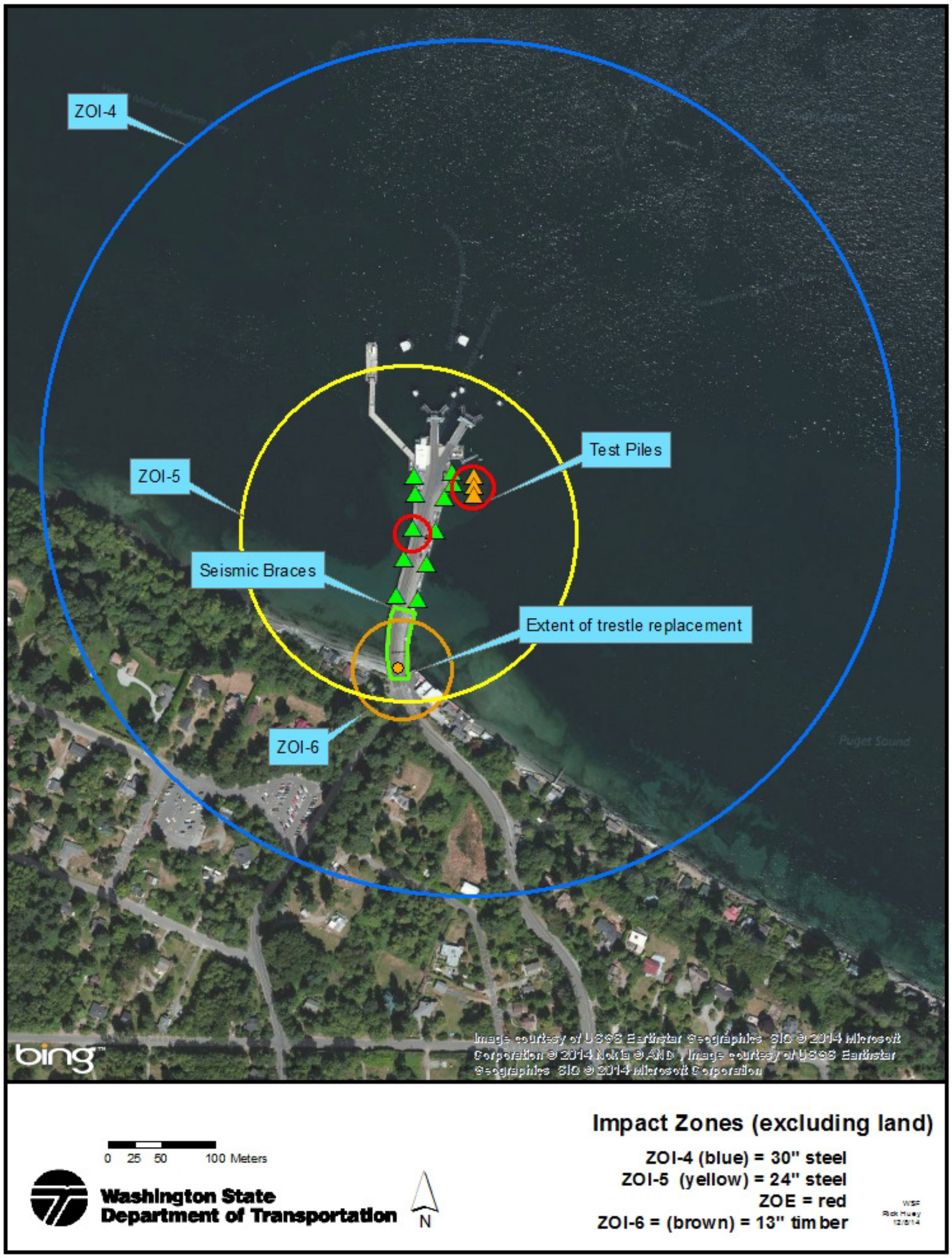


**Figure 1-8** **Vashon Ferry Terminal Impact Hammer ZOEs and ZOIs**

#### 1.6.6.4 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.

The project includes vibratory driving and removal of 24-inch and 30-inch hollow steel piling, vibratory removal of 13-inch timber piles and 30-inch concrete-jacketed timber piles; and impact driving of 24-inch steel piles and 13-inch timber piles.

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

- 24-inch and 30-inch steel vibratory pile driving and removal, and vibratory removal of 13-inch timber piles and 30-inch concrete-jacketed timber piles will reach the harbor seal threshold at approximately 27 m/89 ft., and is below the other pinnipeds threshold.
- 24-inch and 30-inch steel and 13-inch timber impact pile driving will reach the harbor seal threshold at approximately 122 m/400 ft., and the other pinnipeds threshold at approximately 38 m/126 ft.

The closest documented California and Steller sea lion haul out sites to the Vashon terminal are the buoys and Orchard Rocks near Manchester (approximately 8.0 km/5.0 mi NE) (Fig. 3-1).

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 27 m/89 ft., and within 122 m/400 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 122 m/400 ft., and within 38 m/126 ft. for all other 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 September 1, 2015 and February 15, 2016.

## 2.2 Duration

The total worst-case time for pile installation and removal is 315 hours over 152 days (Tables 1-1 and 1-2).

## 2.3 Region of Activity

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

# 3.0 Species and Numbers of Marine Mammals in Area

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

Section 3.0 has been combined with Section 4.0 for ease reading due. Section 3.0 requires a discussion of the species and numbers of marine mammals in the area. Section 4.0 requires a discussion of the status and distribution of the stock(s) and specifically:

*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.*

Each requested topic in Section 4.0 (status, distribution, and seasonal distribution [if known]) has been clearly marked as a subheading in Section 3.0 for ease of finding relevant information while consolidating the species-specific information into one place to avoid searching for information between similar chapters.

## 3.1 Species Present

Ten species of marine mammals may be found in the Vashon 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 | Threatened | Depleted | August-April | Rare |
| Killer Whale Southern Resident | Endangered | Depleted | September - May | Infrequent |
| Killer Whale Transient | Not listed | Depleted | Year-round | Infrequent |
| Gray Whale | Delisted | Unclassified | January-May | Occasional |
| Humpback Whale | Endangered | Depleted | September-May | Occasional |
| Minke Whale | Not listed | Non-depleted | September-January | Occasional |
| Harbor Porpoise | Not listed | Non-depleted | May-June peak | Occasional |
| Dall's Porpoise | Not listed | Non-depleted | October-February | Occasional |

## 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 2008 to 2013, in the September 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 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 Vashon area, including the quadrants of interest for the project. The ZOI (in yellow) intersects with five quadrants: 412-415 and 417. The ZOI in green is for a future Southworth project that will not take place at the same time as the Vashon project. Because both projects intersect the same ZOIs, the reported data can be applied to both projects.

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 quadrants; however, since the project will be conducted in 'Area 2: Puget Sound' of the designated SRKW critical habitat, it is appropriate to include analyses at that geographic scale. Since there is a good chance that whales will be missed within a specific quadrant, a larger area is analyzed as well for comparison to the single quadrants. In this case, the larger area included in the analyses was to the south of the ZOI quadrants, as the whales would have had to pass through the ZOI quadrants to reach more southerly areas. Therefore a conservative whale analysis approach was taken, focusing on the following areas: the quadrants intersecting the Vashon ZOI (quadrants 412-415 and 417), and the south of Vashon quadrants (quadrants 412-443).

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 Vashon ZOI quadrants and the south of Vashon quadrants.

It should be noted that data for marine mammals other than SRKW, grey, 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 2014).

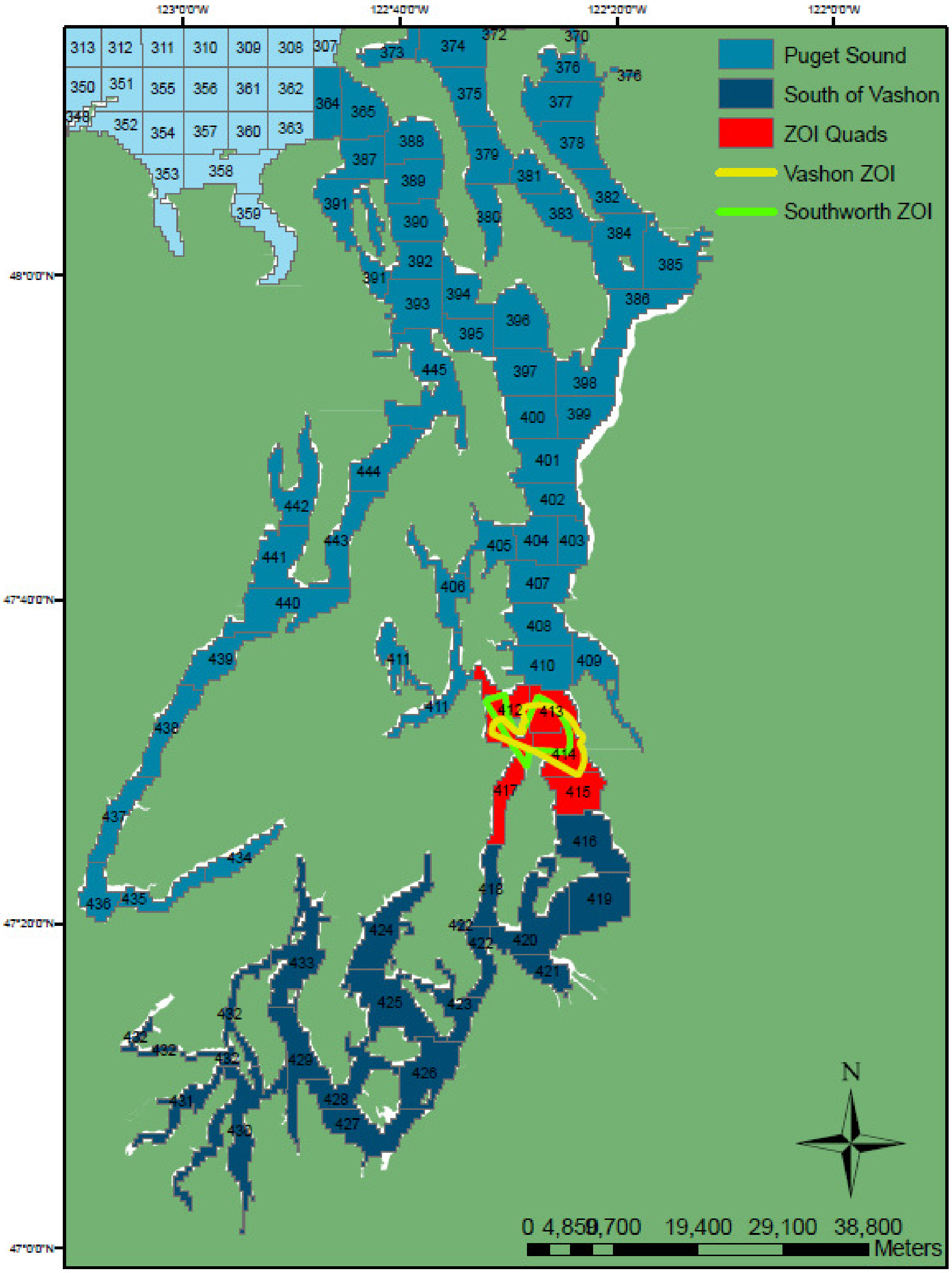


**Figure 3-1 ZOI + Area Quads**

## 3.3 Pinnipeds

There are three species of pinnipeds that may be found in the Vashon Ferry Terminal area: harbor seal (*Phoca vitulina richardsi*), California sea lion (*Zalophus californianus*) and Steller sea lion (*Eumetopias jubatus*). Harbor seals are the most common and the only pinniped that breeds and remains in Puget Sound year-round.

### 3.3.1 Harbor Seal

Harbor seals are members of the true seal family (Phocidae). There are three distinct west coast stocks: 1) inland waters of Washington State (including Hood Canal, Puget Sound, Georgia Basin and the Strait of Juan de Fuca out to Cape Flattery), 2) outer coast of Oregon and Washington, and 3) California (Carretta et al. 2007a).

Pupping seasons vary by geographic region. For the southern Puget Sound region, pups are born from late June through September (WDFW 2012a). After October 1 all pups in the inland waters of Washington are weaned.

Harbor seals, like all pinnipeds, communicate both on land and underwater. Harbor seals have the broadest auditory bandwidth of the pinnipeds, estimated by Southall et al. (2007) as between 75 hertz (Hz) and 75 kilohertz (kHz) for "functional" in-water hearing and between 75 Hz and 30 kHz for "functional" in-air hearing. At lower frequencies (below 1 kHz) sounds must be louder to be heard (Kastak and Schusterman 1998). Studies indicated that pinnipeds are sensitive to a broader range of sound frequencies in-water than in-air (Southall et al. 2007). Hearing capabilities for harbor seals in-water are 25 to 30 dB better than in-air (Kastak and Schusterman 1998).

#### 3.3.1.1 Numbers

Harbor seals are the most numerous pinniped in the inland marine waters of Washington (Calambokidis and Baird 1994). In the 2010 Stock Assessment Report (SAR)(NMFS 2011a), 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). The population across Washington increased at an average annual rate of 10 percent between 1991 and 1996 (Jeffries et al. 1997) and is thought to be stable (Jeffries et al. 2003).

The nearest documented harbor seal haulout site to the Vashon ferry terminal is 9.7 km northwest (Figures 3-2/3-3). The number of harbor seals using the haulout is less than 100 (WDFW 2000).

Harbor seals have been observed hauled-out on a boat ramp to the east of the Vashon Ferry Terminal trestle, and on a beach to the west of the trestle (Figure 3-2)(Stateler 2013, WSF 2009).

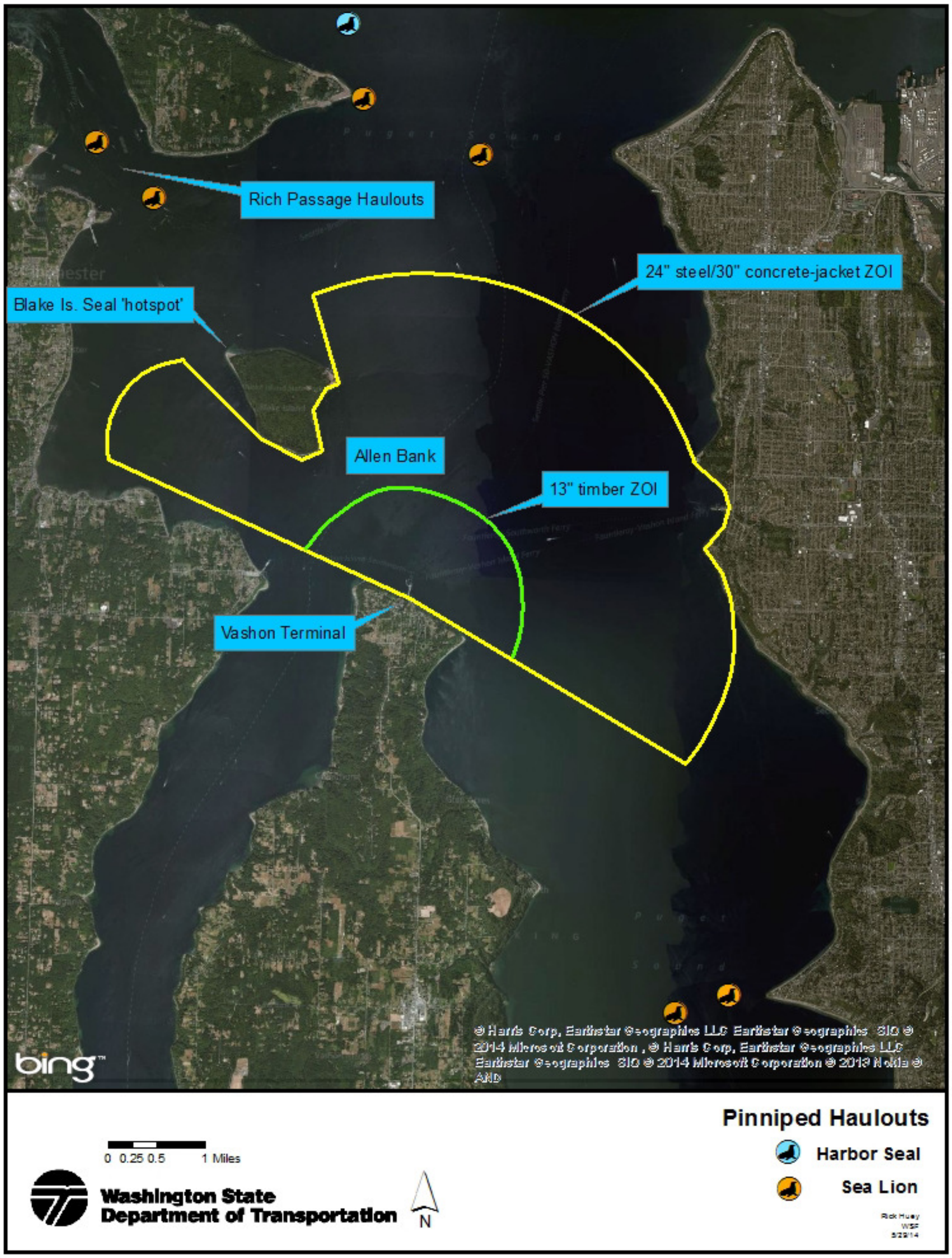


Figure 3-2 ZOI 1/2 Pinniped Haulouts

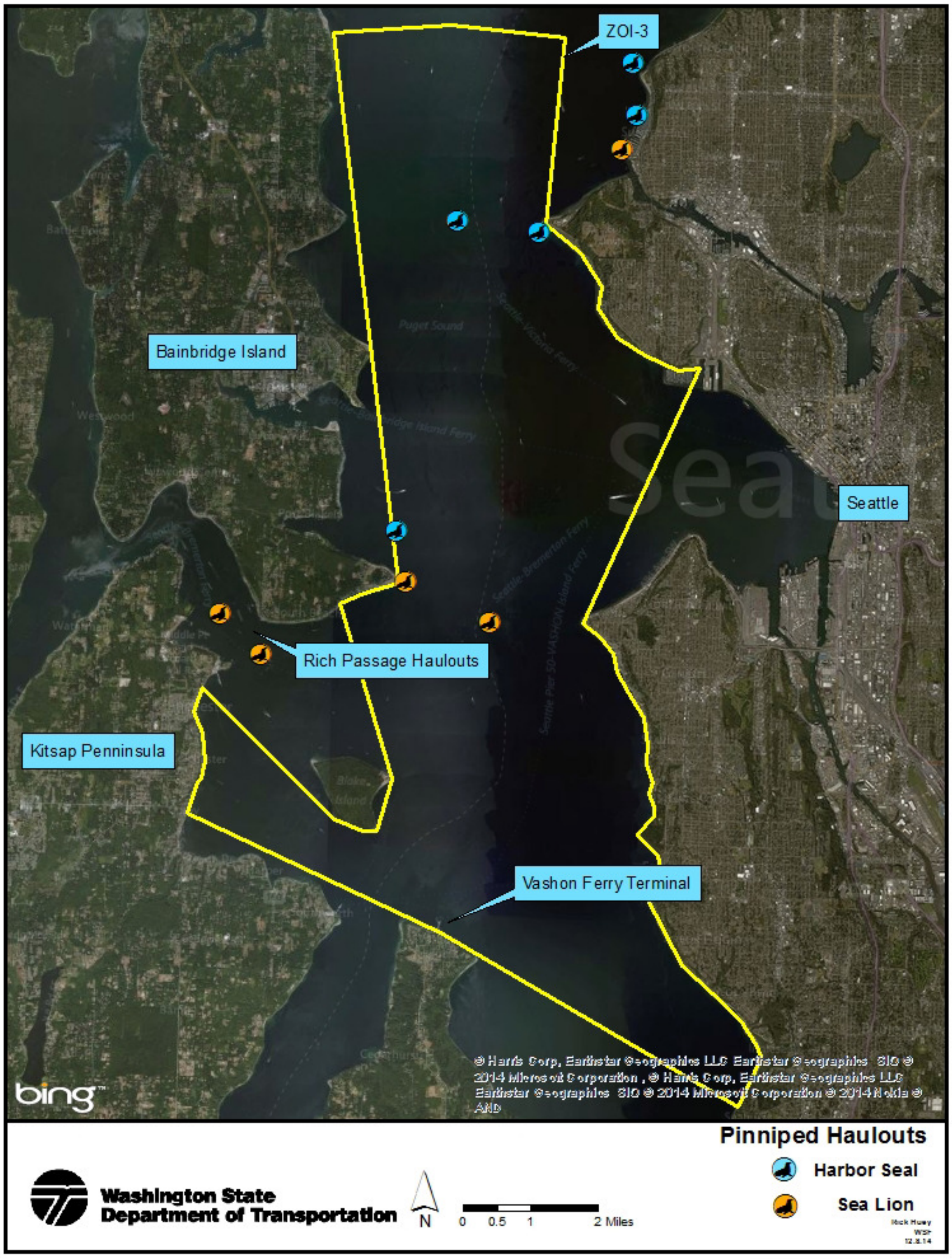


**Figure 3-3 ZOI 3 Pinniped Haulouts**


**Figure 3-4 Nearshore Pinniped Haulouts**

In 2009 WSF replaced several dolphin structures at the Vashon terminal. Marine mammal monitoring was implemented during this project. Over 7 days of monitoring in November of 2009, four harbor seals were observed near the terminal, three swimming and one hauled-out on the beach to the west of the trestle (WSF 2009).

For the years 2008 to 2013, in the September to February timeframe scheduled for this project, The Whale Museum reported two sightings days for harbor seals in the Vashon ZOI quadrants (red) and the South of Vashon quadrants (dark blue) shown in Figure 3-1(TWM 2014). It should be noted that pinnipeds are not reported at the same rate as large cetaceans.

**Table 3-2 Harbor Seal Sightings Days 2008-2013**

| Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0 | 0 |

TWM 2014

According to the NMFS National Stranding Database, there were 38 confirmed harbor seal strandings in the Vashon area in 2010-2013, in the September-February work window scheduled for this project (NMFS 2014a).

#### 3.3.1.2 Status

Harbor seals are not "depleted" under the MMPA or listed as "threatened" or "endangered" under the ESA. Because there is no current estimate of minimum abundance, a potential biological removal (PBR) cannot be calculated for this stock. The previous estimate of PBR was 771 (Carretta et al. 2009). Human-caused mortality relative to PBR is unknown, but it is considered to be small relative to the stock size. The Washington Inland Waters stock of harbor seals is not classified as a "strategic" stock. The stock is also considered within its Optimum Sustainable Population level (Jeffries et al. 2003).

#### 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 1948; Fisher 1952; Bigg 1969, 1981). They are not known to make extensive pelagic migrations, although some long-distance movements of tagged animals in Alaska (174 km) and along the U.S. west coast (up to 550 km) 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 site to the Vashon ferry terminal is 9.7 km northwest (Figure 3-1). 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 may also use other undocumented haulout sites in the area.

Transient killer whales often forage to the east of Allen Bank for harbor seals (Sears 2013), which is within the project ZOI. NW Blake Island, just north of Vashon Island is a 'hot-spot' for seals that are prey for Transients (Stateler 2013) (Fig. 3-1).

### 3.3.2 California Sea Lion

California sea lions (*Zalophus californianus*) are members of the family Otariidae or eared seals (sea lions and fur seals). The breeding areas of the California sea lion are on islands located in southern California, western Baja California and the Gulf of California (Carretta et al. 2007b). Washington California sea lions occur within the geographic boundaries of the U.S. stock, which begins at the U.S./Mexico border and extends northward into Canada

#### 3.3.2.1 Numbers

The U.S. stock was estimated at 296,750 in the 2011 SAR (NMFS 2011b) and may be at carrying capacity, although more data are needed to verify that determination (Carretta et al. 2007a). Some 3,000 to 5,000 animals are estimated to move into northwest waters (both Washington and British Columbia) during the fall (September) and remain until the late spring (May) when most return to breeding rookeries in California and Mexico (Jeffries et al. 2000; J. Calambokidis pers. comm. 2008). Peak counts of over 1,000 animals have been made in Puget Sound (Jeffries et al. 2000).

The nearest documented California sea lion haulout sites to the Vashon ferry terminal is 7.8 km northwest on a Rich Passage float and buoys, net pens and the Orchard Rocks (Figure 3-2/3-3/3-4). The number of California sea lions using the buoys is less than 100 (WDFW 2000).

**Figure 3-5 Sea Lions on Rich Passage Net Pens (U.S. Navy November 2012)**

In 2009 WSF replaced several dolphin structures at the Vashon terminal. Marine mammal monitoring was implemented during this project. Over 7 days of monitoring in November of 2009, four California sea lions swimming near the terminal (WSF 2009).

From November of 2012 to February of 2014, the U.S. Navy collected sightings data of California sea lions hauled-out on the Rich Passage float and buoy (Figure 3-4). In the September to February timeframe scheduled for this project, the Navy reported a total of 646 California sea lions over 14 days of observation, with a high of 110 on January 14, 2014 (U.S. Navy 2014).

**Table 3-3 California Sea Lion Sightings 2012-2014**

| Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|
| N/A | N/A | 4 | 4 | 558* | 0 |

*over 9 days of observation
U.S. Navy 2014

For the years 2008 to 2013, in the September to February timeframe scheduled for this project, The Whale Museum reported two sightings days for California sea lions in the Vashon ZOI quadrants (red) and the South of Vashon quadrants (dark blue) shown in Figure 3-1 (TWM 2014). It should be noted that pinnipeds are not reported at the same rate as large cetaceans.

**Table 3-4 California Sea Lion Sightings Days 2008-2013**

| Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 1 |

TWM 2014

According to the NMFS National Stranding Database, there were four confirmed California sea lion strandings in the Vashon area in 2010-13, in the September-February work window scheduled for this project (NMFS 2014a).

### 3.2.2.2 Status

California sea lions are not listed as endangered or threatened under the ESA or as depleted under the MMPA. They are not considered a strategic stock under the MMPA, because total human-caused mortality, although unknown, is likely to be well less than the PBR (9,200) (NMFS 2011b).

### 3.3.2.2 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 site to the Vashon ferry terminal is 7.8 km NW (Figure 3-1) (WDFW 2000).

### 3.3.3 Steller Sea Lion

Steller sea lions comprise two recognized management stocks (eastern and western), separated at 144º W longitude (Loughlin 1997). Only the eastern stock is considered in this application as the western stock occurs outside of the geographic area under consideration. Breeding rookeries for the eastern stock are located along the California, Oregon, British Columbia, and southeast Alaska coasts, but not along the Washington coast or in inland Washington waters (Angliss and Outlaw 2007). Steller sea lions primarily use haulout sites on the outer coast of Washington and in the Strait of Juan de Fuca along Vancouver Island in British Columbia. Only sub-adults or non-breeding adults may be found in the inland waters of Washington (Pitcher et al. 2007; P. Gearin pers. comm. 2008).

#### 3.3.3.1 Numbers

The eastern stock was estimated at 52,847 individuals in the 2012 SAR, and the most recent estimate for Washington state (including the outer coast) is 516 individuals (non-pups only) (NMFS 2012a). However, there are estimates that 1,000 to 2,000 individuals enter the Strait of Juan de Fuca during the fall and winter months (Jeffries pers. comm. 2008b).

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).

#### 3.3.3.2 Status

Steller sea lions were listed as threatened range-wide under the ESA on November 26, 1990 (55 FR 49204). After division into two stocks, the western stock was listed as endangered under the ESA on May 4, 1997 and the eastern stock remained classified as threatened (62 FR 24345). In 2006 the NMFS Steller sea lion recovery team proposed removal of the eastern stock from listing under the ESA based on its annual rate of increase of approximately 3% since the mid-1970s. The eastern stock was delisted in November 2013 (CFR 2013).

On August 27, 1993, NMFS published a final rule designating critical habitat for the Steller sea lion. No critical habitat was designated in Washington. Critical habitat is associated with breeding and haulout areas in Alaska, California, and Oregon (NMFS 1993).

Steller sea lions are listed as depleted under the MMPA. Both stocks are classified as strategic. The PBR for this stock is 2,378 animals (NMFS 2012a).

### 3.3.3.3 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 2000 individuals present or passing through the Strait of Juan de Fuca in fall and winter months (S. Jeffries pers. comm. 2008b). The number of haulout sites has increased in recent years.

In 2009 WSF replaced several dolphin structures at the Vashon terminal. Marine mammal monitoring was implemented during this project. Over 7 days of monitoring in November of 2009, no Steller sea lions were observed (WSF 2009).

From November of 2012 to February of 2014, the U.S. Navy collected sightings data of Steller sea lions hauled-out on the Rich Passage float and buoy (Figure 3-1). In the September to February timeframe scheduled for this project, the Navy reported a total of 48 Steller sea lions over 14 days of observation, with a high of 9 in January 14, 2014 (U.S. Navy 2014).

**Table 3-5 Steller Sea Lion Sightings 2012-2014**

| Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|
| N/A | N/A | 4 | 4 | 40* | 0 |

*over 9 days of observation
U.S. Navy 2014

For the years 2008 to 2013, in the September to February timeframe scheduled for this project, The Whale Museum reported three sightings days for Steller sea lions in the Vashon ZOI quadrants (red) and the South of Vashon quadrants (dark blue) shown in Figure 3-1(TWM 2014). It should be noted that pinnipeds are not reported at the same rate as large cetaceans.

**Table 3-6 Steller Sea Lion Sightings Days 2008-2013**

| Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|
| 0 | 1 | 0 | 1 | 1 | 0 |

TWM 2014

According to the NMFS National Stranding Database, there were no Steller sea lion strandings in the Vashon area in 2010-13 (NMFS 2014a).

## 3.4 Cetaceans

Six cetacean species may be present in the Vashon terminal area; killer whale, gray whale, humpback whale, Minke whale, harbor porpoise and Dall's porpoise.

### 3.4.1 Killer Whale

The killer whale (*Orcinus orca)* is the largest member of the dolphin family (Delphinidae) and occurs in most marine waters of the world (Rice 1998 as cited in NMFS 2008a). Killer whales are distinct among all cetaceans with their black-and-white coloration with characteristic gray or white saddle patches behind the dorsal fin and white eye patches. Killer whales live in family groups called pods, are highly social, and communicate with a highly developed acoustic sensory system that is also used to navigate and find prey (Ford 1989; Ford et al. 2000). Vocal communication is particularly advanced in killer whales and is an essential element of the species social structure (Wiles 2004; Krahn et al. 2004).

Two sympatric ecotypes of killer whales are found within the activity area: transient and resident. These types vary in diet, distribution, acoustic calls, behavior, morphology and coloration (Baird 2000 as cited in NMFS 2008a; Ford et al. 2000). The ranges of transient and resident killer whales overlap; however, little interaction and high reproductive isolation occurs among the two ecotypes (Barrett-Lennard 2000; Barrett-Lennard and Ellis 2001; Hoelzel et al. 2002 as cited in NMFS 2008a). Resident killer whales are primarily piscivorous, whereas transients primarily feed on marine mammals, especially harbor seals (Baird and Dill 1996). Resident killer whales also tend to occur in larger (10 to 60 individuals), stable family groups known as pods, whereas transients occur in smaller, less structured pods of two to six individuals (Center for Whale Research 2014).

#### 3.4.1.1 Southern Resident Killer Whale

Two stocks of resident killer whales occur in Washington State: the Southern Resident (SRKW) and Northern Resident stocks. Southern Residents occur within the activity area, in the Strait of Juan de Fuca, Strait of Georgia, and in coastal waters off Washington and Vancouver Island, British Columbia. Northern Residents occur primarily in inland and coastal British Columbia and Southeast Alaska waters and rarely venture into Washington State waters. Little interaction (Ford et al. 2000) or gene flow (Barrett-Lennard 2000; Barrett-Lennard and Ellis 2001; Hoelzel et al. 2004 as cited in Krahn et al. 2004) is known to occur between the two resident stocks.

The Southern Residents live in three family groups known as the J, K and L pods. The entire Southern Resident population has been annually recorded since 1973 (Krahn et al. 2004). Individual whales are identified through photographs of unique saddle patch and dorsal fin markings. Each Southern Resident pod has a distinctive dialect of vocalizations (Ford 1989) and calls can travel 10 miles or more underwater. SRKW forage primarily on salmon, with Chinook salmon considered the major prey in the Puget Sound region in late spring through the fall. Other identified prey included chum salmon, other salmonids, herring, and rockfish (NMFS 2008a).

Killer whales are mid-frequency cetaceans (Southall et al. 2007) with an estimated auditory bandwidth of 50 Hz to 100 kHz and peak sensitivity around 15 kHz (73 CFR 41318). Killer whale hearing is well developed for the species' complex underwater communication structure.

However, Southern Residents are highly vocal while Transients limit their use of vocalization and may travel silently, apparently to avoid being detected by marine mammal prey (Deecke et al. 2005 as cited in 73 CFR 41318).

Small population numbers make Southern Residents vulnerable to inbreeding depression and catastrophic events such as disease or a major oil spill. Ongoing threats to Southern Residents include declining prey resources, environmental contaminants, noise and physical disturbance (Krahn et al. 2004; Wiles 2004). In Washington's inland waters, high levels of noise disturbance and potential behavior disruption are due to recreational boating traffic, private and commercial whale watching boats and commercial vessel traffic (Wiles 2004). Other potential noise disturbance includes high output military sonar equipment and marine construction. Noise effects may include altered prey movements and foraging efficiency, masking of whale calls, and temporary hearing impairment (Krahn et al. 2004).

#### 3.4.1.1.1 Numbers

The Southern Resident stock was first recorded in a 1974 census, at which time the population comprised 71 whales. This population peaked at 97 animals in 1996, declined to 79 by 2001 (Center for Whale Research 2011), and then increased to 89 animals by 2006 (Carretta et al. 2007a). As of December 2014, the population collectively numbers 77 individuals: J pod has 23 members, K pod has 19 members, and L pod has 35 members (Center for Whale Research 2014/Orca Network 2014).

The Southern Resident stock has decline from 97 individuals is due to a decrease in birth rates and an increase in mortalities, especially among the L pod (Krahn et al. 2004). There are a limited number of reproductive-age Southern Resident males, and several females of reproductive age are not having calves. Three major threats were identified in the ESA listing: reduced quantity and quality of prey; persistent pollutants that could cause immune or reproductive system dysfunction; and effects from vessels and sound (NMFS 2008a). Other threats identified were demographics, small population size, and vulnerability to oil spills. Previously, declines in the Southern Resident population were due to shooting by fishermen, whalers, sealers and sportsmen largely due to their interference with fisheries (Wiles 2004) and the aquarium trade, which is estimated to have taken a significant number of animals from 1967 to 1973 (Ford et al. 1995). According to the 2012 SAR, the PBR is 0.14 animals (NMFS 2012b).

#### 3.4.1.1.2 Status

The Southern Resident stock was declared depleted under the MMPA in May 2003 (68 FR 31980). At that time, NMFS announced preparation of a conservation plan to restore the stock to its optimal sustainable population. On November 18, 2005, the SRKW stock was listed as an endangered distinct population segment (DPS) under the ESA (70 FR 69903). On November 29, 2006, NMFS published a final rule designating critical habitat for the SRKW 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 SRKW was published in January of 2008 (NMFS 2008a).

In Washington State, killer whales were listed as a state candidate species in 2000. In April 2004, the State upgraded their status to a state endangered species.

#### 3.4.1.1.3 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 within the activity area (Figure 3-4). While in the activity area, resident killer whales generally spend more time in deeper water and only occasionally enter water less than 15 feet deep (Baird 2000). Distribution is strongly associated with areas of greatest salmon abundance, with heaviest foraging activity occurring over deep open water and in areas characterized by high-relief underwater topography, such as subsurface canyons, seamounts, ridges, and steep slopes (Wiles 2004).

Records from 1976 through 2006 document Southern Residents in the inland waters of Washington during the months of March through June and October through December, with the primary area of occurrence in inland waters north of Admiralty Inlet, located in north Puget Sound (The Whale Museum 2008a).

**Spring/Summer Distribution**

Beginning in May or June and through the summer months, all three pods (J, K and L) of Southern Residents are most often located in the protected inshore waters of Haro Strait (west of San Juan Island), in the Strait of Juan de Fuca, and Georgia Strait near the Fraser River. Historically, the J pod also occurred intermittently during this time in Puget Sound; however, records from The Whale Museum (2008a) from 1997 through 2007 show that J pod did not enter Puget Sound south of the Strait of Juan de Fuca from approximately June through August.

**Fall/Winter Distribution**

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

SRKW are present in the Vashon Island area in November-January, coinciding with chum salmon runs, with peak sightings in November/December. SRKW whale commonly forage for salmon on the east side of Vashon Island. They tend to pass through the Vashon area, traveling at approximately 4 mph, rather than staying in the area (Sears 2013).

Ann Stateler of the Vashon Hydrophone Project (and a Vashon Island resident) has been observing whales in the area since 1994. Her observations since 2005 show that the broad window for SRKW presence in the Vashon area has been from October to March, with most encounters occurring between November and January. Prey samples collected by Mark Sears and NOAA researchers in local waters indicate that the SRKW are targeting Chum and Chinook salmon.

SRKW use all of the waterways surrounding Vashon/Maury Island: East Passage, Colvos Pass, Dalco Pass, waters off the north end between Blake and Vashon Islands. Sometimes the SRKW circumnavigate the island. SRKW visits to the Vashon area have been highly variable. Typically, members of all three pods are observed over a year, with the exception of 2006 when J Pod was not present for the first time since observations have been recorded. Observations from 2005-January 2011 for all months of a year (with the exception of 2011) are presented in Table 3-3 (Stateler 2011).

**Table 3-7 SR killer whale sightings near Vashon terminal 2005-2011**

| Year | Sightings |
|---|---|
| **2005** | 10 |
| **2006** | 11 |
| **2007** | 21 |
| **2008** | 8 |
| **2009** | 7 |
| **2010** | 4 |
| **2011*** | 5 |

* partial year data to January
Stateler 2011/

In 2009 WSF replaced several dolphin structures at the Vashon terminal. Marine mammal monitoring was implemented during this project. Over 7 days of monitoring in November of 2009, no killer whales were observed (WSF 2009).

For the years 2008 to 2012, in the September to February timeframe scheduled for this project, The Whale Museum reported 134 whale days for SRKW in the Vashon ZOI quadrants (red) and the South of Vashon quadrants (dark blue) shown in Figure 3-1, with a high of 46 whale days in December of those years (TWM 2014).

According to the NMFS National Stranding Database, there were no killer whale strandings in the Vashon area in 2010-13 (NMFS 2014a).

**Table 3-8 SRKW Whale Days by Year/Project Month**

| Year | Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|---|
| **2008** | 1 | 5 | 8 | 9 | 9 | 1 |
| **2009** | 15 | 7 | 10 | 14 | 1 | 2 |
| **2010** | 2 | 9 | 8 | 0 | 4 | 0 |
| **2011** | 1 | 7 | 4 | 6 | 2 | 16 |
| **2012** | 3 | 11 | 8 | 17 | 6 | 8 |
| **Totals** | **22** | **39** | **38** | **46** | **22** | **27** |
| **Average** | **4.4** | **7.8** | **7.6** | **9.2** | **4.4** | **5.4** |

TWM 2014

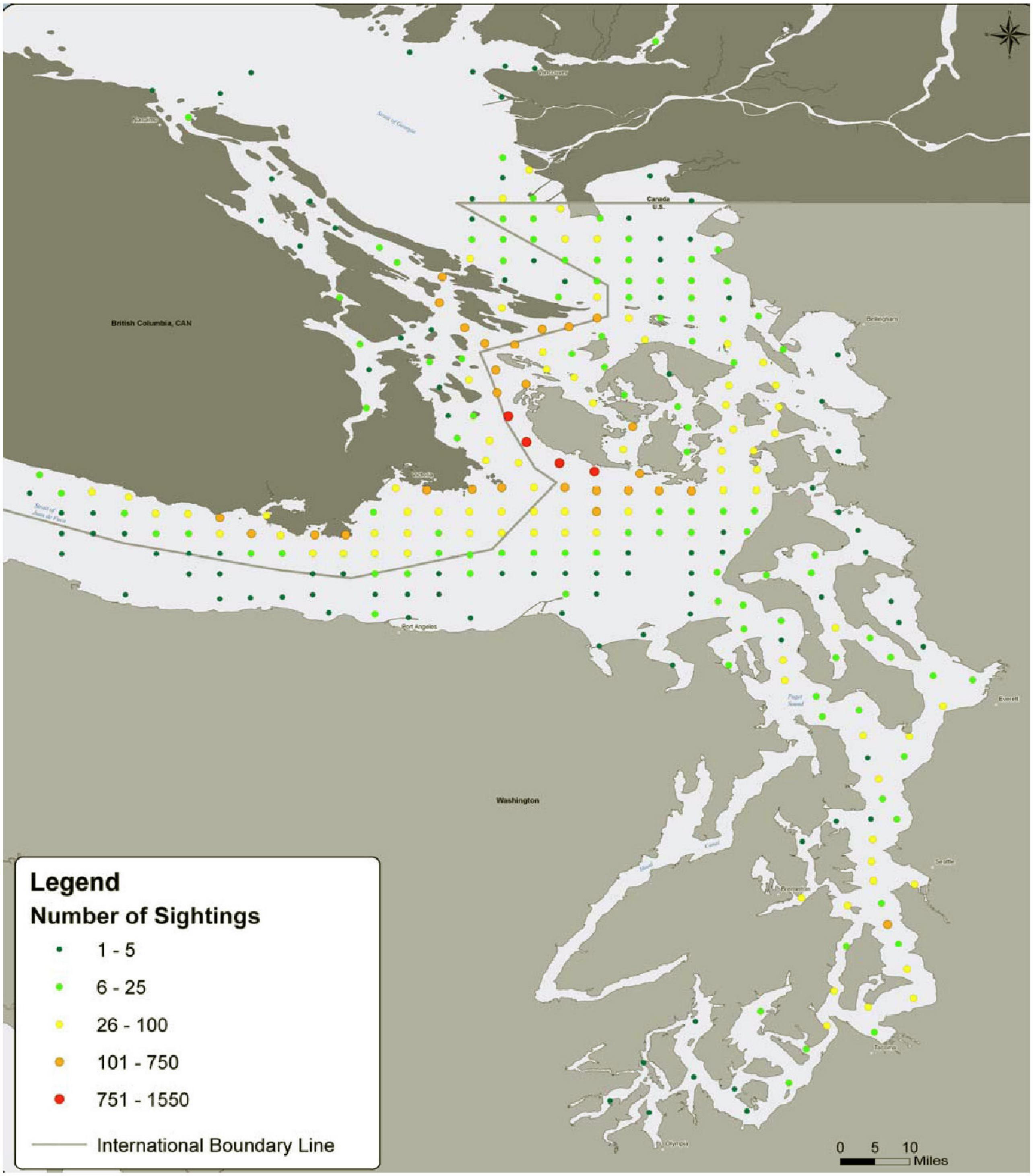


Figure from the Recovery Plan for Southern Resident Killer Whales (NMFS 2008a).

**Figure 3-6 Distribution of SR killer whale (groups) 1990-2005**

### 3.4.1.2 Transient Killer Whale

The West Coast Transient stock occurs in Washington State. This stock ranges from southern California to southeast Alaska and is distinguished from two other Eastern North Pacific transient stocks that occur further north, the AT1 and the "Gulf of Alaska transient stocks. This separation was based on variations in acoustic calls and genetic distinctness (Angliss and Outlaw 2007). West Coast transients primarily forage on harbor seals (Ford and Ellis 1999), but other species such as porpoises and sea lions are also taken (NMFS 2008a).

#### 3.4.1.2.1 Numbers

The West Coast Transient stock, which includes individuals from California to southeastern Alaska, was estimated to have a minimum number of 354 in the 2010 SAR (NMFS 2010).

Trends in abundance for the West Coast Transients were unavailable in the most recent stock assessment report (Angliss and Outlaw 2007). Human-caused mortality and serious injury are estimated to be zero animals per year and do not exceed the PBR, which is estimated at 3.5 animals (NMFS 2010).

#### 3.4.1.2.2 Status

The West Coast Transient stock is not designated as depleted under the MMPA or listed as "threatened or "endangered" under the ESA. Because the estimated level of human-caused mortality and serious injury (zero animals per year) does not exceed the PBR rate (3.5), the stock is not classified as strategic.

### 3.4.1.3 Distribution

Within the inland waters, Transients 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 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. Transients often forage to the east of Allen Bank (Figure 3-2/Sears 2013), which is within the project ZOI. NW Blake Island, just north of Vashon Island is a 'hot-spot' for seals that are prey for Transients (Figure 3-2/Stateler 2013). Transients may be more present during September/October harbor seal pup weaning.

For the years 2008 to 2013, in the September to February timeframe scheduled for this project, The Whale Museum reported 54 sightings days for Transient killer whale in the Vashon ZOI quadrants (red) and the South of Vashon quadrants (dark blue) shown in Figure 3-1, with a high of 26 sightings days in September of those years (TWM 2014).

**Table 3-9 Transient Killer Whale Sightings Days 2008-2013**

| Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|
| 26 | 0 | 6 | 7 | 13 | 2 |

TWM 2014

## 3.4.2 Gray Whale

The North Pacific gray whale (*Eschrichtius robustus*) stock is divided into two distinct geographically isolated stocks: eastern and western "Korean". Individuals in this region are part of the Eastern North Pacific stock. The majority of the Eastern North Pacific population spends summers feeding in the Bering and Chukchi Seas, but some individuals have been reported summering in waters off the coast of British Columbia, Southeast Alaska, Washington, Oregon and California (Rice et al. 1984; Angliss and Outlaw 2007). Gray whales migrate in the fall, south along the coast of North America to Baja California, Mexico to calve (Rice et al. 1981.) Gray whales are recorded in Washington waters during feeding migrations between late spring and autumn with occasional sightings during winter months (Calambokidis et al. 1994, 2002).

Gray whales are low-frequency cetaceans. No direct measurements of auditory capacity have been conducted for these large whales, but hearing sensitivity has been estimated from various studies or observations of behavioral responses, vocalization frequencies used most, body size, ambient noise levels, and cochlear morphometry. A generalized auditory bandwidth of 7 Hz to 22 kHz has been estimated for all baleen whales (Southall et al. 2007).

### 3.4.2.1 Numbers

Early in the 20th century, it is believed that commercial hunting for gray whales reduced population numbers to below 2,000 individuals (Calambokidis and Baird 1994). Population surveys since the delisting estimate that the population fluctuates at or just below the carrying capacity of the species (~26,000 individuals) (Rugh et al. 1999; Calambokidis et al. 1994; Angliss and Outlaw 2007).

According to the 2011 SAR, the minimum population estimate of the Eastern North Pacific stock is 18,017 (NMFS 2011c). 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. 1994). 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. 2004b). Forty-eight individual gray whales were observed in Puget Sound and Hood Canal in 2004 and 2005 (Calambokidis 2007).

### 3.4.2.2 Status

After listing of the species under the ESA in 1970, the number of gray whales increased dramatically resulting in their delisting in 1994. 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). Since delisting under the ESA, the stock has not been reclassified under the MMPA. The PBR for this stock is 360 animals per year (NMFS 2011c).

#### 3.4.2.3 Distribution

Gray whales migrate within 5 to 43 km of the coast of Washington during their annual north/south migrations (Green et al. 1995). Gray whales migrate south to Baja California where they calve in November and December, and then migrate north to Alaska from March through May (Rice et al. 1984; Rugh et al. 2001) to summer and feed. A few gray whales are observed in Washington inland waters between the months of September and January, with peak numbers of individuals from March through May (J. Calambokidis pers. comm. 2007). Peak months of gray whale observations in the area of activity occur outside the proposed work window of September through February (Table 3-6). The average tenure within Washington inland waters is 47 days and the longest stay was 112 days (J. Calambokidis pers. comm. 2007).

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 from March through May to feed on ghost shrimp (Weitkamp et al. 1992; J. Calambokidis pers. comm. 2006). 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. 1994).

In 2009 WSF replaced several dolphin structures at the Vashon terminal. Marine mammal monitoring was implemented during this project. Over 7 days of monitoring in November of 2009, no gray whales were observed (WSF 2009).

For the years 2008 to 2013, in the September to February timeframe scheduled for this project, The Whale Museum reported 38 sightings days for gray whale in the Vashon ZOI quadrants (red) and the South of Vashon quadrants (dark blue) shown in Figure 3-1, with a high of 17 sightings days in December of those years (TWM 2014).

**Table 3-10 Gray Whale Sightings Days 2008-2013**

| Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|
| 1 | 7 | 0 | 17 | 8 | 5 |

TWM 2014

According to the NMFS National Stranding Database, there were no gray whale strandings in the Vashon area in 2010-13 (NMFS 2014a).

### 3.4.3 Humpback Whale

Humpback whales (*Megaptera novaeangliae*) are wide-ranging baleen whales that can be found virtually worldwide. Recent studies have indicated that there are three distinct stocks of humpback whale in the North Pacific: California-Oregon-Washington (formerly Eastern North Pacific), Central North Pacific and Western North Pacific (NMFS 2011d).

The California-Oregon-Washington (CA-OR-WA) stock may be found near the project site. 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. 2007a). Although infrequent, interchange between the other two stocks and the CA-OR-WA stock occurs in breeding areas (Carretta et al. 2007a). Few CA-OR-WA stock 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. Humpback whales feed on krill, small shrimp-like crustaceans and various kinds of small fish.

Like other baleen whales, humpback whales are low-frequency cetaceans. Information on hearing bandwidths for baleen whales is presented under gray whales (Section 3.3.2).

#### 3.4.3.1 Numbers

According to the 2011 SAR, the 2007/2008 estimate of 2,043 humpback whales is the best estimate for abundance for this stock, though it does exclude some whales in Washington (Calambokidis et al. 2009).

#### 3.4.3.2 Status

As a result of commercial whaling, humpback whales were listed as "endangered" under the Endangered Species Conservation Act of 1969. This protection was transferred to the Endangered Species Act (ESA) in 1973. The species is still listed as “endangered”, and consequently the stock is automatically considered as a "depleted" and "strategic" stock under the MMPA. A recovery plan was adopted in 1991 (NMFS 1991). The PBR for this stock is 11.3 animals per year (NMFS 2011d).

#### 3.4.3.3 Distribution

Historically, humpback whales were common in inland waters of Puget Sound and the San Juan Islands (Calambokidis et al. 2002). In the early part of this century, 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). Since the mid-1990s, sightings in Puget Sound have increased. Between 1996 and 2001, Calambokidis et al. (2002) recorded six individuals south of Admiralty Inlet (northern Puget Sound).

In 2009 WSF replaced several dolphin structures at the Vashon terminal. Marine mammal monitoring was implemented during this project. Over 7 days of monitoring in November of 2009, no humpback whales were observed (WSF 2009).

For the years 2008 to 2013, in the September to February timeframe scheduled for this project, The Whale Museum reported two sightings days for Humpback whale in the Vashon ZOI quadrants (red) and the South of Vashon quadrants (dark blue) shown in Figure 3-1 (TWM 2014).

**Table 3-11 Humpback Whale Sightings Days 2008-2013**

| Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|
| 1 | 0 | 1 | 0 | 0 | 0 |

TWM 2014

According to the NMFS National Stranding Database, there were no humpback whale strandings in the Vashon area in 2010-13 (NMFS 2014a).

### 3.4.4 Minke Whale

The northern minke whale (*Balaenoptera acutorostra*) is part of the Northern Pacific stock, which is broken into three management stocks: the Alaskan, California/Oregon/Washington, and the Hawaiian stock (NMFS 2008b). The California/Oregon/Washington management stock is considered a resident stock, which is unlike the other Northern Pacific stocks (NMFS 2008b). This stock includes minke whales within the inland Washington waters of Puget Sound and the San Juan Islands (Dorsey et al. 1990; Carretta et al. 2007b), which may be present in the project area.

Minke whales have small, dark sleek bodies and a small dorsal fin. These whales are often recognized by surfacing snout first and a shallow but visible “bushy” blow. Minke whales feed by side lunging into schools of prey and gulping in large amounts of water. Food sources typically consist of krill, copepods, and small schooling fish, such as anchovies, herring, mackerel, and sand lance (NMFS 2008b).

Like other baleen whales, humpback whales are low-frequency cetaceans. A generalized auditory bandwidth of 7 Hz to 22 kHz has been estimated for all baleen whales (Southall et al. 2007).

#### 3.4.4.1 Numbers

According to the 2011 SAR, the minimum population estimate of the CA/OR/WA stock is 202 (NMFS 2011e) and is likely no more than 600 (NE Pacific Minke Project 2014). Information on minke whale population and abundance is limited due to difficulty in detection. Conducting surveys for the minke whale is difficult because of their low profiles, indistinct blows, and tendency to occur as single individuals (Green et al. 1992). Over a 10-year period, 30 individuals were photographically identified in the U.S./Canada trans-boundary area around the San Juan Islands and demonstrated high site fidelity (Dorsey et al. 1990; Calambokidis and Baird 1994). In a single year, up to 19 individuals were photographically identified from around the San Juan Islands (Dorsey et al. 1990).

#### 3.4.4.2 Status

Minke whales are not listed under the ESA and are classified as non-depleted under the MMPA. The annual mortality due to fisheries and ship strikes is less than the potential biological removal, so they are not considered a strategic management stock under the MMPA (Carretta et al. 2007b). The PBR for this stock is two animals per year (NMFS 2011e).

#### 3.4.4.3 Distribution

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

In the 1980's minke whales were found in three main areas around the San Juan Islands; west of Shaw Island (Minke Lake), the San Juan Channel and the Strait of San Juan de Fuca (Salmon Bank). However, by the 1990's the first two areas were abandoned, and minke whales were only found in the Strait of Juan de Fuca, despite continued search efforts in the other areas. This coincided with a general decline of herring in the area, possibly associated with disturbance of adjacent herring spawning grounds. A qualitative change in the number of sea birds was also noted at this time. In more recent years (2005-2011), minke whales were found foraging in all three areas again, and bird numbers were also higher. But minke whales are still predominantly found on the banks in the Strait of Juan de Fuca (NE Pacific Minke Whale Project 2014).

In 2009 WSF replaced several dolphin structures at the Vashon terminal. Marine mammal monitoring was implemented during this project. Over 7 days of monitoring in November of 2009, no Minke whales were observed (WSF 2009).

For the years 2008 to 2013, in the September to February timeframe scheduled for this project, The Whale Museum reported seven sightings days for Minke whale in the Vashon ZOI quadrants (red) and the South of Vashon quadrants (dark blue) shown in Figure 3-1 (TWM 2014).

**Table 3-12 Minke Whale Sightings Days 2008-2013**

| Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|
| 4 | 1 | 0 | 1 | 1 | 0 |

TWM 2014

According to the NMFS National Stranding Database, there were no Minke whale strandings in the Vashon area in 2010-13 (NMFS 2014a).

### 3.4.5 Harbor Porpoise

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

#### 3.4.5.1 Numbers

According to the 2011SAR, 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 2011f).

No harbor porpoises 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). Recent systematic boat surveys of the main basin indicate that at least several hundred and possibly as many as low thousands of harbor porpoise are now present. While the reasons for this recolonization are unclear, it is possible that changing conditions outside of Puget Sound, as evidenced by a tripling of the population in the adjacent waters of the Strait of Juan de Fuca and San Juan Islands since the early 1990s, and the recent higher number of harbor porpoise mortalities in coastal waters of Oregon and Washington, may have played a role in encouraging harbor porpoise to explore and shift into areas like Puget Sound (Hanson, et. al. 2011).

#### 3.4.5.2 Status

The Washington Inland Waters Stock of harbor porpoise is "non-depleted" under MMPA, and "unlisted" under the ESA. Because there is no current estimate of minimum abundance, a PBR cannot be calculated for this stock (NMFS 2011e).

#### 3.4.5.3 Distribution

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

Little information exists on harbor porpoise movements and stock structure near the Vashon area, although it is suspected that in some areas harbor porpoises migrate (based on seasonal shifts in distribution). For instance 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 (Figures 3-5/3-6).

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 Vashon ZOIs range from 0 to 246 m, with roughly 2/3 of the area within the ZOI falling within the 61-100 m depth where the highest number of harbor porpoises may be observed.

According to Vashon Island area whale specialist Mark Sears, harbor porpoise are seen in groups of 2-3, and occasionally in groups of 6-12, and numbers in the area peak in May/June (Sears 2013).

In 2009 WSF replaced several dolphin structures at the Vashon terminal. Marine mammal monitoring was implemented during this project. Over 7 days of monitoring in November of 2009, one harbor porpoise was observed (WSF 2009).

For the years 2008 to 2013, in the September to February timeframe scheduled for this project, The Whale Museum reported zero sightings days for harbor porpoise in the Vashon ZOI quadrants (red) and the South of Vashon quadrants (dark blue) shown in Figure 3-1 (TWM 2014). It should be noted that small cetaceans are not reported at the same rate as larger cetaceans.

According to the NMFS National Stranding Database, there was one harbor porpoise stranding in the Vashon area in 2010-13, in the September-February work window scheduled for this project (NMFS 2013).

**Table 3-13 Harbor Porpoise Sightings Days 2008-2013**

| Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |

TWM 2014

### 3.4.6 Dall's Porpoise

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

#### 3.4.6.1 Numbers

The most recent estimate of Dall's porpoise stock abundance is 42,000, based on 2005 and 2008 summer/autumn vessel-based line transect surveys of California, Oregon, and Washington waters (NMFS 2011g). 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). Prior to the 1940s, Dall's porpoises were not reported in Puget Sound.

#### 3.4.6.2 Status

The California, Oregon, and Washington Stock of Dall's porpoise is "non-depleted" under the MMPA, and "unlisted" under the ESA. The PBR for this stock is 257 Dall's porpoises per year (NMFS 2011f).

#### 3.4.6.3 Distribution

Dall's porpoises are migratory and appear to have predictable seasonal movements driven by changes in oceanographic conditions (Green et al. 1992, 1993), and are most abundant in Puget Sound during the winter (Nysewander et al. 2005; WDFW 2008). Despite their migrations, Dall's porpoises occur in all areas of inland Washington at all times of year (Calambokidis pers. comm. 2006), but with different distributions throughout Puget Sound from winter to summer. 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 (Figures 3-7/3-8). The average winter group size is three animals (WDFW 2008).

In 2009 WSF replaced several dolphin structures at the Vashon terminal. Marine mammal monitoring was implemented during this project. Over 7 days of monitoring in November of 2009, no Dall's porpoise were observed (WSF 2009).
Dall's porpoise used to be more common that harbor porpoise in the Vashon area, though harbor porpoise is now more common. The usual observation in the Vashon area is a single Dall's porpoise, or a pair (Sears 2013).

Harbor Porpoise

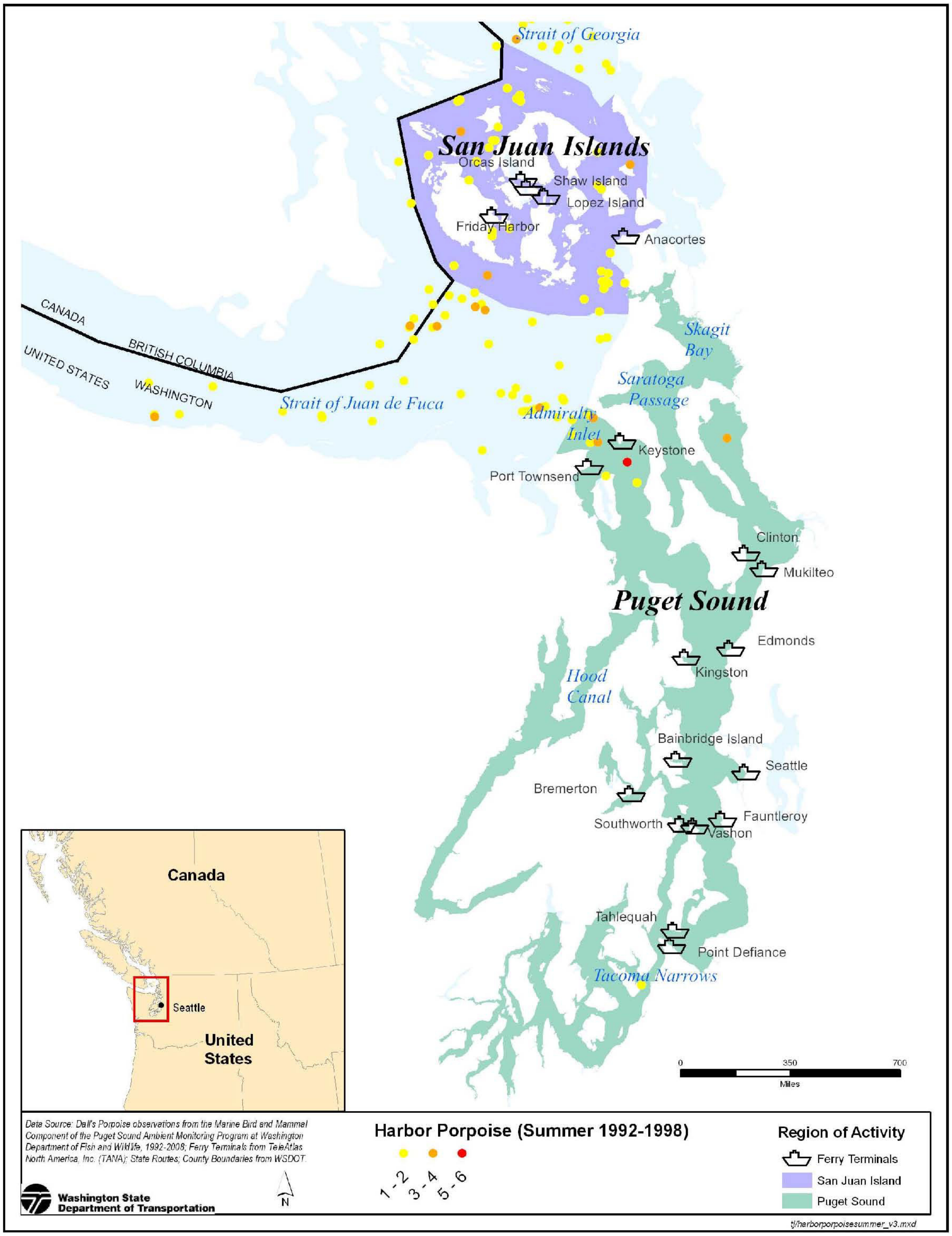


**Figure 3-7 Harbor Porpoise Summer Sightings (groups) (WDFW 2008)**

## Harbor Porpoise

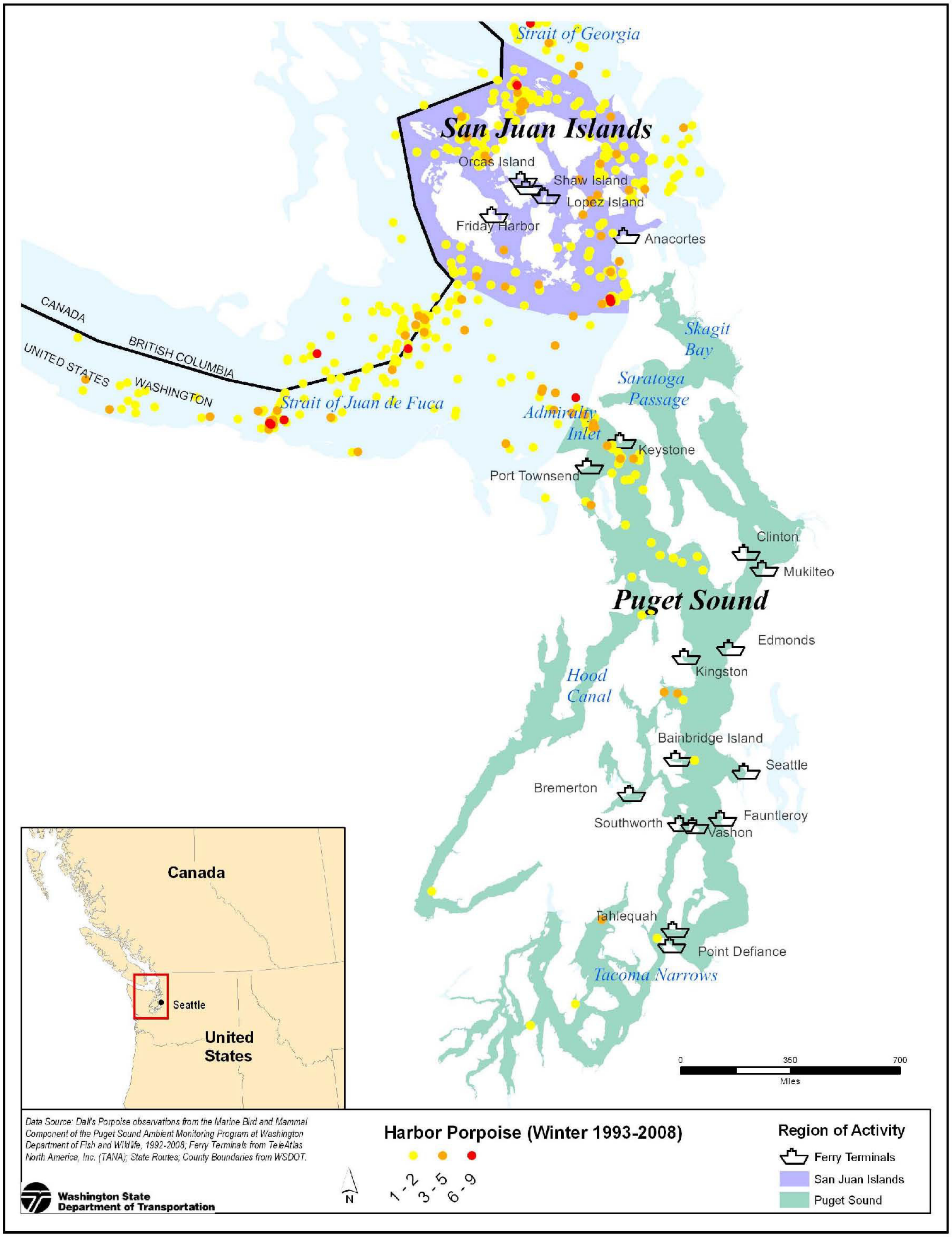


**Figure 3-8 Harbor Porpoise Winter Sightings (groups) (WDFW 2008)**

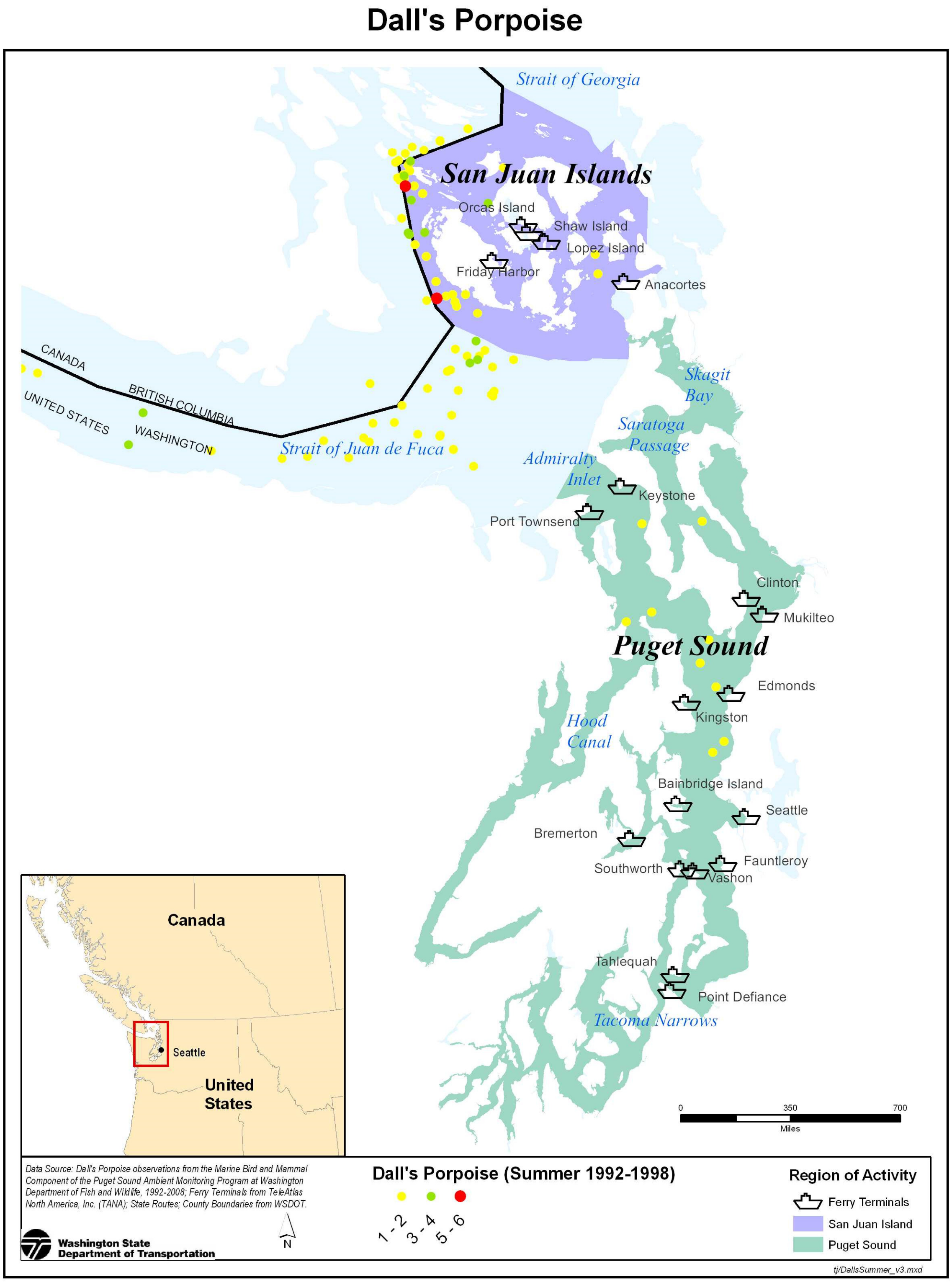


**Figure 3-9 Dall's Porpoise Summer Sightings (groups) (WDFW 2008)**

## Dall's Porpoise

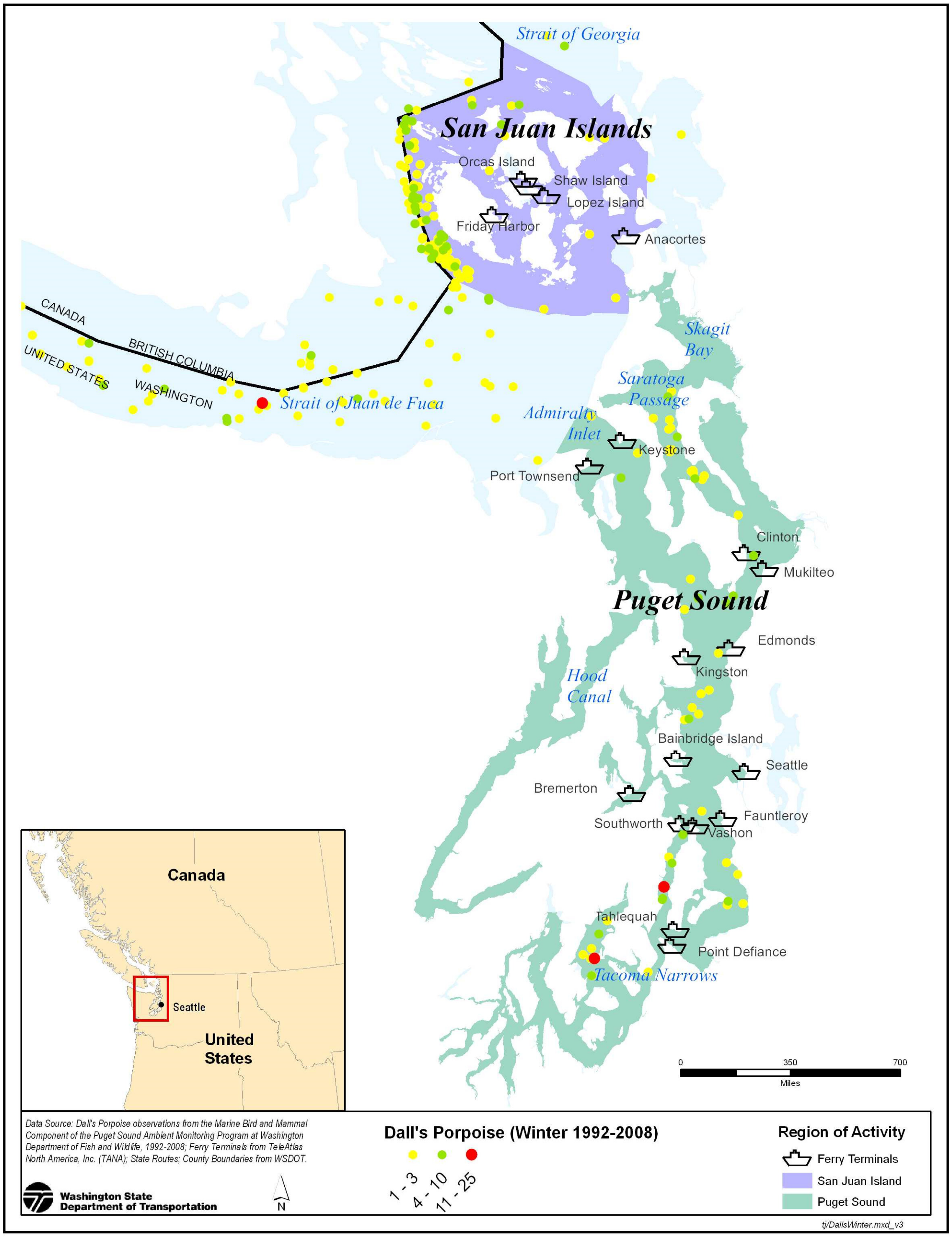


**Figure 3-10 Dall's Porpoise Winter Sightings (groups) (WDFW 2008)**

For the years 2008 to 2013, in the September to February timeframe scheduled for this project, The Whale Museum reported eight sightings days for Dall's porpoise in the Vashon ZOI quadrants (red) and the South of Vashon quadrants (dark blue) shown in Figure 3-1, with a high of four sightings days in October of those years (TWM 2014). It should be noted that small cetaceans are not reported at the same rate as larger cetaceans.

**Table 3-14 Dall's Porpoise Sightings Days 2008-2013**

| Sept | Oct | Nov | Dec | Jan | Feb |
|---|---|---|---|---|---|
| 0 | 4 | 0 | 0 | 2 | 2 |

TWM 2014

According to the NMFS National Stranding Database, there were no Dall's porpoise strandings in the Vashon area in 2010-13 (NMFS 2013).

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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. Each required topic (status, distribution, and seasonally distribution) has been clearly marked as a subheading in Section 3.0 for ease of finding relevant information.

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# 5.0 Type of Incidental Take Authorization Requested

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

The MMPA defines "harassment" as:

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

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

## 5.1 Incidental Take Authorization Request

Under Section 101 (a)(5)(D) of the MMPA, WSF requests an IHA from September 1, 2013 through February 15, 2014 for Level B incidental take (behavioral harassment) of the marine mammals described in this application during the trestle retrofit project at the Vashon Ferry Terminal. Specifically, the requested authorization is for incidental harassment of any marine mammal that might enter the 121 dB underwater background ZOI during active vibratory pile driving, and the 160 dB ZOI during impact pile driving.

The scheduled pile-driving activities discussed in this application will occur between September 1, 2015 and February 15, 2016. WSF requests that the IHA permit be issued by March 1, 2015, and be active for one full year.

## 5.2 Method of Incidental Taking

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

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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 construction activities from WSF's anticipated projects described in Section 1.2 of this IHA. Section 6.2 describes the methods used to calculate 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 vibratory pile driving source levels, this IHA application will incidentally take by Level B acoustical harassment small numbers of harbor seals, California sea lions, Steller sea lions, killer whales, gray whales and humpback whales. 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 haulout in the Vashon ZOI with any frequency and could be exposed multiple times during a project.

## 6.1 Estimated Duration of Pile Driving

As stated in Section 2.0, a worst-case scenario for the Vashon ferry terminal project assumes that it may take 315 hours over 152 days to install and remove piles (Table 1-1, 1-2). The actual number of hours/days is expected to be less.

## 6.2 Estimated Zones of Influence/Zones of Exclusion

The distances to the NMFS thresholds for Level B (harassment) take for vibratory installation and removal and impact installation, and Level A (injury) take for impact installation were presented in Section 1.6.6. The Vashon ZOIs/ZOEs were calculated from these distances (Figure 1-6 and 1-7). Distances are summarized in Table 6-1.

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 27 m/89 ft., and within 122 m/400 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 122 m/400 ft., and within 38 m/126 ft. for all other pinnipeds (Fig. 1-8).

**Table 6-1 In-water/In-air Threshold Distances**

| Hammer | Pile Type | Source Level | Threshold | ZOI Distance | ZOE Distance | In-air Distance |
|---|---|---|---|---|---|---|
| Vibratory | 24-inch steel<br>concrete-jacketed timber | 162 $dB_{RMS}$ | 121 $dB_{RMS}$ | 5.0 km/3.0 mi | ---------- | ---------- |
| Vibratory | 30-inch steel | 171 $dB_{RMS}$ | 121 $dB_{RMS}$ | 21.5 km/13.4 mi | ---------- | ---------- |
| Vibratory | Timber | 152 $dB_{RMS}$ | 121 $dB_{RMS}$ | 2.0 km/1.2 mi | ---------- | ---------- |
| Impact | Timber | 170 $dB_{RMS}$ | 160 $dB_{RMS}$ | 46 m/152 ft. | ---------- | ---------- |
| Impact | 24-inch steel | 181 $dB_{RMS}$ | 160 $dB_{RMS}$ | 251 m/824 ft. | ---------- | ---------- |
| Impact | 24-inch steel | 181 $dB_{RMS}$ | 180 $dB_{RMS}$ | ---------- | 12 m/39 ft. | ---------- |
| Impact | 24-inch steel | 181 $dB_{RMS}$ | 190 $dB_{RMS}$ | ---------- | 3.0 m/10 ft. | ---------- |
| Impact | 30-inch steel | 181 $dB_{RMS}$[1] | 160 $dB_{RMS}$ | 402 m/1,319 ft. | ---------- | ---------- |
| Impact | 30-inch steel | 181 $dB_{RMS}$[1] | 180 $dB_{RMS}$ | ---------- | 19 m/62 ft. | ---------- |
| Impact | 30-inch steel | 181 $dB_{RMS}$[1] | 190 $dB_{RMS}$ | ---------- | 4.0 m/13 ft. | ---------- |
| Vibratory | steel<br>timber<br>concrete-jacketed timber | 96.9 $dB_{RMS}$[2] | 90 $dB_{RMS}$[3] | ---------- | ---------- | 38 m/126 ft. |
| Impact | steel<br>timber | 101 $dB_{RMS}$[2] | 90 $dB_{RMS}$[3] | ---------- | ---------- | 122 m/400 ft. |
| Impact | steel<br>timber | 101 $dB_{RMS}$[2] | 100 $dB_{RMS}$[4] | ---------- | ---------- | 27 m/89 ft. |

[1] @ 16 m [2] In-air [3] harbor seals [4] other pinnipeds

## 6.3 Estimated Incidental Takes

Incidental take is estimated for each species by estimating the likelihood of a marine mammal d being present within a ZOI during active pile driving. Expected marine mammal presence is determined by past observations and general abundance near the Vashon ferry terminal during the construction window. Typically, potential take is estimated by multiplying the area of the

ZOI by the local animal density. This provides an estimate of the number of animals that might occupy the ZOI at any given moment. However, there are no density estimates for any Puget Sound population of marine mammal.

As a result, the take requests were estimated using local marine mammal data sets (e.g., The Whale Museum, state and federal agencies), opinions from state and federal agencies, and observations from local Vashon Island area whale specialists. All haulout and observation data available are summarized in Section 3. Project duration is presented in Section 2.

The calculation for marine mammal exposures is estimated by:

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

For some species, it is assumed that they may be present every day. Other species will be present occasionally, therefore fewer days are used in those calculations. It is assumed that take requests will include multiple harassments of the same individual(s).

Estimates include Level B acoustical harassment ZOIs produced during vibratory driving and removal, and impact pile driving. All of the ZOIs will not be present continuously over 152 days. For example, during a day the 24-inch vibratory ZOI will be present, followed by the impact ZOI. The table below estimates the number of days different ZOIs will be present (Fig. 1-6 and 1-7).

Due to the short duration of the 30-inch steel test piles, they are not included in the take request calculations below, as the overall take request is conservative, and will accommodate the test piles.

**Table 6-2 ZOI Areas/Days Present**

| ZOI | Pile Type | Hammer Type | ZOI Area (approximate) | Days ZOI Present |
|---|---|---|---|---|
| ZOI-1 | 24-inch steel/ 30” concrete-jacketed timber | Vibratory | 44 $km^2$/ 17 $mi^2$ | 84 |
| ZOI-2 | 13-inch timber | Vibratory | 5.6 $km^2$/ 2.2 $mi^2$ | 21 |
| ZOI-3 | 30-inch steel | Vibratory | 151 $km^2$/ 58 $mi^2$ | 1 |
| ZOI-4 | 30-inch steel | Impact | 0.4 $km^2$/ .015 $mi^2$ | 1 |
| ZOI-5 | 24-inch steel | Impact | .07 $km^2$/ .027 $mi^2$ | 83 |
| ZOI-6 | 13-inch timber | Impact | 1,760 $m^2$/ 18,945 $ft^2$ | 17 |

### 6.3.1 Harbor Seal

Based on sightings data and the proximity of the ZOIs to the Blake Island harbor seal 'hot spot' known as a source of Transient killer whale prey, it is assumed that the following number of harbor seals may be present in the ZOIs:

- ZOI-1 exposure estimate: 15 animals * 84 days of pile activity = 1260
- ZOI-2 exposure estimate: 10 animals * 21 days of pile activity = 210
- ZOI-5 exposure estimate: 5 animals * 83 days of pile activity = 415
- ZOI-6 exposure estimate: 2 animals * 17 days of pile activity = 34

WSF is requesting authorization for Level B acoustical harassment of 1,919 harbor seals.

### 6.3.2 California Sea Lion

Based on sightings data and the proximity of the Rich Passage float and buoy haulout, it is assumed that the following number of California sea lions may be present in the ZOIs:

- ZOI-1 exposure estimate: 15 animals * 84 days of pile activity = 1260
- ZOI-2 exposure estimate: 10 animals * 21 days of pile activity = 210
- ZOI-5 exposure estimate: 5 animals * 83 days of pile activity = 415
- ZOI-6 exposure estimate: 2 animals * 17 days of pile activity = 34

WSF is requesting authorization for Level B acoustical harassment take of 1,919 California sea lions.

### 6.3.3 Steller Sea Lion

Based sightings data and the proximity of the Rich Passage float and buoy haulout, it is assumed that the following number of Steller sea lions may be present in the ZOIs:

- ZOI-1 exposure estimate: 5 animals * 84 days of pile activity = 420
- ZOI-2 exposure estimate: 2 animals * 21 days of pile activity = 41
- ZOI-5 exposure estimate: 2 animals * 83 days of pile activity = 166
- ZOI-6 exposure estimate: 1 animals * 17 days of pile activity = 17

WSF is requesting authorization for Level B acoustical harassment take of 644 Steller sea lions.

### 6.3.4 Southern Resident Killer Whale

Due to the status of SRKW, NMFS is limiting Level B harassment to 'unintentional take' of 5 percent of the stock per year (Guan 2014). As of December 2014, the SRKW population is 77, and 5 percent of the stock is 4 individuals. WSF is requesting authorization for Level B acoustical harassment 'unintentional' take of 4 SRKW.

To ensure that project take does not exceed 5 percent, the following monitoring steps will be implemented (see Appendix B – Monitoring Plan):

- The intent of monitoring is to prevent any take of SRKW.
- If SRKW approach the ZOI during vibratory pile driving, work will be paused until the SRKW exit the ZOI.
- If killer whale approach the ZOI during vibratory pile driving, and it is unknown whether they are SRKW or Transient, it shall be assumed they are SRKW and work will be paused until the whales exit the ZOI.
- If SRKW enter the ZOI undetected, up to 4 'unintentional' Level B harassment takes are requested. Work will be paused until the SRKW exit the ZOI to avoid further Level B harassment take.
- The four unintentional Level B harassment takes will be used only if necessary.

### 6.3.5 Transient Killer Whale

Based on sightings data and pod size, it is assumed that the following number of Transient killer whales may be intermittently present in the ZOIs:

- ZOI-1 exposure estimate: 6 animals * 42 days of pile activity = 252
- ZOI-2 exposure estimate: 6 animals * 10 days of pile activity = 60
- ZOI-5 exposure estimate: 6 animals * 5 days of pile activity = 30
- ZOI-6 exposure estimate: 0 animals = 0

The potential take = 342 Transient killer whales. However, due to the difficulty of determining whether approaching killer whales are Southern Resident or Transient, it is likely that pile driving will be paused under the conservative assumption that approaching killer whales are Southern Resident.

Therefore, WSF is requesting authorization for Level B acoustical harassment take of 50 Transient killer whales.

### 6.3.6 Gray Whale

Based on sightings data and the assumption that the whales may be present in pairs, it is assumed that the following number of gray whales may be intermittently in the ZOIs:

- ZOI-1 exposure estimate: 2 animals * 21 days of pile activity = 41
- ZOI-2 exposure estimate: 2 animals * 10 days of pile activity = 20
- ZOI-5 exposure estimate: 2 animals * 5 days of pile activity = 10
- ZOI-6 exposure estimate: 0 animals = 0

WSF is requesting authorization for Level B acoustical harassment take of 71 gray whales.

### 6.3.7 Humpback Whale

Based on sightings data and the assumption that single whales may be present, it is assumed that the following number of gray whales may be intermittently in the ZOIs:

- ZOI-1 exposure estimate: 1 animal * 21 days of pile activity = 21
- ZOI-2 exposure estimate: 1 animal * 10 days of pile activity = 10
- ZOI-5 exposure estimate: 1 animal * 5 days of pile activity = 5
- ZOI-6 exposure estimate: 0 animals = 0

WSF is requesting authorization for Level B acoustical harassment take of 36 humpback whales.

### 6.3.8 Minke Whale

Based on sightings data and the assumption that single whales may be present, it is assumed that the following number of Minke whales may be intermittently in the ZOIs:

- ZOI-1 exposure estimate: 1 animal * 21 days of pile activity = 21
- ZOI-2 exposure estimate: 1 animal * 10 days of pile activity = 10
- ZOI-3 exposure estimate: 1 animal * 5 days of pile activity = 5
- ZOI-6 exposure estimate: 0 animals = 0

WSF is requesting authorization for Level B acoustical harassment take of 36 Minke whales.

### 6.3.9 Harbor Porpoise

Based on sightings data and the assumption that six porpoise may be present, it is assumed that the following number of harbor porpoise may be intermittently in the ZOIs:

- ZOI-1 exposure estimate: 6 animals * 42 days of pile activity = 252
- ZOI-2 exposure estimate: 6 animals * 10 days of pile activity = 60
- ZOI-5 exposure estimate: 6 animals * 21 days of pile activity = 126
- ZOI-6 exposure estimate: 0 animals = 0

WSF is requesting authorization for Level B acoustical harassment take of 438 harbor porpoise.

### 6.3.10 Dall's Porpoise

Based on sightings data and the assumption that two porpoise may be present, it is assumed that the following number of Dall's porpoise may be intermittently in the ZOIs:

- ZOI-1 exposure estimate: 2 animals * 42 days of pile activity = 84
- ZOI-2 exposure estimate: 2 animals * 10 days of pile activity = 20
- ZOI-5 exposure estimate: 2 animals * 21 days of pile activity = 42
- ZOI-6 exposure estimate: 0 animals = 0

WSF is requesting authorization for Level B acoustical harassment take of 146 Dall's porpoise.

## 6.4 Number of Takes for Which Authorization is Requested

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

**Table 6-3 Level B Acoustical Harassment Take Requests**

| Species | Take Request |
|---|---|
| Harbor Seal | 1,919 |
| California Sea Lion | 1,919 |
| Steller Sea Lion | 644 |
| SR Killer Whale | 4 |
| Transient Killer Whale | 50 |
| Gray Whale | 71 |
| Humpback Whale | 36 |
| Minke Whale | 36 |
| Harbor Porpoise | 438 |
| Dall's Porpoise | 146 |

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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.*

Table 7-1 summarizes the Level B harassment take requests, and the percentage of each stock that may be temporarily disturbed.

It is assumed that take requests will include multiple harassments of the same individual(s), resulting in estimates of Take Request % of Stock that are high compared to actual take that will occur.

While the harbor seal and Transient killer whale take request and % of stock appears high, in reality 1,919 harbor seal and 50 Transient killer whale individuals will not be temporarily harassed. Instead, it is assumed that there will be multiple takes of a smaller number of individuals.

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 |
|---|---|---|---|
| Harbor Seal | 14,612 | 1,919 | 13 |
| California Sea Lion | 296,750 | 1,919 | 0.7 |
| Steller Sea Lion | 52,847 | 644 | 1.2 |
| SR Killer Whale | 77 | 4 | 5.0 |
| Transient Killer Whale | 354 | 50 | 14 |
| Gray Whale | 18,017 | 71 | 0.4 |
| Humpback Whale | 2,043 | 36 | 1.7 |
| Minke Whale | 600 | 36 | 6.0 |
| Harbor Porpoise | 10,682 | 438 | 4.0 |
| Dall’s Porpoise | 42,000 | 146 | 0.3 |

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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.*

***This issue is only applicable to activities taking place in and around Alaska.*** *There are no relevant subsistence uses of marine mammals implicated by this action.*

# 9.0 Anticipated Impact on Habitat

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

## 9.1 Introduction

Construction activities will have temporary impacts on marine mammal habitat by through increases in in-water and in-air sound 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 Haulouts

The project is scheduled to begin September 1, 2015, 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 27 m/89 ft., and within 122 m/400 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 122 m/400 ft., and within 38 m/126 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 Vashon 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, and 160 $dB_{RMS}$ for impact noise sources. This project is applying a 121 $dB_{RMS}$ underwater background for vibratory pile driving and removal ZOIs. The distances to the Level B acoustical harassment thresholds are described in Section 1.6.6 Attenuation to NMFS thresholds.

Short- and long-term effects from noise exposure that may occur to marine mammals includes impaired foraging efficiency, and 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 NMFS (2008a) states that the threshold levels at which anthropogenic noise becomes harmful to killer whales are poorly understood. Because marine mammal occurrence is transient near the Vashon ferry terminal, and in-water noise impacts are localized and of short duration, any impact on individual marine mammals will be limited.

## 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 driving. The study found that construction activity at the site had “little or no effect on dissolved oxygen, water temperature and salinity”, and turbidity (measured in nephelometric turbidity units [NTU]) at all depths nearest the construction activity was typically less than 1 NTU higher than stations farther from the project area throughout construction.

Similar results were recorded during pile removal operations at two WSF ferry facilities. At the Friday Harbor terminal, localized turbidity levels (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, local turbidity levels (from removal of timber and steel piles) did not exceed 0.2 NTU above background levels. 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 Vashon 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 Vashon ferry terminal will not obstruct movements of marine mammals. Pile work at Vashon will occur within 70 m/230 ft. of the shoreline leaving 2 km/1.2 miles of Puget Sound for marine mammals to pass. A construction barge will be used during the project. The barge will be anchored and/spudded. No dynamic positioning system (DPS) will be used. In a previous concurrence letter for the Vashon Island Dolphin Replacement Project (NMFS 2008b), NMFS stated the following:

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

Similarly, vessel strikes are unlikely for the proposed project.

## 9.6 Conclusions Regarding Impacts on Habitat

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

For the most part, 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, operating outside the fish window), the proposed project is not expected to have measurable effects on the distribution or abundance of potential marine mammal prey species.

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

# 10.0 Anticipated Impact of Loss or Modification of Habitat

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

The proposed project will occur within the existing Vashon ferry terminal operational footprint and is not expected to 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, prey (fish) disturbance, 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. 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 [MMs]) 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 MMs will be employed during all pile driving activities at the Vashon ferry terminal. The language in each MM 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 MMs is a contract violation.

General MMs used for all construction practices are listed first (Section 11.1, All Construction Activities), followed by specific MMs for pile related activities (Section 11.2, Pile Removal and Installation). The MMs listed under Section 11.1 apply to different activities and are, therefore, listed additional times where appropriate. Specific MMs have been developed to reduce the potential for harassment to marine mammals; these are described beginning in Section 11.2.3.

## 11.1 All Construction Activities

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

- All construction equipment will comply with applicable equipment noise standards of the U.S. Environmental Protection Agency, and all construction equipment will have noise control devices no less effective than those provided on the original equipment.
- WSF policy and construction administration practice is to have a WSF inspector on site during construction. The role of the inspector is to ensure contract compliance. The inspector and the contractor each have a copy of the Contract Plans and Specifications on site and are aware of all requirements. The inspector is also trained in environmental provisions and compliance.
- The contractor will be advised that eelgrass beds are protected under state and federal law. When work will occur near eelgrass beds, WSF will provide plan sheets showing eelgrass boundaries to the contractor. The contractor shall exercise extreme caution when working in the area indicated on the plans as “Eelgrass Beds.” The contractor shall adhere to the following restrictions during the life of the contract.

- The contractor shall not:
  - Place derrick spuds or anchors in the area designated as "Eelgrass."
  - Shade the eelgrass beds for a period of time greater than 3 consecutive days during the growing season (generally March through September).
  - Allow debris or any type of fuel, solvent, or lubricant in the water.
  - Perform activities which could cause significant levels of sediment to contaminate the eelgrass beds.
  - Conduct activities that may cause scouring of sediments within the eelgrass beds or other types of sediment transfer out of or into the eelgrass beds.
  - Any damage to eelgrass beds or substrates supporting eelgrass beds that results from a contractor's operations will be repaired at the contractor's expense.
- WSF will obtain Hydraulic Project Approval (HPA) from WDFW as appropriate and the contractor will follow the conditions of the HPA. HPA requirements are listed in the contract specifications for the contractor to agree to prior to construction, and the HPA is attached to the contract such that conditions of the HPA are made part of the contract.
- WSF will comply with water quality restrictions imposed by Ecology (Chapter 173-201A WAC), which specifies a 150 ft. 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 practical.
- 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. SPCC requirements include:
  - The plan shall be submitted to the Project Engineer prior to the commencement of any construction activities. A copy of the plan with any updates will be maintained at the work site by the contractor.
  - The SPCC plan shall identify construction planning elements and recognize potential spill sources at the site. The SPCC plan shall outline BMPs, responsive actions in the event of a spill or release and identify notification and reporting procedures. The SPCC plan shall also outline contractor management elements such as personnel responsibilities, project site security, site inspections and training.
  - The SPCC will outline what measures shall be taken by the contractor to prevent the release or spread of hazardous materials, either found on site and encountered during construction but not identified in contract documents, or any hazardous materials that the contractor stores, uses, or generates on the construction site during construction activities. These items include, but are not limited to gasoline, oils and chemicals. Hazardous materials are defined in Revised Code of Washington (RCW) 70.105.010 under "hazardous substance."

  - ➢ The contractor shall maintain, at the job site, the applicable spill response equipment and material designated in the SPCC plan.
  - ➢ The contractor shall regularly check fuel hoses, oil drums, oil or fuel transfers valves, fittings, etc. for leaks, and shall maintain and store materials properly to prevent spills.

- No petroleum products, fresh cement, lime or concrete, chemicals, or other toxic or deleterious materials shall be allowed to enter surface waters.
- WSF will comply with water quality restrictions imposed by 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.
- Projects and associated construction activities will be designed so potential impacts on species and habitat are avoided and minimized to the extent practicable.

### 11.1.1 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 Vashon ferry terminal is July 16 through February 15. Actual construction activities are planned to take place from September 1, 2015 and February 15, 2016.

## 11.2 Pile Removal and Installation

Specific to pile removal and installation, the following mitigation measures are proposed by WSF to reduce impacts on marine mammals to the lowest extent practicable.

## 11.2.1 Pile Driving and Removal

MMs to be employed during pile driving and removal include:

- The vibratory hammer method will be used as much as possible to install steel piles, in order to minimize noise levels.
- A bubble curtain will be used to attenuate all permanent steel impact pile driving in-water noise.
- The vibratory hammer method or direct pull will be used to remove piles to minimize noise levels.
- Marine mammal monitoring during vibratory driving and removal, and impact pile driving will be employed for the Level A ZOE and Level B ZOIs (see Section 11.2.3, Marine Mammal Monitoring).
- 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. Debris will be disposed of upland.
- Excess or waste materials will not be disposed of or abandoned waterward of OHW/MHHW or allowed to enter waters of the state.
- Demolition and construction materials shall not be stored where high tides, wave action, or upland runoff can cause materials to enter surface waters.
- The contractor will have oil-absorbent materials on site to be used in the event of a spill if any oil product is observed in the water.
- If test piles cannot be removed, they will be cut at the mudline and covered with sand.

## 11.2.2 Marine Mammal Monitoring

### 11.2.2.1 Coordination

WSF will conduct briefings between the construction supervisors and the crew and marine mammal observer(s) prior to the start of pile-driving activity, marine mammal monitoring protocol and operational procedures.

Prior to the start of pile driving, the Orca Network and/or Center for Whale Research will be contacted to find out the location of the nearest marine mammal sightings. 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 driving.

#### 11.2.2.2 Visual Monitoring

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

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 driving. A monitoring plan is provided in Appendix B.

#### 11.2.2.3 Soft Start

Soft start for vibratory hammers requires contractors to initiate hammer noise for 15 seconds at reduced energy followed by a 1-minute waiting period. The procedure will be repeated two additional times. Soft start for impact hammers requires contractors to provide an initial set of three strikes from the impact hammer at 40 percent energy, followed by a 1-minute waiting period, then two subsequent three-strike sets.

Each day, WSF will use the soft-start technique at the beginning of pile driving or removal, or if pile driving or removal has ceased for more than one hour.

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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 Monitoring Plan

WSF has developed a marine mammal monitoring plan for this project. The monitoring plan is detailed in Section 11.2.3, Marine Mammal Monitoring, and provided in Appendix B.

## 13.2 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 vibratory and impact pile driving at the Vashon ferry terminal is the primary issue of concern to local marine mammals during this project. WSF has conducted research on sound propagation from vibratory and impact hammers, and plans on continuing that research to provide data for future ferry terminal projects.

Since 2008, WSF has supported research by the University of Washington Applied Physics Lab and School of Mechanical Engineering. Research has focused on measuring and modeling in-water noise from pile driving, the development of a prototype underwater sound level meter (UWSLM) that can provide real-time measurements of vibratory and impact pile driving in-water noise, and attenuation of impact pile driving noise.

WSF plans to 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 driving. Marine mammal monitoring will be conducted to collect information on presence of marine mammals within the ZOIs for this project.

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