FINAL

Request for an
Incidental Harassment Authorization

Under the
Marine Mammal Protection Act

Port Townsend Ferry Terminal Transfer Span Replacement

August 2011

Submitted To:

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Abbreviations and Acronyms

BMP	best management practices
CFR	Code of Federal Regulations
dB	decibels
DPS	Distinct Population Segment
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FR	Federal Register
HPA	Hydraulic Project Approval
HPU	Hydraulic Power Unit
Hz	hertz
IA	Implementing Agreement
IHA	Incidental Harassment Authorization
IWC	International Whaling Commission
kHz	kilohertz
kJ	kilojoules(s)
km	kilometer(s)
m	meters
Makah	Makah Indian Tribe
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
PUD	Public Utility District
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
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
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 (20 total facilities), all of which are located in either Puget Sound or the San Juan Islands (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. Over 23 million passengers ride WSF ferries each year. Ridership of WSF ferries is projected to grow more than 37% over the next 20 years.

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 replacement of the transfer span at the Port Townsend terminal, and is the subject of this Incidental Harassment Authorization (IHA) request. The Port Townsend Ferry Terminal transfer span replacement project (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 the 11 marine mammal species that may occur in the project vicinity.

1.2 Project Purpose and Need

Transfer spans (Figure 1-2) are moveable traffic bridges that connect ferries with the terminal dock. Transfer spans typically used at WSF terminals are cable-lift systems that act much like a drawbridge. Major components include cables, a cable winch, and a tower headframe (Figure 1-2). To avoid future failures and improve ferry terminal safety, WSF is systematically replacing aging cable-lift transfer spans with hydraulic lift spans. Transfer span replacement is a part of WSF's commitment to improve ferry terminal safety for its workers and passengers. Called *H spans*, these transfer spans are connected to the shore side by bridge seats and are operated vertically by two hydraulic cylinders located under the offshore end. The steel span, and its bridge seat connection, will be designed with enough stiffness and strength to continue to support a live load in the event of a hydraulic failure.

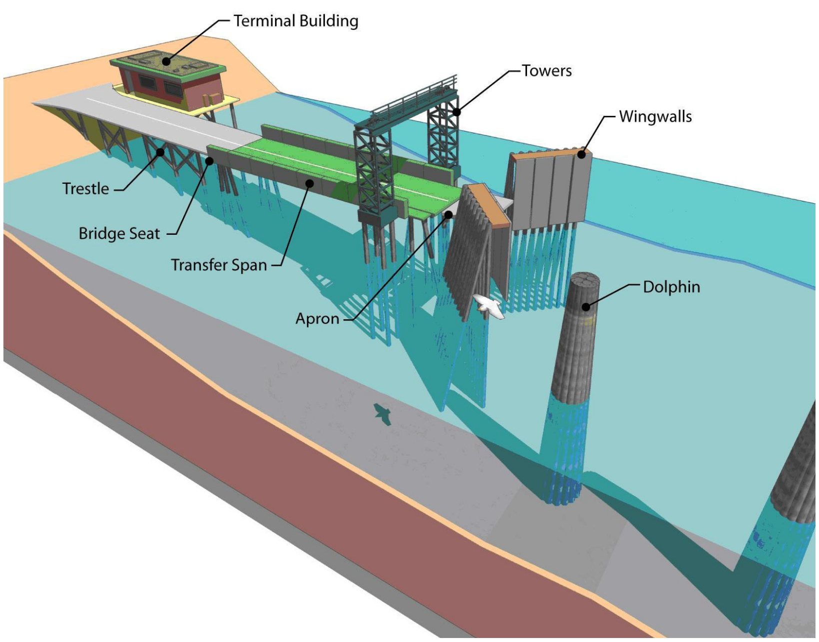

Figure 1-2. Typical Ferry Terminal Layout showing the Location of the Transfer Span

1.3 Project Setting and Land Use

The project will occur at the Port Townsend ferry terminal in northern Puget Sound. The terminal is located on the city of Port Townsend waterfront approximately 1 kilometer (km) southwest of Point Hudson.

1.4 Specific Project Activities

The specific project activity is to replace the current cable-lift transfer span at Slip 1 (Figure 1-3) of the Port Townsend ferry terminal with a hydraulic lift H span. The work will include removal of the existing transfer span, lift towers, tower foundations, and a portion of the bridge seat and replacing them with a new transfer span, bridge seat, and lift cylinder shafts, as shown in Appendix A, Sheets 1 and 2.

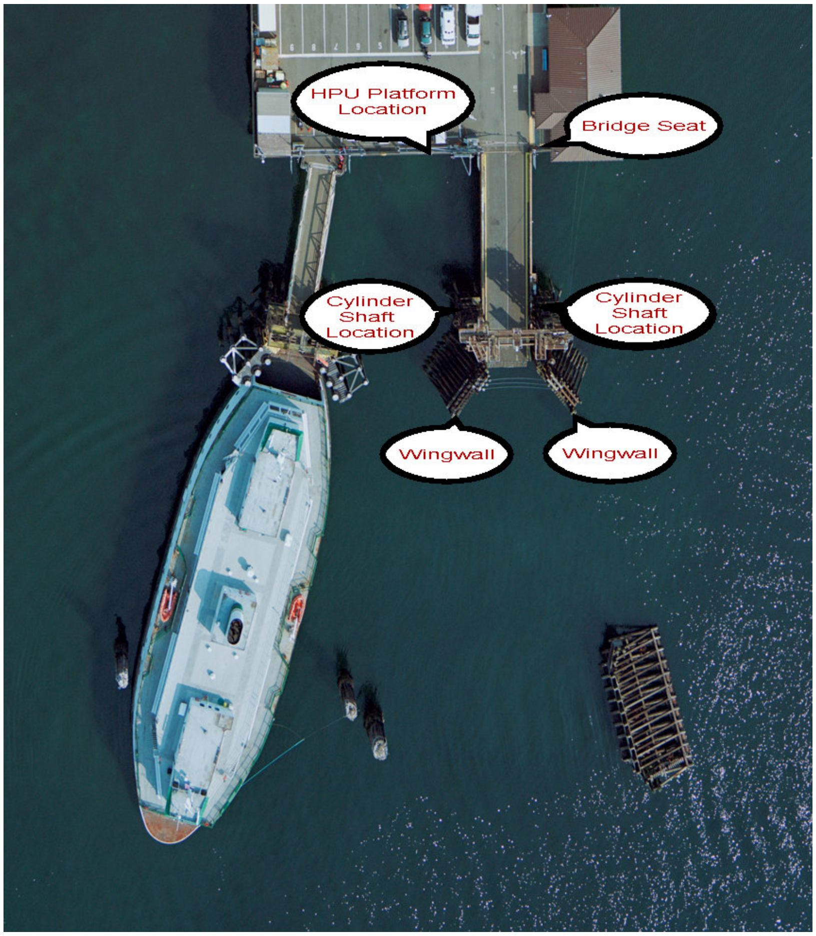

Figure 1-3. SR 20/Port Townsend Slip 1 Transfer Project

As a reference, photos from an existing lift cylinder shaft transfer span at the WSF Bainbridge Ferry Terminal are shown in Figures 1-4 to 1-6. A Hydraulic Power Unit (HPU) for the lift cylinders will also be installed adjacent to the trestle. Because of space limitations on the trestle, the HPU unit will be supported by a platform mounted on up to three 24-inch steel piling, adjacent to the trestle (Appendix A, Sheets 1 and 2). The platform will be 9 feet wide by 22 feet long.

Because the new bridge seat will be located farther offshore than the existing bridge seat, the fender panels of the Slip 1 wingwalls will be moved several feet farther offshore so that the end of the transfer span apron will be properly aligned with the wingwalls. Structural revisions to the wingwall reaction frames will be made to accommodate the relocated fender panels.

In-water construction is planned to take place between October 2012 and February 2013. The on-site work will last approximately 16 weeks with actual pile removal and driving activities taking place approximately 25% of that time. All work will occur in water depths between -10 and -24 feet MLLW.

Figure 1-4. Bainbridge Ferry Terminal Transfer Span and Hydraulic Tower

Figure 1-5. Bainbridge Ferry Terminal Hydraulic Tower

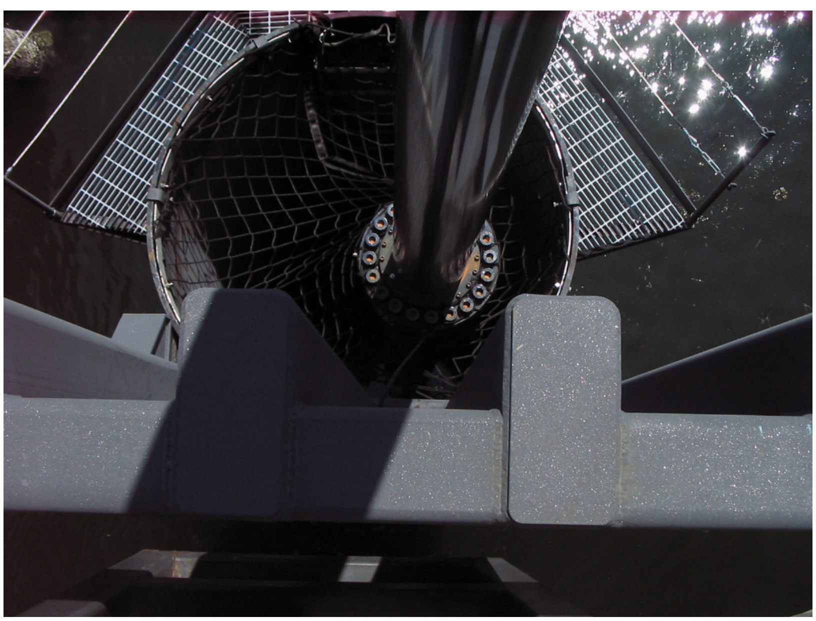

Figure 1-6. Bainbridge Ferry Terminal Lift Cylinder inside 72-inch Pile

1.4.1 Construction Sequence and Schedule

Replacement of the transfer span will require a 16-week temporary closure of Slip 1 during construction. Slip 2 will be operational during this closure. The following major construction activities are anticipated:

- Fabricate transfer span, concrete bridge seat, wingwall framing, and steel piling off site.
- Mobilize on site and close Slip 1 (ferry traffic will be transferred to Slip 2 during the construction period).
- Remove transfer span, towers, tower foundations, and wingwall fender panels.
- Saw-cut bridge seat and remove portion of existing bridge seat and concrete piling.
- Vibratory pile drive five 30-inch hollow steel piles for bridge seat and up to three 24-inch hollow steel piles for HPU platform. Impact pile drive last two feet of these piles to determine load bearing capacity.
- Place precast concrete bridge seat and HPU platform and weld to steel piles.
- Install expansion joint between new bridge seat and existing trestle.
- Install HPU equipment and electrical utilities for transfer span.
- Vibratory pile drive six to eight 24- to 30-inch temporary steel piles for a template to brace cylinder shaft construction.
- Vibratory pile drive two 72-inch hollow steel lift cylinder shafts and construct lift cylinders.
- Place transfer span and attach to bridge seat and lift cylinders. Test transfer span.
- Vibratory pile drive up to four 30-inch hollow steel piles for new wingwall fender panels.
- Vibratory pile drive up to four 24-inch hollow steel piles for wingwall reaction frames.
- Install spacer beams on wingwall reaction frame and make structural revisions to the reaction frame.
- Attach fender panels to new fender piles and complete wingwall modifications.
- Reopen Slip 1.

1.5 Project Elements

The proposed project has six primary elements involving noise production of concern to local marine mammals:

1. **Vibratory Hammer Removal.** Vibratory hammer removal consists of removing 20 timber piles, four concrete piles, and six steel piles.
2. **Vibratory Hammer Installation.** Vibratory hammer installation involves installing 16 steel piles that support the new bridge seat, HPU platform and modified wingwalls; 2 steel casings for the hydraulic lift cylinders; and up to 8 temporary piles to secure the casings during installation.

3. **Impact Hammer Installation.** Impact hammer installation or "proofing" involves driving the last 2 feet of the pile to verify capacity of eight steel piles.
4. **Steel Casing Installation.** Steel casing installation is the vibratory hammer installation of the two steel casings that will house the lift cylinder shafts.
5. **Template Installation and Removal.** Template installation and removal involves the vibratory hammer installation and removal of six to eight steel piles that are a part of a temporary template that braces the cylinder shafts and supports the transfer span during construction.

Each element is discussed separately below.

1.5.1 Vibratory Hammer Removal

Vibratory hammer extraction is a common method for removing timber piling and the method proposed for removing the 48 pilings (40 timber and 8 steel) at the Port Townsend terminal. A vibratory hammer is a large mechanical device mostly constructed of steel (weighing 5 to 16 tons) that is suspended from a crane by a cable. It is attached to a derrick and positioned on the top of a pile. The pile is then unseated from the sediments by engaging the hammer, creating a vibration that loosens the sediments binding the pile, and then slowly lifting up on the hammer with the aid of the crane.

Figure 1-7. Vibratory Hammer Removing a Timber Pile

Once unseated, the crane will continue to raise the hammer and pull the pile from the sediment. When the pile is released from the sediment, the vibratory hammer is disengaged and the pile is pulled from the water and placed on a barge for transfer upland. Figure 1-7 shows a timber pile being removed with a vibratory hammer.

Vibratory removal will take approximately 10 to 15 minutes per pile. The piling will be loaded onto the barge or into a container and disposed of offsite in accordance with State of Washington Administrative Code (WAC) 173-304 Minimum Functional Standards for Solid Waste Handling and mitigation measures in Section 11.0, Mitigation Measures, of this document.

1.5.2 Direct Pull and Clamshell Removal

Older timber pilings are particularly prone to breaking at the mudline because of damage from marine borers and vessel impacts and must be removed because they can interfere with the installation of new pilings. In some cases, removal with a vibratory hammer is not possible if the pile is too fragile to withstand the hammer force. Broken or damaged piles may be removed by wrapping the piles with a cable and pulling them directly from the sediment with a crane. If the piles break below the waterline, the pile stubs will be removed with a clamshell bucket, a hinged steel apparatus that operates like a set of steel jaws. The bucket will be lowered from a crane and the jaws will grasp the pile stub as the crane pulled up. The broken piling and stubs will be loaded onto the barge for off-site disposal. Direct pull or clamshell removal will be employed at Port Townsend only if necessary and will not constitute a major noise source of concern.

1.5.3 Vibratory Hammer Installation

Vibratory hammers are commonly used in steel pile installation where sediments allow and involve the same vibratory hammer used in pile extraction. The pile is placed into position using a choker and crane, and then vibrated between 1,200 and 2,400 vibrations per minute (Figure 1-8). The vibrations liquefy the sediment surrounding the pile allowing the pile to penetrate to the required seating depth. In some cases the pile encounters too much resistance for the vibratory hammer to advance the pile to the required depth, in which case, an impact hammer is used to finish the process (see Section 1.5.4).

Figure 1-8. Impact Hammer Driving a Pile (Left), Vibratory Hammer Driving a Pile (Right)

1.5.4 Impact Hammer Installation

An impact hammer is a large steel piston used to install wood, concrete, or steel piles. Impact hammers have a guide (called a lead) that holds the hammer in alignment with the pile while a heavy piston moves up and down, striking the top of the pile and driving it into the substrate

(Figure 1-8). 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 driving into glacial till and bedrock or exceptionally loose material in which the pile keeps moving out of position). Impact hammer installation may occur at Port Townsend to seat piles that cannot be fully seated with the vibratory hammer (which is not expected based on past pile construction at Port Townsend). Impact hammer installation will occur to "proof" the five piles supporting the bridge seat and the three piles supporting the HPU platform to verify the piles will be able support intended loads.

1.5.5 Steel Casing (Hydraulic Cylinder Shaft) Installation

The lift cylinder shafts will be located at the offshore end of the transfer span and will consist of a reinforced concrete section with a permanent steel casing pipe at the top of the shaft. They will be constructed by setting the steel casing into the soil and embedding it approximately 10 feet into the dense till layer to ensure soil stability near the mudline. The casing will be driven with a vibratory hammer (no proofing will be required).

1.5.6 Template Installation and Removal

To secure the steel casing during construction, a template is typically constructed. The template for the proposed project will consist of a steel frame supported by six to eight steel piles that brace the shaft casings during construction. The template will be removed after the shaft is completed. Temporary piles will be driven and removed with a vibratory hammer.

1.6 Sound Levels

1.6.1 Reference Vibratory Sound Source Levels

This project includes vibratory removal of 12-inch timber piles, vibratory removal and driving of 30-inch and 24-inch hollow steel piling, and vibratory driving of 72-inch hollow steel cylinder shafts.

Based on in-water measurements at the WSF Port Townsend Ferry Terminal (Laughlin 2011a), removal of 12-inch timber piles generated 149 to 152 dB RMS with an overall average RMS value of 150 dB RMS measured at 16 meters. A worst-case noise level for vibratory removal of 12-inch timber piles will be 152 dB RMS at 16 m.

Based on in-water measurements during a vibratory test pile at the WSF Port Townsend Ferry Terminal, vibratory pile removal of a 30-inch steel pile generated 171 dB RMS measured at 10 meters, and vibratory pile driving of a 30-inch steel pile generated 170 dB RMS (overall average), with the highest measured at 174 dB RMS measured at 10 meters (Laughlin 2010). A worst-case noise level for vibratory removal of 30-inch steel piles will be 171 dB RMS at 10 m, and a worst-case noise level for vibratory driving of 30-inch steel piles will be 174 dB RMS at 10 m.

Based on in-water measurements at the WSF Friday Harbor Ferry Terminal, vibratory pile driving of 24-inch steel piles generated 162 dB RMS measured at 10 meters (Laughlin 2005b). Vibratory pile removal data for 24-inch steel piles is not available, so a reduction of 3 dB RMS will be assumed (the same reduction as the 30-inch vibratory pile removal at Port Townsend).

A worst-case noise level for vibratory removal of 24-inch steel piles will be 159 dB RMS at 10 m, and a worst-case noise level for vibratory driving of 24-inch steel piles will be 162 dB RMS at 10 m.

Based on in-water measurements at the SR 529 Ebey Slough Bridge Replacement Project, vibratory pile driving of 72-inch steel piles generated 148-166 dB RMS measured at 10 meters (WSDOT 2011). A worst-case noise level for vibratory driving of 72-inch steel cylinder casings will be 166 dB RMS at 10 m.

Using the NOAA practical spreading model, the distances at which the following vibratory pile removal or driving source levels are expected to attenuate down to the 120 dB RMS threshold are:

- 152 dB RMS at 16m (vibratory timber pile removal) = ~2.2 km (1.4 miles)
- 159 dB RMS at 10m (24-inch steel pile removal) = ~4 km (2.5 miles)
- 162 dB RMS at 10m (24-inch steel pile driving) = ~6.3 km (3.9 miles)
- 166 dB RMS at 10m (72-inch steel pile driving) = ~11.6 km (7.2 miles)
- 171 dB RMS at 10m (30-inch steel pile removal) = ~18.5 km (15.6 miles)
- 174 dB RMS at 10m (30-inch steel pile driving) = ~39.8 km (24.7 miles)

However, during the vibratory test pile project at the Port Townsend Ferry Terminal, two hollow steel piles, one 36-inch and one 30-inch were driven and removed with a vibratory hammer. An array of hydrophones measured in-water noise during the project. Vibratory driving of the 36-inch steel pile generated 159 to 177 dB RMS at 10m, and vibratory driving of the 30-inch steel pile generated 164 to 174 dB RMS at 10 m (Laughlin 2010). Based on analysis of in-water noise data from the test pile project, vibratory pile removal and driving at Port Townsend is expected to reach the 120 dB RMS threshold at approximately 6.8 km (4.2 miles) (Laughlin 2010).

Given that all steel driving source levels for the transfer span project are below 177 dB RMS, it is expected that the source levels noted above will attenuate down to the 120 dB RMS threshold at approximately 6.8 km (4.2 miles) or sooner. Therefore, the estimated distance to the 120-dB threshold for purposes of estimating Level B takes to marine mammals is assumed to be 6.8 km.

1.6.2 Reference Impact Sound Source Levels

As mentioned previously, impact pile driving is not the proposed means for seating the piles at Port Townsend, except to “proof” eight piles for load safety reasons, or to finish seating a pile where the substrate might not allow complete pile seating by the vibratory hammer alone (although this is not expected given the existing bottom substrate and past experience driving piles at this location). Thus, impact pile driving is assumed to occur over a relatively short duration compared to vibratory pile driving. Although impact pile driving has been measured at several locations (Reyff 2007), few of these measurements are relevant because of differing hammer force, piling size and type, and water depths. Impact pile driving of steel piles has not occurred at the Port Townsend Ferry Terminal before. Fortunately, WSDOT has conducted field measurements for steel piles at other Puget Sound terminal locations from impact hammers typically used at WSF projects. Impact pile driving of 24-inch steel piles at the WSF Bainbridge Island Ferry Terminal generated approximately 189 dB root mean squared (RMS) (unattenuated at 10 m from the source) (Laughlin 2005a). Impact pile driving of 30-inch steel piles at the WSF Friday Harbor Ferry Terminal generated approximately 195 dB RMS (unattenuated at 10 m from the source), with dominant frequencies in the range of 800 to 1000 Hz (Laughlin 2005b). WSDOT has also deployed bubble curtains – with varied success at multiple locations. Reductions ranged from 0-32 dB, with an overall average reduction from these deployments of 12 dB (WSDOT 2011). Assuming a more conservative 10-dB reduction, with an unattenuated source level of 195 dB (conservative for the 24-inch piles), gives a source level of 185 dB (195 – 10), the value that will be used in this application to establish the impact safety zone.

1.6.3 Background Noise

Background noise by definition are sound levels absent of the proposed activity (pile removal/driving in this case) while ambient sound levels are levels absent of human activity (NMFS 2009) Various factors contribute to the background noise levels in Puget Sound including 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 important to understand relative to noise impacts on marine mammals where they exceed National Oceanic and Atmospheric Administration (NOAA) threshold levels designed to protect marine mammals from take. For example, 120 dB is the threshold value where Level B acoustical harassment occurs to marine mammals exposed to continuous noise sources. However, if background noise levels exceed 120 dB, for example 130 dB, then animals would not be exposed to "harassment level" sounds at less than 130 dB as those sounds no longer dominate; they are essentially part of the background. In such a case, the 130 dB isopleth becomes the new project threshold for Level B take of marine mammals. Therefore, understanding the local background noise levels are important in determining the true zone of influence of a given construction sound source.

A number of background noise measurements have been taken in Puget Sound, including in the vicinity of ferry terminals. These measurements vary with the underwater environments in which they are located. Veirs and Veirs (2005) measured background noise levels in Haro Strait, an area in the San Juan Islands actively used by southern resident killer whales, and found daily background sound levels to average between 117.5 dB (summer) and 115.6 dB (non-summer), although they did not specify whether the values were peak, peak-peak, or RMS. Their values were greatly influenced by vessel traffic. When no passing ships were present, the background levels were approximately 95 dB. When ships were present, the values increased to as high as 130 dB. Carlson et al. (2005) found similar levels in Hood Canal where background noise levels varied between 115 dB and 135 dB depending on the presence of passing vessels.

Background noise levels in the vicinity of Port Townsend were measured in April 2010 (Stockham et al. 2010). Thirty-second RMS values both with and without a high-pass filter applied at 1Hz-20 kHz and 150 Hz for the mid- frequency cetaceans (including killer whale) were plotted using a Cumulative Density Function (CDF) to determine the percent of time each sound level occurred during a continuous 72-hour recording. The 50th percentile from the CDF plot reflects the average background sound level near the ferry terminal.

These data show that local background levels are well less than 120 dB (50th percentile between 100 and 104 dB), at least during April. Therefore, no adjustments of the threshold for continuous noise sources were made.

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 (Greeneridge 2007). Logarithmic loss **B** is typically between 10 dB (10 Log R cylindrical spreading) and 20 dB (20 Log R spherical spreading) (Greeneridge 2007). Linear loss **C** has several physical components, including absorption in seawater, absorption in the sub-bottom, scattering from inhomogeneities 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. Recognizing the conservative nature of this approach (because the linear loss is discounted), all estimates to the injury and harassment noise thresholds for cetaceans and pinnipeds were calculated using this model.

1.6.5 Airborne Transmission Loss

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. Airborne transmission loss was calculated using the spherical spreading model (20 Log R) and data collected by Laughlin (2011) during impact driving of 2 72-inch piles at the SR 529 Ebey Slough project. The highest average RMS value recorded was 101 dB RMS re: 20 µPa (unweighted) at 15 m and is the value used in distance to threshold calculations.

1.6.6 Attenuation to NMFS Thresholds

NMFS has established disturbance and injury thresholds relative to the impacts of noise levels on marine mammals (Table 1-1). To determine the area that is ensonified by SPLs exceeding each threshold level (the zone of influence [ZOI]), and therefore, be able to calculate the area that will need to be monitored for marine mammals in order to avoid take or estimate the number of animals that might be taken, it is necessary to estimate the distance to each threshold.

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

Marine Mammals	Airborne Noise from Marine Construction Activity 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 100 dB RMS (unweighted) for all other pinnipeds re: 20 µPa	120 dB RMS	160 dB RMS	190 dB RMS

1.6.6.1 Timber Pile Vibratory Removal

Laughlin (2011) measured SPLs from removing timber piles during a December 2010 dolphin replacement project at the Port Townsend terminal. The average measured RL was 150 dB at 16 m with a high value of 152 dB. The estimated difference using the higher (worst-case) value (152 dB) yields an estimated distance of 2.2 km to the 120 dB harassment threshold (and is the value to be used to estimate the ZOI). SPLs at source (<160 dB) do not reach Level A injury thresholds (180 or 190 dB).

1.6.6.2 Steel Pile Vibratory Removal and Driving

The vibratory steel pile driving hammer noise source level used in the distance calculations was 162.5 dB at 10 m, the central source level from Laughlin (2010c) during test pile driving at the Port Townsend ferry terminal. Consequently, injury noise levels (>180 dB) relative to vibratory pile driving and removal do not occur. The disturbance threshold for vibratory pile driving, a continuous noise source, is 120 dB. The central tendency estimate from Laughlin (2010c) using the practical spreading model is 6.8 km to the 120 dB isopleth (Figure 1-9). This is the value that is used to estimate the Level B acoustical harassment zone of influence for vibratory pile driving.

1.6.6.3 Impact Pile Driving (Underwater Noise)

Like the vibratory pile-driving calculations, the distances to NMFS thresholds from noise emanating from impact pile driving was determined by applying local data collected by Laughlin to the practical spreading model. Laughlin's (2005b) source level value of 195 dB, attenuated to 185 dB (WSDOT 2011), was used to calculate distances to impact thresholds.

Application of the conservative practical spreading model recommended by NMFS to the 185 dB value yields a distance of 5 m to the 190 dB threshold (pinniped injury), 22 m to the 180 dB threshold (cetacean injury), and 465 m to the 160 dB threshold (harassment). For conservative purposes, estimates of take and safety zones were developed using the 22 m (injury) and 465 m (harassment) values (Figure 1-10).

1.6.6.4 Impact Pile Driving (Airborne Noise)

The estimated in-air source level from impact pile driving a 72-inch steel pile with a diesel hammer is estimated at 101 dB RMS re: 20 µPa (unweighted) at 15 m (50 feet) from the pile (Laughlin 2011b). The distance in-air disturbance from pile driving would be expected to extend was calculated using a spherical spreading loss of 6 dB per doubling of distance from the pile driving source. The distances to the 90 dB and 100 dB thresholds were estimated at 81 m and 17 m, respectively.

1.6.7 Safety Zone

The purpose of the safety zone is to ensure that noise-generating activities are shut down before a marine mammal "take" can occur. The concern is to ensure that Level A (injurious) take does not occur from cetaceans entering a 180 dB ZOI or a pinniped entering a 190 dB ZOI while pile driving is active. The potential for Level A take during vibratory hammering is essentially nonexistent, because source energy levels are usually less than the NMFS threshold. However, during impact hammering Level A take (for cetaceans) can occur out to 22 m (distance to the 180 dB isopleth). Thus, during any impact hammering, a 22 m radius safety zone will be fully monitored and impact hammering will shut down at the approach of any marine mammal (not just cetaceans) to this zone (see Section 11.2.4, Marine Mammal Monitoring).

Figure 1-9. Vibratory Hammer Zones of Influence (120 dB threshold)

Figure 1-10. Impact Hammer Zones of Influence (160 dB and 180 dB thresholds)

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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 in-water work timing restrictions required by NMFS and the U.S. Fish and Wildlife Service (USFWS), which are used to avoid in-water construction when Endangered Species Act (ESA)-listed salmonids are most likely to be present, and those restrictions (Hydraulic Project Approval) mandated by the Washington Department of Fish and Wildlife (WDFW), pre-planned WSF in-water activities are limited each year to July 16 through February 15. For this project, activities are planned to take place between October 1, 2012, and February 15, 2013.

2.2 Duration

The number of days it will take to remove and install the pilings at Port Townsend largely depends on the condition of the piles being removed and the difficulty in penetrating the substrate during pile installation. Duration estimates of each of the pile driving elements follow:

- Vibratory pile removal of the existing timber piles will take approximately 10 to 15 minutes per pile. Vibratory removal will take less time than driving, because piles are vibrated to loosen them from the soil, then pulled out with the vibratory hammer turned off. Assuming the worst case of 15 minutes per pile, removal of 40 piles will take 10 hours over two days of pile removal (Table 2-1).
- Vibratory pile removal of the existing four 30-inch and four 24-inch wingwall steel piles will take approximately 15 minutes per pile. Assuming 15 minutes per pile, removal of eight piles will take 2 hours over 2 days (Table 2-1).
- Vibratory pile driving of the 16 steel piles (five 30-inch bridge seat, three 24-inch HPU, four 30-inch, four 24-inch wingwall,) will take approximately 20 minutes per pile, with three to five piles installed per day. Assuming 20 minutes per pile, and three piles per day, driving of 16 piles will take 5 hours and 20 minutes over 5 days.
- Vibratory pile driving of the H-pile temporary template (assuming eight piles, 20 min/pile, four piles/day) will take two hours 40 minutes over two days of pile driving. It will not be necessary to drive template piles as deep as temporary dolphin piles, which accounts for the differences in the pile driving estimates above.
- Vibratory pile driving of the two 72-inch cylinder shafts will take approximately 20 minutes per shaft. Assuming the 20 minutes per shaft, and two piles per day, driving of two shafts will take 40 minutes over two days.
- Impact pile driving (proofing) assumes that eight piles (five 30-inch bridge seat and three 24-inch HPU) will be impact driven the last 2 feet. Assuming the eight piles requiring impacting of 10 minutes per pile, driving of the eight piles will take 1 hour and 20 minutes over 2 days.

The total worst-case time for pile removal is 4 days, and 9 days for pile installation, plus 2 days "proofing" using the impact hammer. The actual number of pile-driving days is expected to be much less (Table 2-1).

Table 2-1. Worst Case Pile Removal and Driving for the Port Townsend Slip 1 Proposed Project

Removal/Installed	Maximum Number of Piles	Time	Days
Timber Pile Removal (Vibratory)	40	10 hrs.	2
Steel Pile Removal (Vibratory)	8	2 hrs.	2
Total (Vibratory Removal)	**48**	**12 hrs.**	**4**
Steel Pile Installation (Vibratory)	16	5 hrs. 20 min.	5
Temporary H-pile Installation (Vibratory)	8	2 hrs. 40 min.	2
Cylinder Shaft Casings (Vibratory)	2	40 min.	2
Total (Vibratory Installation)	**26**	**8 hrs. 40 min.**	**9**
Steel Pile Proofing (**Total Impact**)	**8**	**1 hr. 20 min.**	**2**

2.3 Region of Activity

The proposed activities will occur at the Port Townsend ferry terminal located in northern Puget Sound inside Port Townsend Bay (see Figure 1-9).

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 of writing and reading due to the number of marine mammals discussed.

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

Eleven species of marine mammals are found in Puget Sound and/or the San Juan Islands region (Table 3-1). Given that Port Townsend is located essentially on the boundary between the two inland water regions, all 11 species might be found at some time of the year within the vicinity of the Port Townsend terminal. However, not all the species would likely be present during the October 1 to February 15 work window.

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

Species	ESA Status	MMPA Status	Puget Sound		San Juan Island	
			Work Window Oct–Feb	Non-work Window Mar–Sep	Work Window Oct–Feb	Non-work Window Mar–Sep
Pinnipeds						
Harbor Seal	Not listed	Non-depleted	Yes	Yes	Yes	Yes
California Sea Lion	Not listed	Non-depleted	Yes (males only)	Yes (males only until end of May)	Yes (males only)	Yes (males only until end of May)
Northern Elephant Seal	Not listed	Non-depleted	Yes, rare	Yes, rare	Yes	Yes
Steller Sea Lion	Threatened	Depleted	Yes	Yes, rare	Yes, rare	Yes, rare
Cetaceans						
Harbor Porpoise	Not listed	Non-depleted	Yes	Yes, rare	Yes	Yes
Dall's Porpoise	Not listed	Non-depleted	Yes, rare	Yes, rare	Yes	Yes
Pacific White-sided dolphin	Not listed	Non-depleted	No	Yes, rare	Yes	No
Killer Whale	Endangered	Depleted	Yes, all pods in fall	Yes, J pod	Yes	Yes
Gray Whale	Delisted	Unclassified	Yes	Yes	Yes	Yes
Humpback Whale	Endangered	Depleted	Yes, rare	Yes, rare	Yes	Yes
Minke Whale	Not listed	Non-depleted	Yes, rare	Yes, rare	Yes	Yes

3.2 Pinnipeds

There are four species of pinnipeds that occur in the inland waters of Washington: harbor seal (*Phoca vitulina richardsi*), California sea lion (*Zalophus californianus*), northern elephant seal (*Mirounga angustirostris*), and Steller sea lion (*Eumetopias jubatus*). Harbor seals are the most common and only pinniped that breeds and remains in the Port Townsend area year-round.

3.2.1 Harbor Seal

Harbor seals are members of the true seal family (Phocidae). For management purposes, differences in mean pupping date (Temte 1986), movement patterns (Jeffries 1985; Brown 1988), pollutant loads (Calambokidis et al. 1985), and fishery interactions have led to the recognition of three separate harbor seal stocks along the west coast of the continental U.S. (Boveng 1988). The three distinct stocks are: 1) inland waters of Washington State (including

Hood Canal, Puget Sound, 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 San Juan Island region, pups are born from June through August, and in southern Puget Sound pups are born from mid-July through September (Jeffries et al. 2000). However, recent observations by WDFW biologists reveal that harbor seal pupping seasons in San Juan Island and Puget Sound extend from June 1 to October 1 (D. Lambourn pers. comm. 2008). After October 1 all pups in the inland waters of Washington are weaned.

Phocids have the broadest auditory bandwidth of pinnipeds. The bandwidth for phocids was estimated by Southall et al. (2007) as between 75 hertz (Hz) and 75 kilohertz (kHz) for “functional” underwater hearing and between 75 Hz and 30 kHz for “functional” aerial hearing. At lower frequencies (below 1 kHz) sounds must be louder to be heard (Kastak and Schusterman 1998). Harbor seals, like all pinnipeds, communicate both on land and underwater. 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).

3.2.1.1 Numbers

Of the four pinniped species that occur within the region of activity, harbor seals are the most numerous and the only one that breeds in the inland marine waters of Washington (Calambokidis and Baird 1994). In 1999, Jeffries et al. (2003) recorded a mean count of 9,550 harbor seals in Washington’s inland marine waters, and estimated the total population to be approximately 14,600 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).

3.2.1.2 Status

Harbor seals are not considered to be “depleted” under the MMPA or listed as “threatened” or “endangered” under the ESA. Based on available data, the level of human-caused mortality and serious injury is less than 10 percent of the potential biological removal (PBR) of 771 harbor seals per year (Carretta and Chivers 2003). Therefore, 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).

3.2.1.3 Distribution

Harbor seals are the most numerous marine mammal species within the Strait of Juan de Fuca and Puget Sound. In general, harbor seals inhabit coastal and estuarine waters off Baja California, north along the western coasts of the continental U.S., British Columbia, and southeast Alaska, west through the Gulf of Alaska and Aleutian Islands, and in the Bering Sea north to Cape Newenham and the Pribilof Islands. Harbor seals are non-migratory; their local movements are associated with such factors as tides, weather, season, food availability, and reproduction (Scheffer and Slipp 1944; Fisher 1952; Bigg 1969, 1981). They are not known to make extensive pelagic migrations, although some long-distance movements of tagged animals in Alaska (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, beaches, and drifting glacial ice 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). Within the inland waters of Washington, there are numerous harbor seal haulout sites located on intertidal rocks, reefs, and islands. The nearest known haulout site to the Port Townsend ferry terminal is 3 km away across the bay at Rat Island/Kilisut Harbor Spit. Recent counts by WDFW indicate between 80 and 120 harbor seals use this site during the summer months (S. Jefferies pers. comm. 2010). 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 seals in general hauling out less (H. Huber pers. comm. 2010).

3.2.2 California Sea Lion

California sea lions are members of the family Otariidae or eared seals (sea lions and fur seals). The California sea lion includes three subspecies: *Z. c. wollebaeki* (on the Galapagos Islands), *Z. c. japonicus* (in Japan, but now thought to be extinct), and *Z. c. californianus* (found from southern Mexico to southwestern Canada; herein referred to as the California sea lion) (Carretta et al. 2007a). 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). These three geographic regions are used to separate this subspecies into three stocks: 1) the U.S. stock begins at the U.S./Mexico border and extends northward into Canada; 2) the Western Baja California stock extends from the U.S./Mexico border to the southern tip of the Baja California Peninsula; and 3) the Gulf of California stock, which includes the Gulf of California from the southern tip of the Baja California peninsula and across to the mainland and extends to southern Mexico (Lowry et al. 1992). Washington sea lions occur within the geographic boundaries of the U.S. stock.

3.2.2.1 Numbers

The U.S. stock was estimated at 238,000 in the 2006 Stock Assessment Report (SAR) and may be at carrying capacity, although more data are needed to verify that determination (Carretta et al. 2007a). The number of California sea lions in the San Juan Islands and the adjacent Strait of Juan de Fuca totaled fewer than 3,000 in the mid-1980s (Bigg 1985; Gearin et al. 1986). In 1994, it was reported that the number of sea lions had stabilized or decreased in some areas (Gearin et al. 1988; Calambokidis and Baird 1994). More recently, 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. 2007). Peak counts of over 1,000 animals have been made in Puget Sound (Jeffries et al. 2000).

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 (8,511) (Carretta et al. 2007b).

3.2.2.3 Distribution

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

In Washington, California sea lions use haulout sites within all inland water regions (Jeffries et al. 2000). The nearest California sea lion haulout site is a channel marker buoy (used by less than 10 animals) located off Bush Point 12.9 km southeast of the Port Townsend ferry terminal. The nearest large (100-500 animals) haulout is located 42 km to the southeast at the Everett Harbor log boom. This species also may be seen resting in the water (rafting) together in groups in Puget Sound (Jeffries et al. 2000).

California sea lions were unknown in Puget Sound until approximately 1979 (Steiger and Calambokidis 1986). Everitt et al. (1980) reported the initial occurrence of large numbers at Port Gardner, just north of Everett (in northern Puget Sound), in the spring of 1979. The number of California sea lions using this area today number around 1,000 (P. Gearin pers. comm. 2008). 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 Elliot Bay near Seattle and heavily used areas of central Puget Sound (P. Gearin et al. 1986). 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, in Puget Sound, typically does not flush from a buoy or haulout if approached.

3.2.3 Northern Elephant Seal

Northern elephant seals are the largest pinniped found in Washington marine waters. Populations of northern elephant seals in the U.S. and Mexico are the result of a few hundred survivors remaining after hunting nearly led to the species' extinction (Stewart et al. 1994). Elephant seals present in the region of activity are considered part of the California breeding stock (Carretta et al. 2007a). Northern elephant seals breed and give birth primarily on islands off of California and Mexico from December through March (Stewart and Huber 1993; Carretta et al. 2007a). Typically, juveniles form new colonies and one or more females join to result in new haulout and rookery sites (Bonnell et al. 1991).

3.2.3.1 Numbers

Once nearly extirpated, the West Coast population of this species has had a remarkable comeback. By the early 1990s, this species was once again considered abundant and stable within its range in the eastern North Pacific (Campbell 1987; Calambokidis and Baird 1994). Based on pup counts in California in 2005, the population of the eastern North Pacific stock was estimated at 124,000 (Carretta et al. 2007b). Based on current trends and pup counts in California, the population of northern elephant seals appears to remain stable (Carretta et al. 2007b).

Abundance estimates for inland Washington waters are not available due to the infrequency of sightings and the low numbers encountered incidentally (J. Calambokidis pers. comm. 2008). Rough estimates suggest less than 100 individuals use the area annually (S. Jeffries pers. comm. 2008a).

3.2.3.2 Status

Northern elephant seals are not listed as endangered or threatened under the ESA or as depleted under the MMPA.

3.2.3.3 Distribution

Breeding rookeries are located on beaches and islands in California and Mexico (Jeffries et al. 2000). Historically, after their winter breeding season and annual molt cycles, individuals dispersed northward along the Oregon and Washington coasts and were present only on a seasonal basis. However, a few individuals are now found in Washington inland waters year-round.

Small numbers of juveniles haul out throughout this area for periods of over a month to molt (Calambokidis and Baird 1994). Rat Island across the bay from the Port Townsend ferry terminal is occasionally used by juvenile elephant seals (S. Jeffries pers. comm. 2008a).

Haulout areas are not as predictable as for the other species of pinnipeds found there. In recent years pups have been seen at beaches at Destruction, Protection, and Smith/Minor islands in the Strait of Juan de Fuca (Jeffries et al. 2000). In total, WDFW has identified seven haulout sites in inland Washington waters used by this species. There are regular haulout sites at Smith and Minor islands, Dungeness Spit, Protection Island, and Race Rocks in the Strait of Juan de Fuca (S. Jeffries pers. comm. 2008a). Typically these sites have only two to ten adult males and females, but pupping has occurred at all of these sites over the past ten years (S. Jeffries pers. comm. 2008a).

3.2.4 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 because 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).

3.2.4.1 Numbers

The eastern stock of Steller sea lions is estimated to be between 48,519 and 54,989 individuals based on 2002 through 2005 pup counts (Angliss and Outlaw 2007). Washington's estimate including the outer coast is 651 individuals (non-pups only) (Pitcher et al. 2007). However, recent estimates are 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 lions in Washington State decline during the summer months, which correspond to the breeding season at Oregon and British Columbia rookeries (approximately late May to early June) and peak during the fall and winter months (Jeffries et al. 2000). A few Steller sea lions can be observed year-round in Puget Sound although most of the breeding age animals return to rookeries in the spring and summer (P. Gearin pers. comm. 2008).

3.2.4.2 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.

On August 27, 1993, NMFS published a final rule designating critical habitat for the Steller sea lion (NMFS 1993). No critical habitat has been designated in Washington (NMFS 1993). 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 thus classified as strategic.

3.2.4.3 Distribution

As previously mentioned, 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). However, the number of haulout sites has increased in recent years and includes most navigation buoys including the Bush Point navigation buoy, possibly other bell buoys in Admiralty Inlet, and the Craven Rock haulout east of Marrowstone Island, approximately 7 km southeast of the Port Townsend Ferry Terminal.

3.3 Cetaceans

Seven cetacean species are present in the inland waters of Washington, at least seasonally. Of these, harbor and Dall's porpoises are the most abundant and each number in the several thousands (Calambokidis and Baird 1994). Other species, such as the larger whales, are less numerous, but appear to be increasing. Each of the seven species is addressed below.

3.3.1 Harbor Porpoise

Harbor porpoises (*Phocoena phocoena*) are found in coastal and inland waters of the eastern North Pacific Ocean from Point Barrow, Alaska, south to Point Conception, California (Gaskin 1984). Harbor porpoises are divided into two stocks: 1) the Washington Inland Waters Stock, and 2) the Oregon/Washington Coast Stock (Carretta et al. 2007b). The Washington Inland Waters Stock occurs in waters east of Cape Flattery (Strait of Juan de Fuca, San Juan Island Region, and Puget Sound). The Oregon/Washington Coast Stock extends from Cape Flattery, Washington south to Cape Blanco, Oregon. 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).

Little information regarding food habits of the harbor porpoise is available for British Columbia or inland Washington waters (Hall 2004). What prey species have been documented include juvenile blackbelly eelpout, opal squid, Pacific herring, walleye pollock, Pacific hake, eulachon, and Pacific sanddab (Walker et al. 1998). Based on the results from Walker et al. (1998) and Hall (2004), harbor porpoises in British Columbia and Washington are opportunistic feeders, with prey species varying based on seasonal abundance. They also likely alter their spatial and temporal distributions based on prey availability.

Harbor porpoises are high-frequency cetaceans with an estimated auditory bandwidth of 200 Hz to 180 kHz (Southall et al. 2007) with a maximum sensitivity between 16 and 140 kHz (73 FR 41318).

3.3.1.1 Numbers

The Washington Inland Waters Stock mean abundance estimate based on 2002 and 2003 aerial surveys conducted in the Strait of Juan de Fuca, San Juan Islands, Gulf Islands, and Strait of Georgia is 10,682 harbor porpoises (Carretta et al. 2007b). Abundance estimates of harbor porpoises for the Strait of Juan de Fuca and the San Juan Islands in 1991 were approximately 3,300 animals (Calambokidis et al. 1993). Harbor porpoises were once considered common in southern Puget Sound (Scheffer and Slipp 1948); however, there has been a significant decline in sightings within southern Puget Sound since the 1940s (Everitt et al. 1980; Calambokidis et al. 1985, 1992; Carretta et al. 2007b).

Virtually no data are available to assess population trends in Puget Sound (Scheffer and Slipp 1948; Everitt et al. 1980; Calambokidis et al. 1985, 1992; Calambokidis and Baird 1994). 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. Declines were attributed to gill-net fishing, increased vessel activity, contaminants, and competition with Dall’s porpoise. However, Puget Sound populations appear to be rebounding with increased sightings in central (Carretta et al. 2007b) and southern (D. Nysewander pers. comm. 2008; WDFW 2008) Puget Sound.

3.3.1.2 Status

The harbor porpoise is not listed under the ESA and is classified as non-depleted under the MMPA.

3.3.1.3 Distribution

Harbor porpoises are common in the Strait of Juan de Fuca and south into Admiralty Inlet (near Port Townsend), especially during the winter, but are not at all common south of Admiralty Inlet (Figures 3-1 and 3-2). Harbor porpoises occur year-round and breed in the waters around the San Juan Archipelago and north into Canadian waters (Calambokidis and Baird 1994).

Little information exists on harbor porpoise movements and stock structure near Port Townsend, 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 WDFW's PSAMP data show peaks in Washington water to occur during the winter. Still, no additional evidence exists for migrations in the inland waters of Washington or British Columbia (Calambokidis and Baird 1994; Rosel et al. 1995).

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.

3.3.2 Dall's Porpoise

Dall's porpoise (*Phocoenoides dalli*) occur in the North Pacific Ocean and is divided into two stocks: 1) California, Oregon, and Washington; and 2) Alaska (Carretta et al. 2007b). The segment of the population within Washington's inland waters was last assessed in 1996 by aerial surveys (Calambokidis et al. 1997). During a ship line-transect survey conducted in 2005, Dall's porpoise was the most abundant cetacean species off the Oregon and Washington coast (Forney 2007). Dall's porpoises are migratory and appear to have predictable seasonal movements driven by changes in oceanographic conditions (Green et al. 1992, 1993). This species is commonly seen in shelf, slope, and offshore waters (Carretta et al. 2007b).

Their feeding strategies are likely dependent on what prey species are present and how the prey is distributed (Miller 1988). Dall's porpoises feed mainly on small schooling fishes and cephalopods, including herring, anchovies, sardines, mackerels, sauries, octopuses, squid, and cuttlefish (Miller 1988). They often chase fish at the water surface, and have been observed cooperatively herding prey when herring balls were present (Miller 1988). This species may also target deeply distributed single prey items by performing prolonged deep dives lasting up to 7 minutes (Miller 1988).

Like harbor porpoises, Dall's porpoises are high-frequency cetaceans with an estimated auditory bandwidth of 200 Hz to 180 kHz (Southall et al. 2007).

Harbor Porpoise

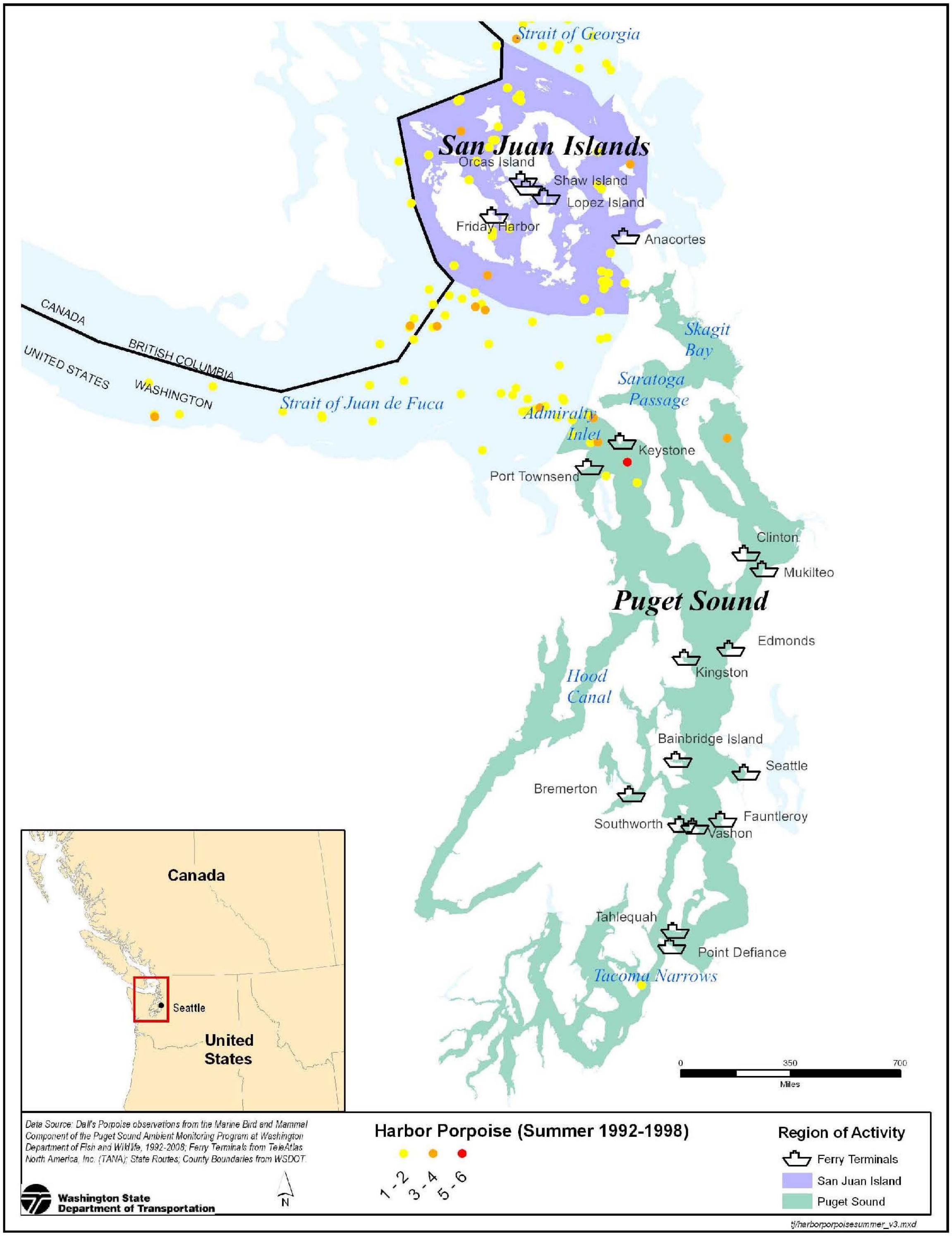

Figure 3-1. Harbor Porpoise Summer Sightings (groups)

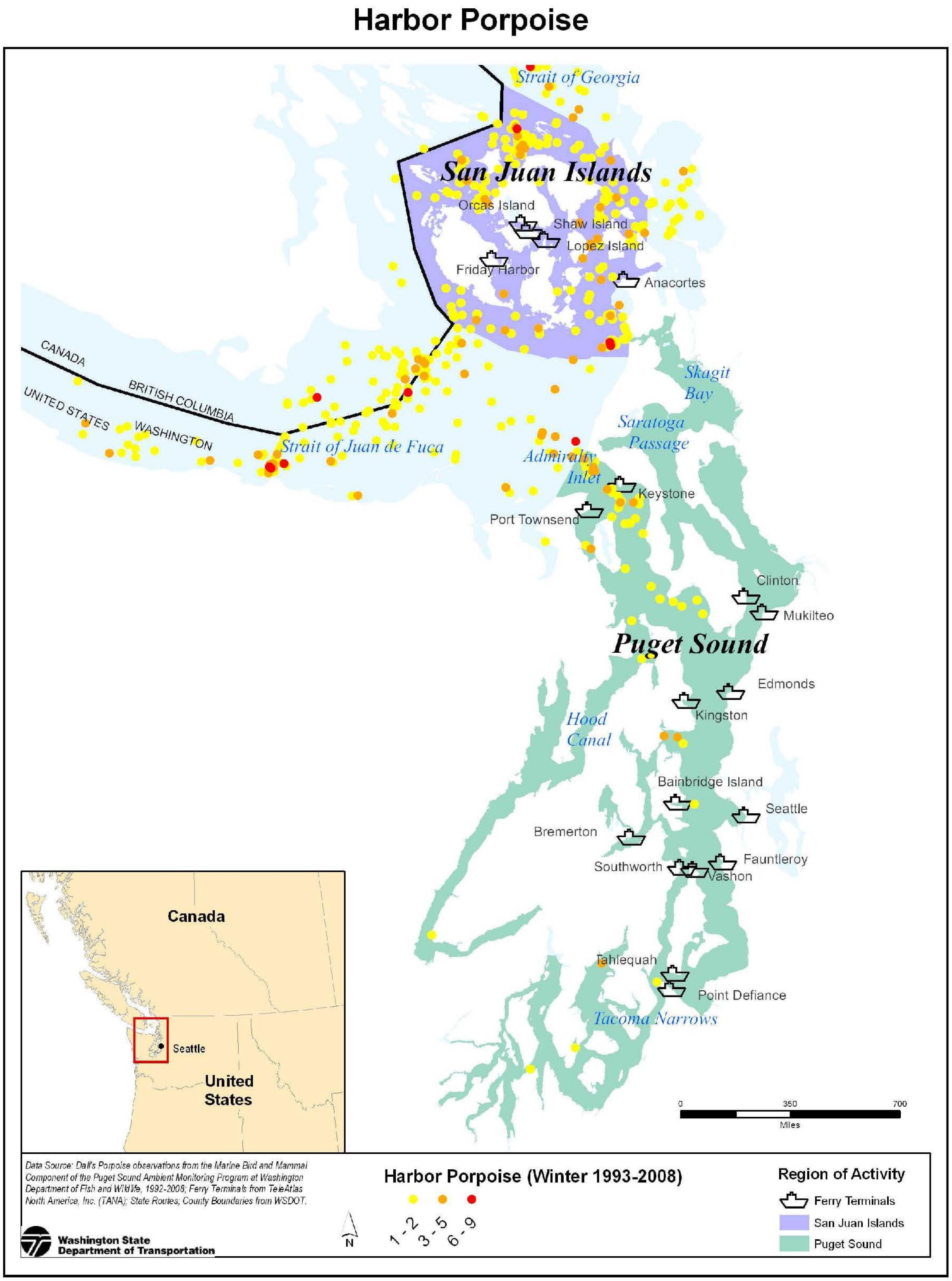

Figure 3-2. Harbor Porpoise Winter Sightings (groups)

3.3.2.1 Numbers

The California, Oregon, and Washington stock mean abundance estimate of Dall's porpoises based on 2001 and 2005 ship surveys is 57,549 (Barlow 2003; Forney 2007). 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. In 1994, Calambokidis and Baird (1994) estimated the Juan de Fuca population at 3,015 animals and the San Juan Island population at about 133 animals. More recently, Calambokidis et al. (1997) estimated that 900 animals annually inhabited Washington's inland waters. Prior to the 1940s, Dall's porpoises were not reported in Puget Sound.

3.3.2.2 Status

Dall's porpoise are not listed under the ESA and is classified as non-depleted under the MMPA.

3.3.2.3 Distribution

Dall's porpoises are migratory and appear to have predictable seasonal movements driven by changes in oceanographic conditions (Green et al. 1992, 1993). Despite their migrations, Dall's porpoises occur in all areas of inland Washington at all times of year (J. Calambokidis pers. comm. 2006), but with different distributions throughout Puget Sound from winter to summer (Figures 3-3 and 3-4). All of these movements between the San Juan Islands and Puget Sound would include movements past Port Townsend via Admiralty Inlet, especially during the winter when Dall's porpoises are most abundant in Puget Sound (D. Nysewander et al. 2005; WDFW 2008).

3.3.3 Pacific White-sided Dolphin

Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) are divided into northern and southern stocks comprising two discrete, non-contiguous areas: 1) waters off California, Oregon, and Washington; and 2) Alaskan waters (Carretta et al. 2007b). Pacific white-sided dolphins are occasionally seen in the northernmost part of the Strait of Georgia and in western Strait of Juan de Fuca, but are generally only rare visitors to this area (Calambokidis and Baird 1994). This species is rarely seen in Puget Sound. Pacific white-sided dolphins have been documented primarily in deep, off-shore areas (Green et al. 1992, 1993; Calambokidis et al. 2004a).

Pacific white-sided dolphins are mid-frequency cetaceans with an estimated auditory bandwidth of 150 Hz to 160 kHz (Southall et al. 2007).

3.3.3.1 Numbers

The California, Oregon, and Washington stock mean abundance estimate based on the two most recent ship surveys is 25,233 Pacific white-sided dolphins (Forney 2007). This abundance estimate is based on two summer/autumn shipboard surveys conducted within 300 nautical miles of the coasts of California, Oregon, and Washington in 2001 and 2005 (Barlow 2003, Forney 2007). Surveys in Oregon and Washington coastal waters resulted in an estimated abundance of 7,645 animals (Forney 2007).

Dall's Porpoise

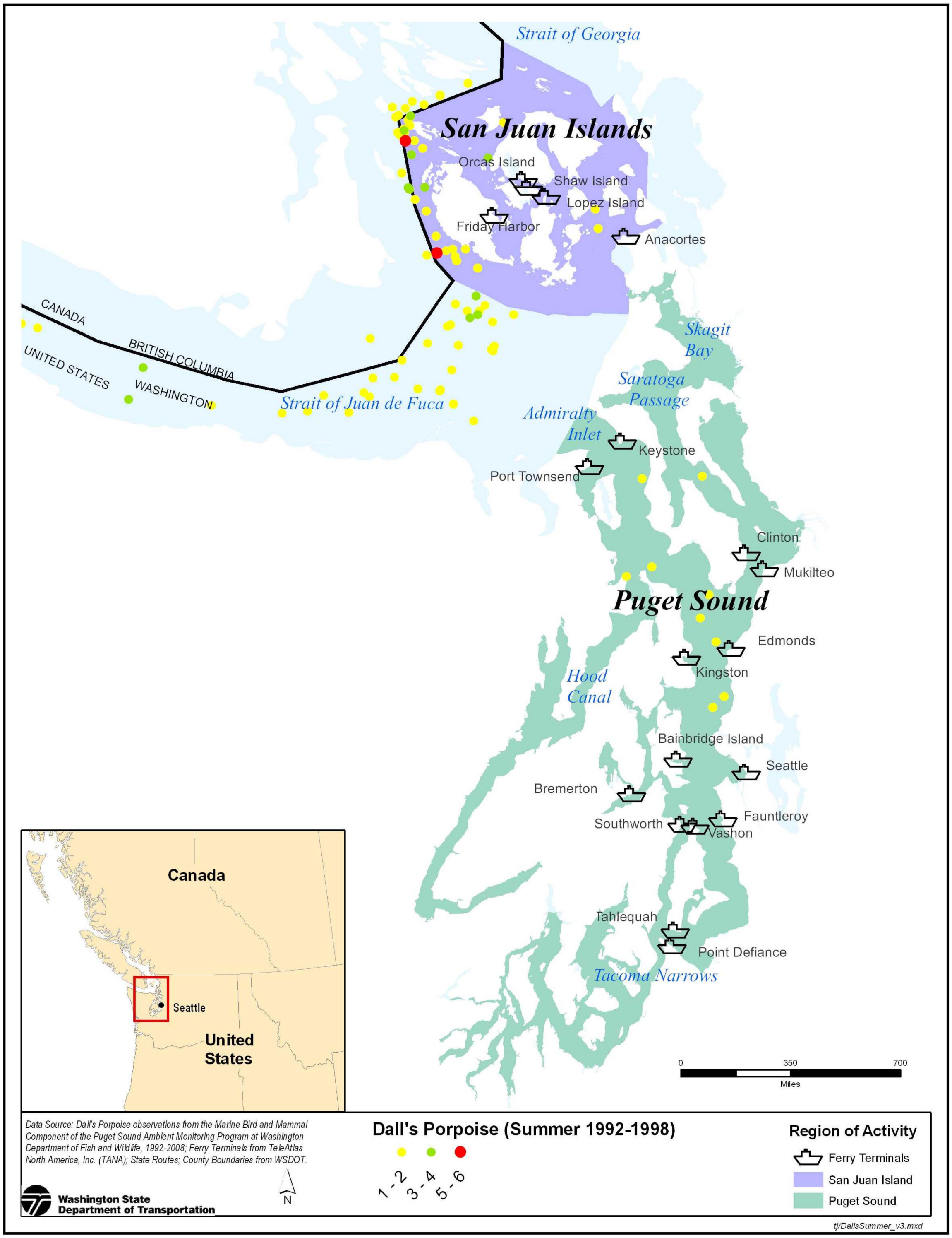

Figure 3-3. Dall's Porpoise Summer Sightings (groups)

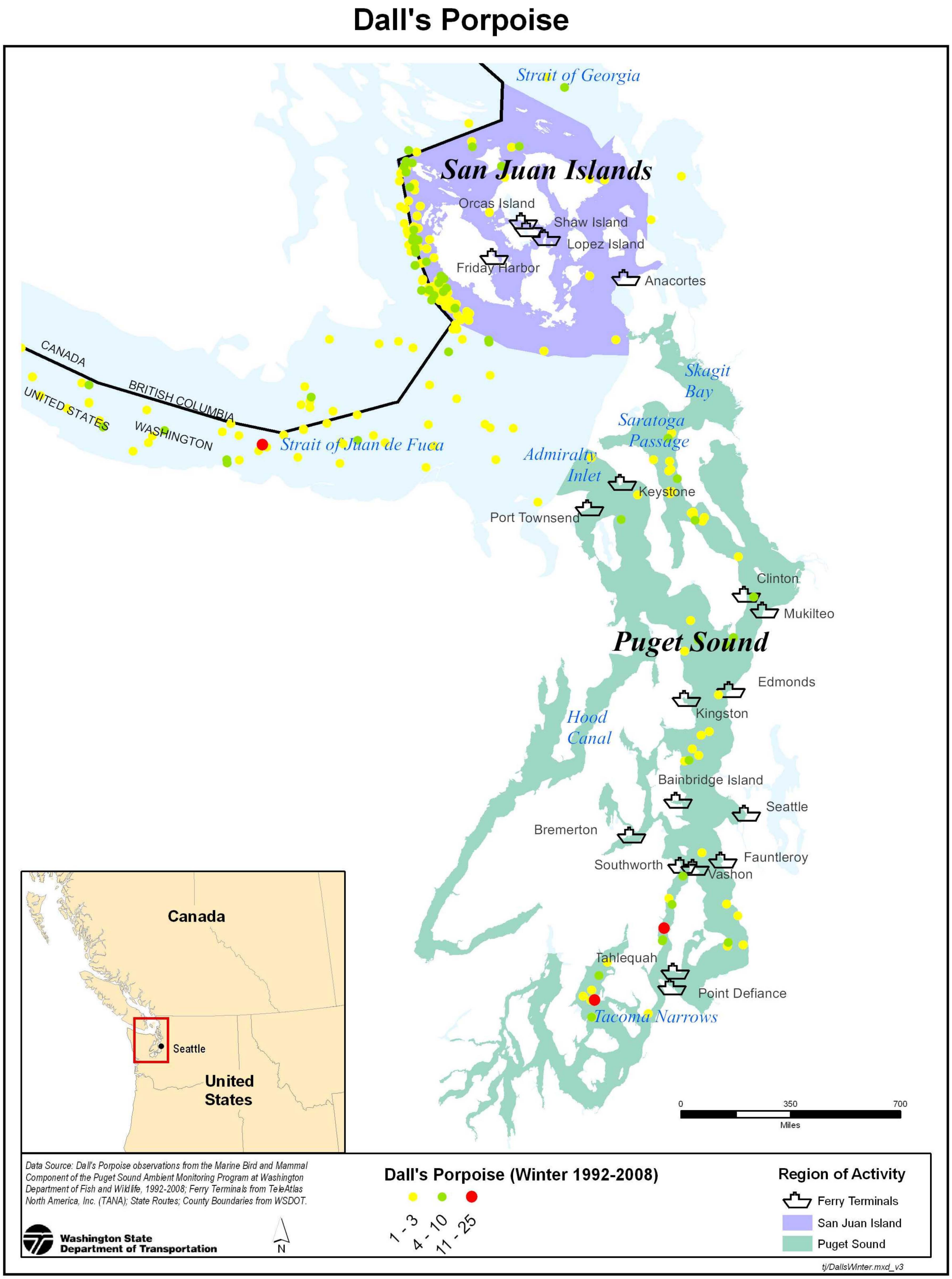

Figure 3-4. Dall's Porpoise Winter Sightings (groups)

Fine-scale surveys in Olympic Coast slope waters and the Olympic Coast National Marine Sanctuary resulted in an estimated abundance of 1,196 and 1,432 animals, respectively (Forney 2007), but there are no population estimates for Washington's inland waters. During aerial surveys of Washington inland waters conducted under WDFW's PSAMP program between 1992 and 2008, only a single group of three Pacific white-sided dolphins was observed (summer 1995 in the Strait of Juan de Fuca), although Osborne et al. (1988) states they are regularly reported in the Strait of Juan de Fuca and Haro Strait. There are few records for Puget Sound.

3.3.3.2 Status

Pacific white-sided dolphins are not listed under the ESA and are classified as non-depleted under the MMPA.

3.3.3.3 Distribution

Sighting patterns from aerial and shipboard surveys conducted in California, Oregon, and Washington at different times of the year (Green et al. 1992, 1993; Barlow 1995; Forney et al. 1995) suggest seasonal north-south movements, with animals found primarily off California during the colder water months and shifting northward into Oregon and Washington as water temperatures increase in late spring and summer (Green et al. 1992). Pacific white-sided dolphins have been reported to be regular summer and fall inhabitants of the Strait of Juan de Fuca and San Juan Islands (specifically Haro Strait) (Osborne et al. 1988), but extremely rare in Puget Sound. The Pacific white-sided dolphin is primarily a pelagic species that feeds along the continental slope or the shelf edge (Green et al. 1993; Calambokidis et al. 2004a).

3.3.4 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 than 10 individuals), less structured pods.

One stock of 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 (Angliss and Outlaw 2007). 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).

Two stocks of resident killer whales occur in Washington State: the Southern Resident 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 (Ford et al. 2000). 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. The southern residents forage primarily on salmon, with Chinook salmon considered the major prey in the Puget Sound region in late spring through the fall (NMFS 2008a). 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 FR 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 FR 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 (Krahn et al. 2004). Noise effects may include altered prey movements and foraging efficiency, masking of whale calls, and temporary hearing impairment (Krahn et al. 2004).

3.3.4.1 Numbers

West Coast Transient Stock

The West Coast Transient stock, which includes individuals from California to southeastern Alaska, was estimated to have a minimum of 314 individuals (including animals identified in

Canada) based on whales catalogued by photo identification (Angliss and Outlaw 2007). In addition, another 30 individuals were provisionally classified as transients in this stock. Unlike Southern Residents, re-sighting transients is more infrequent, and therefore, the population estimate was conservative based on individually identified animals (Angliss and Outlaw 2007).

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 population's biological removal rate, which is estimated at 3.1 animals.

Southern Resident Stock

The Southern Resident stock was first recorded in a census in 1974, 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 2011, the population collectively numbers 86 individuals: J pod has 26 members, K pod has 19 members, and L pod has 41 members (Center for Whale Research 2011).

The Southern Resident stock has declined in the past 10 years 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).

The estimated annual level of human-caused mortality and serious injury is 0.2 animals per year, which exceeds the PBR of 0.18 animals and reflects a vessel strike of one animal every 5 years (Carretta et al. 2007b).

3.3.4.2 Status

Killer whales are protected under the MMPA of 1972. 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 (3.1), the stock is not classified as strategic.

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 Southern Resident 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 Southern Resident killer whale DPS (71 FR 69054). Both Puget Sound and the San Juan Islands are designated as core areas of critical habitat under the ESA, but areas less than 20 feet deep (most of the Port Townsend Ferry Terminal trestle) are not designated as critical habitat (71 FR 69054). A final recovery plan for southern residents 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.

3.3.4.3 Distribution

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

West Coast Transient Stock

The West Coast Transient stock occurs in California, Oregon, Washington, British Columbia, and southeastern Alaskan waters. In the activity area, small groups of one to five individuals are sighted intermittently throughout the year. Within the inland waters, they may frequent areas near seal rookeries when pups are weaned (Baird and Dill 1995).

Southern Resident Stock

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 3-5). 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).

3.3.4.4 Seasonal Distribution

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

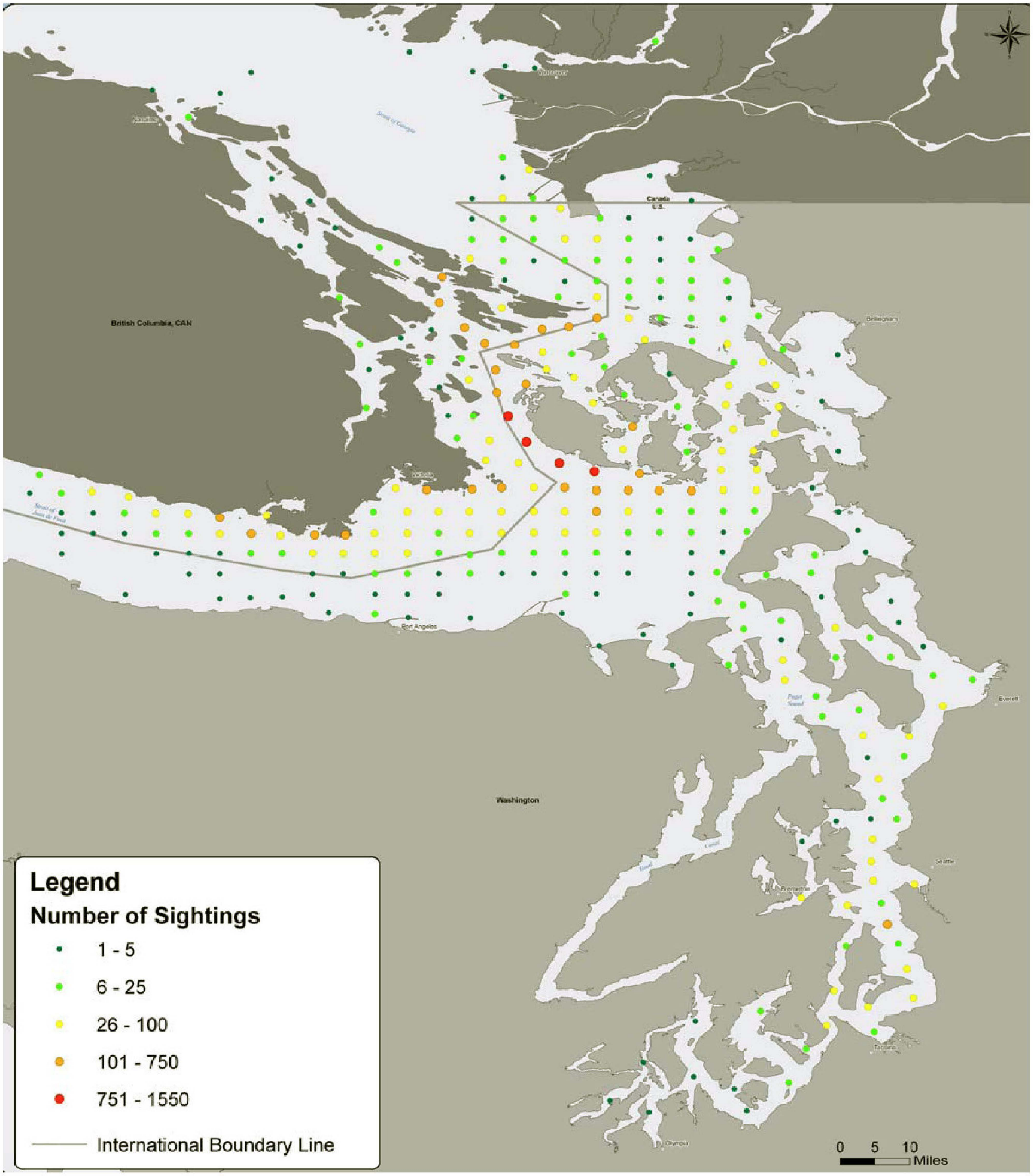

Figure from the Recovery Plan for Southern Resident Killer Whales (NMFS 2008).

Figure 3-5. Distribution of Southern Resident killer whale sightings (groups), 1990–2005

Fall/Winter Distribution

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

The Friday Harbor Whale Museum keeps a database of verified marine mammal sightings by location quadrants. Between 1990 and 2005 an average of 1.75 killer whale group sightings were annually reported for Quad 357 (which includes Port Townsend), with most sightings (primarily of J Pod) occurring between September and December, and March. Based on this information, the possibility of encountering killer whales during the project work window is very low, although encountering a single group is possible.

3.3.5 Gray Whale

Gray whales are members of baleen whales (Mysticete). The North Pacific gray whale (*Eschrichtius robustus*) stock is divided into two distinct geographically isolated stocks: eastern and western “Korean” (Rice et al. 1984; Angliss and Outlaw 2007). 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; Orca Network 2011).

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

3.3.5.1 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). After listing of the species under the ESA in 1970, the number of gray whales increased dramatically resulting in their delisting in 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).

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). Forty-eight individual gray whales were observed in Puget Sound and Hood Canal in 2004 and 2005 (Calambokidis 2007). 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).

3.3.5.2 Status

The Eastern North Pacific stock of gray whales was removed from listing under the ESA in 1994 after a 5-year review by NOAA Fisheries (Angliss and Outlaw 2007). 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.

3.3.5.3 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 very 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 work window of October 1 through February 15 (Table 3-2). The average tenure within Washington inland waters is 47 days and the longest stay was 112 days (J. Calambokidis pers. comm. 2007).

Table 3-2. Gray Whale Observations per Month between January 2005 and July 2011

Month	San Juan Islands	Northern Puget Sound	Central Puget Sound	Southern Puget Sound
		South of Admiralty Inlet to the Edmonds to Kingston ferry route	South of the Edmonds to Kingston ferry route, to the Point Defiance to Tahlequah ferry route	South of the Point Defiance to Tahlequah route
January	3	9	5	
February		29	1	2
March	11	209	19	6
April	19	289	13	15
May	17	145	11	2
June	21	69	1	
July	7	22	3	
August	4	15		
September	4	5		1
October	3	3	1	
November	2	2	1	
December	1	5	6	7

Source: Orca Network 2011.

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, 2002). In northern Puget Sound between Admiralty Inlet and the Edmonds/Kingston Ferry route, sightings of gray whales are more common and regular (Calambokidis et al. 1994, Orca Network 2011), although most all these sightings occur between March and May, outside the work window (Table 3-2). Gray whales are much less common in the vicinity of Port Townsend between October 1 and February 15 when the proposed transfer span replacement is likely to occur (Table 3-2).

3.3.6 Humpback Whale

Humpback whales (*Megaptera novaeangliae*) are wide-ranging baleen whales that can be found virtually worldwide. They summer in temperate and polar waters for feeding, and winter in tropical waters for mating and calving. Humpbacks are vulnerable to whaling due to their tendency to feed in near shore areas. Recent studies have indicated sufficient evidence to suggest that there are three distinct stocks of humpback whale in the North Pacific: Eastern North Pacific, Central North Pacific, and Western North Pacific (NMFS 1991; Carretta et al. 2007a). The Eastern North Pacific stock calve and mate in coastal Central America and Mexico and migrate 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 Eastern North Pacific stock occurs in breeding areas (Carretta et al. 2007a). Few humpback whales have been 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 3.3.5).

3.3.6.1 Numbers

Whaling statistics estimate that prior to 1905, the population in the North Pacific was approximately 15,000 (Rice 1978), but by 1966 the population was reduced by whaling to 1,200 to 1,400 (Gambell 1976; Johnson and Wolman 1984). In the 1990s the abundance of North Pacific humpback whales was estimated at 6,000 (Calambokidis et al. 1997). Current estimates indicated that the total abundance is just over 18,000 individuals (Calambokidis et al. 2008). The majority of the population (~9,000) winter in Hawaiian waters and feed (~6,000 to 14,000) in the Bering Sea and Aleutians (Calambokidis et al. 2008). New observations of Eastern North Pacific whales are photographically identified regularly, indicating that whales from other areas and/or stocks are immigrating to the Eastern North Pacific stock (Carretta et al. 2007a). Recent estimates of the Eastern North Pacific stock indicate that the population is between 1,100 and 1,300 individuals (Carretta et al. 2007a; Calambokidis et al. 2008). Abundance estimates for Washington and southern British Columbia are less than 500 (Calambokidis et al. 2008); estimates for inland Washington waters including Puget Sound are fewer. Vessel surveys in

Washington coastal and inland waters between 1995 and 2000 estimated around 100 individuals (Calambokidis et al. 2008).

3.3.6.2 Status

Humpback whales were listed as endangered under the ESA in 1970. A recovery plan was adopted in 1991. Under the MMPA, the Eastern North Pacific stock is listed as depleted and strategic (Carretta et al. 2007a).

3.3.6.3 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 time 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 only six individuals south of Admiralty Inlet. However, between January 2005 and July 2011, the Orca Network logged 69 sightings in these waters (Table 3-3). Still, only three of these 69 sightings occurred between October and January when the bulk of the pile driving activity will occur. Thus, while humpback whales have been recorded passing through Admiralty Inlet, past Port Townsend, during the winter months, the event is rare enough that WSF doesn't expect them to occur in the project vicinity during the work window.

Table 3-3. Humpback Whale Observations per Month between January 2005 and July 2011

Month	San Juan Islands	Northern Puget Sound	Central Puget Sound	Southern Puget Sound
		South of Admiralty Inlet to the Edmonds to Kingston ferry route	South of the Edmonds to Kingston ferry route, to the Point Defiance to Tahlequah ferry route	South of the Point Defiance to Tahlequah route
January				
February	2	6	1	
March				
April		8		
May	3	2	2	11
June	11	4	2	8
July	4	4	5	
August	1			
September	2			
October	3	2		
November	8		2	
December	3		1	

Source: Orca Network 2011.

3.3.7 Minke Whale

Worldwide, minke whales are one of the most abundant whales (Calambokidis and Baird 1994). The northern minke whale (*Balaenoptera acutorostra*) is separated into two distinct subspecies: the Northern Pacific (*B. a. scammoni*) and the Northern Atlantic (*B. a. acutorostrata*). Within the Northern Pacific subspecies, there are three stocks of minke whale recognized: the Sea of Japan/East China Sea, the western Pacific, and the "remainder" of the Pacific (Carretta et al. 2007b). Within U.S. waters, the Northern Pacific stock is broken into three management stocks: the Alaskan stock, California/Oregon/Washington stock, 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).

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, minke whales are low-frequency cetaceans. Information on hearing bandwidths for baleen whales is presented under gray whales (Section 3.3.5).

3.3.7.1 Numbers

Information on minke whale population and abundance is limited due to difficulty in detection (Green et al. 1991). Conducting surveys for the minke whale is difficult because of their low profiles, indistinct blows, and tendency to occur as single individuals (Green et al. 1992). The total population size for the entire North Pacific is unknown (Calambokidis and Baird 1994; Carretta et al. 2007b). Some estimates indicate as many as 9,000 individuals reside in the North Pacific (Wada 1976; Green et al. 1992), but this number is uncertain (Calambokidis and Baird 1994). The number of minke whales in the California/Oregon/Washington stock is estimated between 500 and 1,015 individuals (Barlow 2003; Carretta et al. 2007b; NMFS 2008b). Over a 10-year period, 30 individuals were photographically identified in the transboundary 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).

3.3.7.2 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).

3.3.7.3 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. Infrequent observations occur in Puget Sound south of Admiralty Inlet (Orca Network 2011). Between January 2005 and July 2011, 50 observations of minke whales were recorded with Orca Network from Admiralty Inlet to the southern tip of Puget Sound (Table 3-4). The majority of these sightings (44) occurred in Admiralty Inlet near the Coupeville/Port Townsend ferry route or in the Saratoga Passage near the Clinton/Mukilteo ferry route (Orca Network 2011), and none of these sightings occurred in December and January. Although likely rare, it is possible that minke whales could be encountered at Port Townsend during the work window.

Table 3-4. Minke Whale Observations per Month between January 2005 and July 2011

Month	San Juan Islands	Northern Puget Sound	Central Puget Sound	Southern Puget Sound
		South of Admiralty Inlet to the Edmonds to Kingston ferry route	South of the Edmonds to Kingston ferry route, to the Point Defiance to Tahlequah ferry route	South of the Point Defiance to Tahlequah route
January	1			
February	2	2		
March	5	1	1	
April	7	11	1	
May	4	5	1	
June	26	5		2
July	12			
August	37	4	2	1
September	25	4		
October	10	4		3
November	1	3		
December	3			

Source: Orca Network 2011.

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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 for ease of writing and reading. Each requested 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 (B. Norberg pers. comm. 2007a).

5.1 Incidental Take Authorization Request

Under Section 101 (a)(5)(D) of the MMPA, WSF requests an IHA from October 1, 2012 through February 15, 2013 for Level B incidental take (behavioral harassment) of the marine mammals described within this application during transfer span replacement activities at the Port Townsend ferry terminal. Specifically, the requested authorization is for incidental harassment of any marine mammal that might enter the 120 dB ZOI during active vibratory hammer activity or the 160 dB ZOI during active impact hammering. Monitoring of an established safety zone will ensure that no Level A take occurs from marine mammals entering the 180 dB (cetaceans) or 190 dB (pinnipeds) ZOIs.

The scheduled pile-driving activities discussed in this application will occur between October 1, 2012 and February 15, 2013.

5.2 Method of Incidental Taking

The method of incidental take is Level B acoustical harassment of any non-listed marine mammal occurring within the 120 dB isopleth during vibratory pile driving and within the 160 dB contour 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 coordination, safety zone establishment, visual monitoring, and shut-down mitigation measures outlined in Section 11.2.4, Marine Mammal Monitoring, all construction activities included in this IHA application are only expected to incidentally take by Level B acoustical harassment small numbers of harbor seals, northern elephant seals, California sea lions, Steller sea lions, harbor porpoises, Dall's porpoises, white-sided dolphins, killer whales, gray whales, minke whales, and humpback whales. As part of the mitigation measures, WSF has committed to shutting down pile-driving activities for any marine mammal approaching the Level A ZOI, thereby eliminating any incidental injury takes of these species.

With the exception of harbor seals, 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 are expected to forage and haulout in Port Townsend Bay with any frequency and could be exposed multiple times during a project (Jeffries 2000).

6.1 Estimated Duration of Pile Driving

As mentioned previously in Section 2.0, Dates, Duration, and Region of Activity, a worst-case scenario assumes that it may take 4 days to remove the existing piles and 11 days to install the new piles (Table 2-1). The maximum total number of hours of pile removal activity is about 12 hours, and pile-driving activity is about 10 hours (averaging about 2 hours of active pile driving for each construction day). The actual number of hours is expected to be less.

6.2 Estimated Zones of Influence

Distances to the various NMFS thresholds for Level A (injurious) and B (harassment) take for each type of pile driving (vibratory and impact) were estimated and presented in Section 1.6.6, Attenuation to NMFS Thresholds. From these distances were calculated the various ZOIs or area ensonified by sounds at or greater than threshold (Figure 1-7). For Level A thresholds, the estimated distance to the 180 dB contour was 22 m for impact hammering, which equates to about a 1,520 square meter ZOI. This area is also the shut-down safety zones that will be monitored to ensure no Level A take of any species occurs during impact pile driving. There is no Level A ZOI for vibratory hammering as the source sound levels do not exceed 180 dB (Laughlin 2010).

The distance to the 160 dB isopleth during impact pile driving (the Level B acoustical harassment threshold) was estimated at 465 m, which equates to a ZOI of approximately 0.45 square km considering only half the area is water (see Figure 1-9). The distance to the 120 dB contour Level B acoustical harassment threshold for vibratory pile driving was estimated at 6.8 km, representing approximately 42 square km in water (see Figure 1-9). Both of these areas will be monitored during construction to estimate actual harassment take of marine mammals.

Airborne noises can affect pinnipeds, especially resting seals hauled out on rocks or sand spits. The airborne 90 dB Level B threshold for hauled out harbor seals was estimated at 81 m, well less than the 3 km distance to the nearest harbor seal haulout site (Kilisut Harbor spit). Also, the airborne noise harassment ZOI is smaller than both the impact and vibratory hammer underwater noise harassment ZOIs, and therefore is encompassed in the underwater noise take estimates.

6.3 Estimated Incidental Takes

Incidental take is estimated for each species by estimating the likelihood of a marine mammal being present within a ZOI during active pile driving. Expected marine mammal presence is determined by past observations and general abundance near the Port Townsend 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., Orca Network, state and federal agencies), opinions from state and federal agencies, and incidental observations from WSF biologists. All estimates are conservative.

6.3.1 Harbor Seal

The harbor seal is the most numerous marine mammal in the vicinity of Port Townsend, occurring year-round. Kilisut Harbor spit (Rat Island), 3 km directly across the bay from Port Townsend, is used by 80 to 120 seals during the summer months (S. Jeffries pers. comm. 2010). Harbor seals haul out much less frequently during the fall and winter (when pile-driving activity is planned to occur) as air temperatures become colder than water temperatures reducing the thermal advantage for hauling out (H. Huber pers. comm. 2010). However, harbor seal haulout sites in Puget Sound are not monitored in the winter, so no confirmation data on winter haulout use at Kilisut Harbor spit are available. During most of the year, all age and sex classes are expected to forage within Port Townsend Bay, except for pups which only occur from June through September.

As mentioned above, 80 to 120 seals per day might use Kilisut Harbor spit (Rat Island) to haul out during the summer, but that number would be greatly reduced in the winter. Marine mammal surveys conducted from Admiralty Head by Snohomish Public Utility District (PUD) contracted biologists (Tollit et al. 2010) during the fall and winter of 2009/2010 recorded about 10 harbor seals per day of survey. Given the total number of pile driving hours is estimated to not exceed 22 hours (Table 2-1), which is equivalent to about three eight-hour work days, then the estimated number of seals that could be harassed is 30. For conservative purposes, however, WSF is requesting authorization to harass 45 harbor seals based on their predilection for embayments.

6.3.2 California Sea Lion

California sea lions are sighted and haul out throughout Puget Sound at all times of the year. However, abundances peak in the late fall and winter, which coincides with proposed periods of project activity. Still, there are no haulout sites within any of the estimated ZOIs. The nearest known haulout site (only occasionally used by California sea lions) is the Marrowstone Island haulout located 7 km southeast of the Port Townsend terminal on the east side of Marrowstone Island. There is a bell buoy located about 1 km north-northwest of Point Hudson that might occasionally be used as a haulout by sea lions, but has not been identified as such to date.

There are no density estimates of California sea lions for the inland waters of Washington. Therefore, a quantitative estimate of take cannot be calculated. Transit of California sea lions through Admiralty Inlet in the fall and winter as they move to concentration areas near Everett and perhaps occasionally investigate the interior waters of Port Townsend is expected, but the total number of California sea lions that will enter Level B ZOIs is estimated to be low.

Tollit et al. (2010) monitored marine mammals passing Admiralty Head (located directly across Admiralty Inlet from Port Townsend) for 88 days between October 2009 and February 2010 as part of a proposed tidal energy study and recorded only six California sea lions. Similarly, WDFW (2008) recorded only eight California sea lions (out of a total of 788 marine mammals) in Admiralty Inlet during Puget Sound-wide vessel surveys between 1992 and 2004. Given that hundreds California sea lions annually overwinter near Everett, and that all of these animals must pass through Admiralty Inlet to enter Puget Sound, movements through Admiralty Inlet may be pulsive and occur primarily before or after the planned pile replacement activity at Port Townsend. Regardless, it is possible for California sea lions to appear at Port Townsend, especially given their inquisitive nature. Since there are no density estimates for California sea lions in Puget Sound, the WSF is estimating that up to six California sea lions could enter the harassment ZOIs leading to Level B take,

6.3.3 Northern Elephant Seal

Almost all elephant seal winter haulout activity occurs north of Admiralty Inlet. Juvenile elephant seals sporadically haul out at Kilisut Harbor spit (Rat Island) in the late summer to molt (S. Jeffries 2008a, 2010), but winter activity at this site is unknown. Wintering elephant seals do haul out at Protection Island 12 km west and Smith and Minor islands 24 km north of Port Townsend, and may forage as far south as Admiralty Inlet. Thus, it is possible that elephant seals might enter Port Townsend Bay during pile-driving activity periods. However, WDFW (2008) did not observe any elephant seals in Admiralty Inlet during vessel-based surveys between 1992 and 2004, and none were recorded off Admiralty Head during 24 days of survey by Tollit et al. (2010) in October 2009.

There are no density estimates for elephant seals in inland marine waters; thus, there is no quantifiable way to estimate take. The WSF presumes it is possible that elephant seals from Protection or Smith/Minor islands might occasionally visit Port Townsend, but the likelihood of an elephant seal entering an active Level B ZOI is remote. Regardless, for the purposes of this IHA application, the WSF is assuming it is possible that very few elephant seals could be taken (Level B acoustical harassment) for each day of active pile driving, especially since they spend large amounts of time below the water surface where they are cannot be detected. Therefore, WSF is requesting authorization for Level B acoustical harassment take of five northern elephant seals.

6.3.4 Steller Sea Lion

Steller sea lions are relatively common in Admiralty Inlet during the winter as they move between the Strait of Juan de Fuca and Puget Sound, and haul out at Craven Rock east of Marrowstone Island, or on channel buoys. During marine mammal monitoring conducted from Admiralty Head, Tollit et al. (2010) recorded nearly 800 Steller sea lions in 88 days or survey, or about 9 Steller sea lions per day. Considering that only 22 hours of pile driving is planned for this proposed project (Table 2-1), equating to about three work days, no more than 27 Steller sea lions are expected to be found inside the Level B acoustical harassment ZOI during pile driving. However, for conservative purposes accounting for vagaries in sea lions distributions, WSF is requesting authorization for Level B acoustical harassment take of 35 animals.

6.3.5 Harbor Porpoise

Harbor porpoises are observed relatively frequently in the Admiralty Inlet area. During surveys conducted from Admiralty Inlet by Snohomish PUD, contract biologists (Tollit et al. 2010) recorded over 1,500 harbor porpoises during 88 days of survey between October 2009 and February 2010, or approximately 17 harbor porpoise per day of survey. If we assume the 22 hours of planned pile driving (Table 2-1) equates to about three work days, then approximately 50 harbor porpoise might be present during actual pile driving periods. WSF is requesting authorization for Level B acoustical harassment take of 50 harbor porpoise.

6.3.6 Dall's Porpoise

In the winter, the PSAMP data sightings indicate that Dall's porpoises, although relatively uncommon, could be encountered throughout Puget Sound (including Admiralty Inlet), but are rare in the marine waters outside Haro Strait in the San Juan Region (Figure 3-4). However, surveys conducted from October 2009 to February 2010 from Admiralty Head by Snohomish PUD, contract biologists failed to positively identify any Dall's porpoise in Admiralty Inlet (although they did identify approximately 1,000 harbor porpoises and about 500 porpoises that could not be identified to species). Given this porpoise's preference for deeper waters (Reeves et al. 2002), as further indicated by their spatial distribution in Puget Sound, Dall's porpoises transiting through Admiralty Inlet are not expected to regularly enter the shallower waters of Port Townsend Bay. However, with the lack of good empirical data it can only be assumed that it is possible that Dall's porpoises might approach close enough to the proposed pile-driving activity to be exposed to the Level B acoustical harassment ZOI. Using a conservative approach, it is assumed that Dall's porpoises might enter the Port Townsend Level B ZOI every five days of operation, or three times during the maximum of 15 days it could take to replace the transfer span. Given an average winter group size of three animals (PSAMP data), WSF is requesting authorization for Level B acoustical harassment take of nine Dall's porpoises.

6.3.7 Pacific White-sided Dolphin

The presence of Pacific white-sided dolphins is rare throughout the inland waters of Washington, and especially in the Puget Sound region. The inland distribution of this species is largely limited to the Strait of Juan de Fuca and Haro Strait on the west side of the San Juan Islands. Because these dolphins appear confined to the deeper channels of the inland waters of Washington, they might occur in Admiralty Inlet but are unlikely to enter the shallower waters of Port Townsend Bay. Further, these dolphins move to warmer temperate waters during the fall and winter, and may be entirely absent from Washington inland waters when most of the dolphin replacement activity at Port Townsend is scheduled. Lacking better evidence on the likelihood of Pacific white-sided dolphins occurring in the vicinity of the proposed project, WSF is requesting authorization for Level B acoustical harassment take of ten Pacific white-sided dolphins, equating to one group, over the 22 hours of pile driving.

6.3.8 Killer Whale

Killer whales are not expected to be present near Port Townsend during the proposed fall/winter activity period. Transient type use of Puget Sound is very rare, and Southern Resident killer whales spend much of the time during the winter near the mouth of the Fraser River. Still, it is possible that a pod of killer whales, especially J pod, could pass through Admiralty Inlet (and within the Level B acoustical harassment ZOI) during this period based on past records, and transient movements are unpredictable. For example, contract biologists (Tollit et al. 2010) working for Snohomish County PUD did record southern resident killer whales pass Admiralty Head three times in October 2009, and one group of transients passed by on one occasion in December (although none likely entered Port Townsend bay). Therefore, WSF is requesting authorization for Level B acoustical harassment take of 30 killer whales, equating to one group of three transients plus the 27 animals comprising J pod.

6.3.9 Gray Whale

Gray whales generally come into Washington inland waters from March through May and sightings during the fall and winter when pile-driving activity will occur are infrequent. However, because gray whales tend to be localized around Admiralty Inlet and Possession Sound, the possibility of a gray whale occurring in the vicinity of Port Townsend during periods of pile-driving activity cannot be discounted. Therefore, WSF is requesting authorization for Level B acoustical harassment take of two gray whales (an average group size).

6.3.10 Humpback Whale

Humpback whales are occasionally observed in Puget Sound during the summer months, but nearly all recent fall and winter sightings are largely confined to the vicinity of the San Juan Islands. It is not expected that humpback whales will be found in the project vicinity during the work window. However, the possibility cannot be fully discounted. Therefore, WSF is requesting authorization for Level B acoustical harassment of one group (two animals) of humpback whales.

6.3.11 Minke Whale

Minke whale sightings in Puget Sound are very rare during the winter. However, of the few sightings in Puget Sound, most have occurred in north Puget Sound in the Admiralty Inlet area. Still, given the rarity of these animals in the winter in general, anything more than a very occasional minke whale transit of Admiralty Inlet is anticipated, with the remote possibility of one or two whales entering Port Townsend Bay during periods of pile-driving activity. Therefore, WSF is requesting authorization for Level B acoustical harassment take of two minke whales.

6.4 Number of Takes for Which Authorization is Requested

The total number of takes for which for Level B acoustical harassment take authorization is requested is 45 harbor seals, 6 California sea lions, 5 northern elephant seals, 35 Steller sea lions, 50 harbor porpoise, 9 Dall's porpoise, 10 Pacific white-sided dolphins, 30 killer whales, 2 gray whales, 2 humpback whales, and 2 minke whales.

7.0 Anticipated Impact on Species or Stocks

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

7.1 Introduction

WSF is proposing to replace the transfer span at the Port Townsend ferry terminal using vibratory hammering and occasional impact hammering over a maximum of 22 hours spread over 15 days (Table 2-1) during the fall and winter of 2012/2013. These activities generate sounds that exceed thresholds considered harming (Level A) or disturbing (Level B) to local marine mammals. However, the mitigation measures proposed for this project, especially the shut-down safety zones, will ensure that there will be no Level A take of any marine mammal.

WSF is requesting authorization for Level B acoustical harassment take of 45 harbor seals, 5 northern elephant seals, 6 California sea lions, 35 Steller sea lions, 50 harbor porpoises, 9 Dall's porpoises, 10 Pacific white-sided dolphins, 30 killer whales, 2 gray whales, 2 humpback whales, and 2 minke whales. These numbers in relation to the overall stock size of each species, and the effect that Level B acoustical harassment could have to individual recruitment or survival within each stock of marine mammal, are discussed in further detail below.

7.2 Harbor Seal

The harbor seal population in inland Washington waters is stable at approximately 14,612 individuals and is considered within its Optimum Sustainable Population level (Jeffries et al. 2003). This application requests incidental taking by Level B acoustical harassment of up to 45 harbor seals occurring in the vicinity of Port Townsend. The majority of these incidental takes would probably occur to harbor seals traveling to and from the Kilisut Harbor spit (Rat Island) haulout site located 3 km across Port Townsend Bay from the ferry terminal. Although the estimate assumes multiple take of a few individuals, not single takes of 45 individuals, the requested number of takes represents only about 0.3 percent of the harbor seal inland Washington population. Further, local seals are accustomed to disturbance by local recreation activities. Thus, the small number of incidental takes of harbor seals by Level B acoustical harassment to this large, stable population is not expected to impact recruitment or survival and therefore, will have a negligible impact on the stock.

7.3 California Sea Lion

The U.S. stock was estimated to be 238,000 in the 2006 SAR and may be at carrying capacity, although more data are needed to verify that determination (Carretta et al. 2007a). This application requests incidental taking by Level B acoustical harassment of up to five California sea lions. No California sea lion haulouts are present within any of the estimated ZOIs, so incidental takes will only occur to individuals transiting a 160 dB (impact) or 120 dB (vibratory) Level B acoustical harassment isopleths and therefore, will be for a short duration. Incidental takes are only expected to result in short-term changes in behavior and potentially temporary threshold shift (TTS). These takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the U.S. stock.

7.4 Northern Elephant Seal

The California stock of northern elephant seals is considered to be a stable population with a population estimate of approximately 101,000 individuals (Carretta et al. 2007a). This application requests incidental taking by Level B acoustical harassment of up to five northern elephant seals (or 0.005 percent of the stock). No winter northern elephant seal haulouts are present within any ZOI, so incidental takes will only occur to individuals transiting a Level B acoustical harassment ZOI and therefore, will be for a short duration. Incidental takes are only expected to result in short-term changes in behavior and potentially TTS. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the California stock.

7.5 Steller Sea Lion

An estimate 1,000 to 2,000 Steller sea lions enter the Strait of Juan de Fuca during the fall months, with some number passing through Admiralty Inlet into Puget Sound. This application requests incidental taking by Level B acoustical harassment of up to 35 Steller sea lions, which represents 1.75 to 3.5 percent of that population, but only 0.07 percent of the stock (~48,500) as a whole. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the stock.

7.6 Harbor Porpoise

Harbor porpoises are relatively common in Admiralty Inlet, and as their name suggests they frequently enter shallow water embayments such as Port Townsend Bay. This application requests incidental taking by Level B acoustical harassment of up to 50 harbor porpoise. Presumably, this number would represent multiple takes of a smaller number of individuals, which represent a small fraction (0.5 percent) of the 10,632 harbor porpoise most recently estimated for the Washington Inland Waters stock (Carretta et al. 2007b). Incidental takes are only expected to result in short-term changes in behavior. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the Washington Inland Waters stock.

7.7 Dall's Porpoise

The California, Oregon, and Washington stock mean abundance estimate based on 2001 ship surveys is 57,000 individuals (Barlow 2003; Forney 2007). This application requests authorization of incidental taking by Level B acoustical harassment of up to nine individuals. Incidental takes are only expected to result in short-term changes in behavior. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the California, Oregon, and Washington stock.

7.8 Pacific White-sided Dolphin

This application requests incidental taking by Level B acoustical harassment of up to 10 Pacific white-sided dolphins (essentially one group) represents a very small fraction (0.04 percent) of the 25,233 individuals estimated to comprise the California, Oregon, and Washington stock (Forney 2007). But even this low take request is conservative based on the rarity of the dolphin in the Admiralty Inlet region, especially during the winter, but it does recognize that the presence of at least one group of dolphins in the vicinity of the Port Townsend project is possible. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the California, Oregon, and Washington stock.

7.9 Killer Whale

This application requests incidental taking by Level B acoustical harassment of up to 30 killer whales. While this represents a significant fraction of the Salish Sea killer whale population, this number is elevated simply because Southern Resident killer whales travel in large groups. Killer whales are unlikely to occur in the project vicinity during pile driving, but if they were to appear, they might enter the Level B ZOI as a full group, thus necessitating the need for a larger authorization. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the Southern Resident or West Coast Transient stock.

7.10 Gray Whale

Gray whales entering the Level B ZOI during pile driving would be considered a very rare event. This application requests incidental taking by Level B acoustical harassment of up to two gray whales, which represents a very small fraction of the more than 20,000 gray whales comprising the Eastern North Pacific stock (Rugh et al. 2008). These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the Eastern North Pacific stock.

7.11 Humpback Whale

As with gray whales, humpback whales entering the Level B ZOI during pile driving would be considered a very rare event. This application requests incidental taking by Level B acoustical harassment of up to two animals (one group) is a safety measure should humpback whales unexpectedly appear. These two animals represent only 0.2 percent of the approximate 1,100 animals found in this stock. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the Eastern North Pacific stock.

7.12 Minke Whale

As with gray and humpback whales, minke whales entering the Level B ZOI during pile driving would be considered a very rare event. This application requests incidental taking by Level B acoustical harassment of up to two minke whales, which comprises only 0.2 percent of the approximately 1,000 minke whales found in this stock. These incidental takes would be unlikely to have any impact on stock recruitment or survival and therefore, would have a negligible impact on the California/Oregon/Washington stock.

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8.0 Anticipated Impact on Subsistence

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

8.1 Subsistence Harvests by Northwest Treaty Indian Tribes

Historically, Pacific Northwest Native American tribes were known to hunt several species of marine mammals including, but not limited to harbor seals, Steller sea lions, northern fur seals, gray whales, and humpback whales (B. Norberg pers. comm. 2007b). More recently, several Pacific Northwest Native American tribes have promulgated[1] tribal regulations allowing tribal members to exercise treaty rights for subsistence harvest of harbor seals and California sea lions (Carretta et al. 2007a). The Makah Indian Tribe (Makah) has specifically passed hunting regulations for gray whales (B. Norberg pers. comm. 2007b). However, the directed take of marine mammals (not just gray whales) for ceremonial and/or subsistence purposes was enjoined[2] by the Ninth Circuit Court of Appeals in rulings against the Makah in 2002, 2003, and 2004 (B. Norberg pers. comm. 2007b; NMFS 2007). Currently, there are no authorized ceremonial and/or subsistence hunts for marine mammals in Puget Sound or the San Juan Islands (B. Norberg pers. comm. 2007b) with the possible exception of some coastal tribes who may allow a small number of directed take for subsistence purposes.

8.1.1 Harbor Seals

The U.S. Pacific Marine Mammal Stock Assessments for 2006 (Carretta et al. 2007a) reports that there have been few takes of harbor seals from directed tribal subsistence hunts. They state that a few seals may have been taken in directed hunts because tribal fishers are able to use seals caught incidental to fishing operations in the northern Washington marine set gillnet and Washington Puget Sound Region treaty salmon gillnet fisheries for their subsistence needs.

No impacts on the availability of the species or stocks to the Pacific Northwest treaty tribes are expected as a result of the proposed project.

8.1.2 California Sea Lions

Current estimates of annual subsistence take are zero to two animals per year (Carretta et al. 2007a).

No impacts on the availability of the species or stock to the Pacific Northwest treaty tribes are expected as a result of the proposed project.

8.1.3 Gray Whales

The Makah ceased whaling in the 1920s after commercial whaling decimated the Eastern North Pacific gray whale population (NMFS 2007). On June 16, 1994, gray whales were removed from

[1] To make known by open declaration; publish; proclaim formally or put into operation (a law, decree of a court, etc.).

[2] To prohibit or forbid.

the endangered species list after a determination that the population has "recovered to near its estimated original population size and is neither in danger of extinction throughout all or a significant portion of its range, nor likely to again become endangered within the foreseeable future throughout all or a significant portion of its range" (59 FR 31094). On May 5, 1995, the Makah formally notified the U.S. Government of its interest in resuming treaty ceremonial and subsistence harvest of Eastern North Pacific gray whales, asking the Department of Commerce to represent them in seeking approval from the International Whaling Commission (IWC) for an annual quota (NMFS 2007). On October 18, 1997, the IWC approved an aboriginal subsistence quota of 620 Eastern North Pacific gray whales (with an annual cap of 140) for the Russian Checotah people and the Makah (Angliss and Outlaw 2007; NMFS 2007). The Makah successfully hunted one Eastern North Pacific gray whale on May 17, 1999 (NMFS 2005a).

Whaling by the Makah was halted on December 20, 2002, when the Ninth Circuit Court of Appeals ruled that an environmental impact statement rather than an environmental assessment should have been prepared under the National Environmental Protection Act and that the Makah must comply with the process prescribed in the MMPA for authorizing take of marine mammals otherwise prohibited by a moratorium (NMFS 2007). This was further upheld by rulings in 2003 and 2004 (NMFS 2007). At a 2007 meeting of the IWC (59th Annual Meeting in Anchorage, Alaska), an aboriginal subsistence quota for gray whales was again approved for natives in Russia and 20 whales (four per year for 5 years) for the Makah (Norberg pers. comm. 2007b), but under the Ninth Circuit Court ruling the Makah must first obtain a waiver of the MMPA take moratorium before harvesting under their IWC quota (Norberg pers. comm. 2007b). In February 2005, NMFS received a request from the Makah for a waiver of the MMPA take moratorium to resume limited hunting of Eastern North Pacific gray whales. A draft environmental impact statement to examine the alternatives for a decision to approve or deny the waiver was released for public comment on May 9, 2008, but to date, no final ruling has been made and the future of the Makah whale hunt remains in limbo.

Gray whales migrate north and south along the coast of Washington and there is a regular group of gray whales that enter Puget Sound waters (specifically the Saratoga passage on the eastern side of Whidbey Island) to feed during early spring and summer (March through May/June) (Orca Network 2011). However, any future hunts by the Makah would occur along the outer coast of Washington, not in the vicinity of Port Townsend. Therefore, the proposed activities would not interfere with the hunt. Furthermore, Port Townsend in-water work will take place between October 1, 2012 and February 15, 2013. Therefore, the proposed activities will not interfere with gray whales that may enter or leave Puget Sound from March through May/June.

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 producing temporary disturbance primarily through increases in air noise and in-water sound pressure levels from pile driving. Other potential temporary changes are water quality (primarily through 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

In-air noise from impact pile driving is estimated to reach the behavioral threshold at 81 m for harbor seals and 17 m for all other pinnipeds. No haulout sites are within the in-air disturbance threshold distances. Therefore, no disturbance to hauled-out pinnipeds is expected, but terrestrial noise-disturbance may disturb pinnipeds while surfacing when swimming within the threshold distances. In-air noise from non-pile driving construction activities is not expected to cause in-air disturbance to pinnipeds, because the Port Townsend 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 underwater noise injury thresholds of 190 dB and 180 dB for pinnipeds and cetaceans, respectively, and a disturbance threshold of 160 dB for both pinnipeds and cetaceans for impulsive sounds, and 120 dB for both animal groups for continuous noise sources. The only construction activity expected to reach the injury threshold is the impact driving of steel piles, although the disturbance threshold will be reached during both impact and vibratory pile driving. The distance to these thresholds is described in Section 2, Dates, Duration, and Region of Activity.

For cetaceans, sound is perhaps the most critical sensory pathway of information. Odontocetes, such as killer whales and dolphins, communicate with each other over short and long distances with a variety of clicks, chirps, squeaks, and whistles. They also use echolocation to find prey and to navigate. Long-term impacts from noise pollution to habitat would not likely show up as noticeable behavioral changes in habitat use, but rather as sensory damage or a gradual reduction in population health.

There are several short-term and long-term effects from noise exposure that may occur to marine mammals including impaired foraging efficiency and its potential effects on movements of prey, as well as 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 whale and pinniped occurrence is for the most part transient near the Port Townsend ferry terminal, and underwater noise impacts are localized and of short duration, any impact on individual marine mammals will be limited.

9.3.1 Potential Sound Pressure Level Impacts on Fish Prey Species

Fish are a primary dietary component of the odontocete and pinniped species listed in this application. Impact driving of steel piles could produce sound pressure waves that could injure and kill small fish (multiple sources as cited in NMFS 2005b). However, vibratory pile driving does not produce the same percussive sound waves that are harmful to fish and has not resulted in any known fish kills at this time (USFWS 2004), and is being employed at Port Townsend partially as a mitigation measure (see Section 11, Mitigation Measures) to limit effects to fish. Vibratory hammer studies by Carlson (1996) in Oregon and Nedwell and Edwards (2003) in the United Kingdom have confirmed that fish are little impacted by this hammering method.

Impact hammering of piles at Port Townsend is planned only to “proof” eight piles to ensure load integrity, or where it might occasionally be needed if the vibratory hammer is not able to seat a pile to depth. The sound pressure levels associated with the impact hammer might be injurious to small fish species, but only within an area of approximately 153 m from the piles, for an estimated one hour and twenty minutes total for proofing of all eight piles (WSF 2011). However, all pile-driving activity will occur outside the fish window, and bubble curtains will be used to attenuate SL sounds during impact pile driving to minimize impacts to prey species. Temporary Turbidity

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

Roni and Weitkamp (1996) monitored water quality parameters during a pier replacement project in Manchester, Washington. The study measured water quality before, during, and after pile removal and pile replacement. 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 construction 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 September 2004, water quality monitoring conducted at the Friday Harbor Ferry Terminal during three pile-removal events showed turbidity levels did not exceed 1 NTU over background conditions and were generally less than 0.5 NTU over 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 Port Townsend terminal to experience turbidity, and any pinnipeds will be transiting the terminal areas and could avoid the localized areas of turbidity. Therefore, the impact from increased turbidity levels is expected to be discountable to marine mammals.

9.4 Water and Sediment Quality Improvements

Removal of the 40 creosote-treated piles (140 tons) at Port Townsend will result in the potential, temporary sediment re-suspension of some of the contaminants associated with creosote, such as the polycyclic aromatic hydrocarbons that cause cancers and mutations. However, the actual removal of the creosote-treated wood piles from the marine environment will result in a long-term improvement in water and sediment quality, meeting the goals of WSF's Creosote Removal Initiative started in 2000. The net impact is a benefit to marine organisms, especially toothed whales and pinnipeds that are high in the food chain and bioaccumulate these toxins. This is especially a concern for long-lived species that spend their entire life in Puget Sound, such as Southern Resident killer whales (NMFS 2008a).

9.5 Passage Obstructions

Pile removal and installation operations at Port Townsend will not obstruct movements of marine mammals in Port Townsend Bay proper. The operations will occur between 90 and 125 m of the Port Townsend shoreline leaving nearly 3 km of the bay width for marine mammals to pass. Further, a construction barge will be used to remove and install the pilings. In a previous concurrence letter for the Vashon Island Dolphin Replacement Project (August 4, 2008), 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 significant effects on marine mammal habitat for the proposed project are underwater noise, water quality effects, and adverse effects on the food supply. The direct loss of habitat available to marine mammals during construction due to noise or water quality impacts and construction activity is expected to be minimal. All marine mammal species utilizing habitat near the terminal are primarily transiting the terminal area, although a harbor seal haulout site does occur 3 km away.

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 (using vibratory hammer over impact hammer, using a bubble curtain while using an impact hammer) and BMPs (operating outside the fish window) to protect salmonids during construction, the proposed project is not expected to have measurable effects on the distribution or abundance of potential marine mammal prey species.

Long-term water quality improvements in Puget Sound will result from WSF's replacement of creosote-treated timber structures with steel pilings. Because many of the marine mammal species potentially present are at the top of the food chain and have a long life expectancy, bioaccumulation of toxins is of high concern. Removal of creosote from the aquatic environment has a beneficial effect on marine mammals.

Passage is not expected to be obstructed as a result of the proposed project submitted under this application. Any temporary obstruction due to barge placement will be localized and limited in duration, and traveling barges are 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 largely within the existing transfer span footprint and is not expected to result in a significant permanent loss or modification of habitat for marine mammals or their food sources. There will be no significant net increase in shading due to the span replacement. The greatest impact on marine mammals associated with the proposed activities will be a temporary loss of habitat due to elevated noise levels and the potential temporary resuspension of sediment toxins (from creosote). 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 removal and installation activities at the Port Townsend 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 pile 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. Noise attenuation mitigation measures and acoustic monitoring continue through the remainder of Section 11.

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.

- 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[3] (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.
- The contractor shall be responsible for the preparation of a Spill Prevention, Control, and Countermeasures (SPCC) plan to be used for the duration of the project. The plan shall be submitted to the Project Engineer prior to the commencement of any construction activities. A copy of the plan with any updates will be maintained at the work site by the contractor.
  - The SPCC plan shall identify construction planning elements, and recognize potential spill sources at the site. The SPCC plan shall outline BMPs, responsive actions in the event of a spill or release, and identify notification and reporting procedures. The SPCC plan shall also outline contractor management elements such as personnel responsibilities, project site security, site inspections, and training.
  - The SPCC will outline what measures shall be taken by the contractor to prevent the release or spread of hazardous materials, either found on site and encountered during construction but not identified in contract documents, or any hazardous materials that the contractor stores, uses, or generates on the construction site during construction activities. These items include, but are not limited to gasoline, oils, and chemicals. Hazardous materials are defined in Revised Code of Washington (RCW) 70.105.010 under "hazardous substance."
  - The contractor shall maintain, at the job site, the applicable spill response equipment and material designated in the SPCC plan.
  - The contractor shall regularly check fuel hoses, oil drums, oil or fuel transfers valves, fittings, etc. for leaks, and shall maintain and store materials properly to prevent spills.

[3] The Washington Hydraulic Code (Chapter 77.55 RCW) requires that any person, organization, or government agency wishing to conduct any construction activity that will use, divert, obstruct, or change the bed or flow of state waters must do so under the terms of a permit (called the Hydraulic Project Approval-HPA) issued by the Washington State Department of Fish and Wildlife.

- 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 Port Townsend Ferry Terminal is July 16 through February 15. Actual construction activities are planned to take place from October 1 through February 15, which would ensure these activities do not coincide with marine mammal breeding seasons.

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 Removal

MMs to be employed during pile removal include:

- A containment boom surrounding the work area will be used during creosote-treated pile removal to contain and collect any floating debris and sheen, provided that the boom does not interfere with operations. The contractor will also retrieve any debris generated during construction and properly disposed of at an approved upland location.
- 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.

- All creosote-treated material, pile stubs, and associated sediments will be disposed of by the contractor in a landfill which meets the liner and leachate standards of the Minimum Functional Standards, Chapter 173-304 WAC. The contractor will provide receipts of disposal to the WSF Project Engineer. Both waste facilities that accept creosote waste in Washington State dispose of the piling in a landfill where they are buried.
- Removed piles, stubs, and associated sediments (if any) shall be contained on a barge. If piles are placed directly on the barge and not in a container, the storage area shall consist of a row of hay or straw bales, or filter fabric, placed around the perimeter of the barge.
- Excess or waste materials will not be disposed of or abandoned waterward of ordinary high water (OHW) or allowed to enter waters of the state, as per WAC 220-110-070. Waste materials will be disposed of in a landfill. Hazardous waste and treated wood waste will be disposed of by the contractor in a landfill which meets the liner and leachate standards of the Minimum Functional Standards, Chapter 173-304 WAC.
- Pilings that break or are already broken below the waterline may be removed by wrapping the piles with a cable or chain and pulling them directly from the sediment with a crane. If this is not possible, they will be removed with a clamshell bucket. To minimize disturbance to bottom sediments and splintering of piling, the contractor will use the minimum size bucket required to pull out piling based on pile depth and substrate. The clamshell bucket will be emptied of piling and debris on a contained barge before it is lowered into the water. If the bucket contains only sediment, the bucket will remain closed and be lowered to the mudline and opened to redeposit the sediment. In some cases (depending on access, location, etc.), piles may be cut below the mudline and the resulting hole backfilled with clean sediment.
- Demolition and construction materials shall not be stored where high tides, wave action, or upland runoff can cause materials to enter surface waters.

11.2.2 Pile Removal and Installation

MMs to be employed during pile removal and installation include:

- The vibratory hammer method will be used to remove timber piles, and install and remove steel piles (temporary steel piles will be removed) to minimize noise levels. An impact hammer will be used only to “proof” eight piles, and if necessary, to seat piles that could not be fully seated by the vibratory hammer.
- Marine mammal coordination, safety zone establishment, monitoring, and shut-down measures will be employed during the impact hammer installation of steel piles. Monitoring during vibratory pile removal and installation will be employed for the Level B ZOI (see Section 11.2.3, Marine Mammal Monitoring).
- A bubble curtain(s) or other noise attenuation device will be employed during all impact installation of steel piles (additional information below in Section 11.2.4, Noise Attenuation).
- Excess or waste materials will not be disposed of or abandoned waterward of OHW/MHHW or allowed to enter waters of the state, as per WAC 220-110-070. Waste materials will be disposed of in a landfill. Hazardous waste and treated wood waste will be disposed of by the

contractor in a landfill which meets the liner and leachate standards of the Minimum Functional Standards, Chapter 173-304 WAC.

- WSF will comply with water quality restrictions imposed by Ecology (Chapter 173-201A WAC), which specifies 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 practical.
- Creosote-treated timber piling shall be replaced with hollow steel piling.
- The contractor will be required to retrieve any floating debris generated during construction. Any debris in the containment boom will be removed by the end of the work day or when the boom is removed, whichever occurs first. Retrieved debris will be disposed of at an upland disposal site. Debris will be disposed of upland.
- Whenever activities that generate sawdust, drill tailings, or wood chips from treated timbers are conducted, tarps or other containment material shall be used to prevent debris from entering the water. If tarps cannot be used (because of the location or type of structure), a containment boom will be placed around the work area to capture debris and cuttings.
- 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.

11.2.3 Marine Mammal Monitoring

11.2.3.1 Coordination

WSF will conduct briefings between the construction supervisors and the crew, marine mammal observer(s), and acoustical monitoring team prior to the start of all pile-driving activity, and when new personnel join the work, to explain responsibilities, communication procedures, 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.

In addition, there is a growing coalition of scientists, educators, and citizens working together to expand a regional hydrophone network in the Salish Sea. The "Salish Sea" is the traditional name for the inland waters of Canada and Washington State, stretching from Puget Sound north to Johnstone Strait, British Columbia. The Salish Sea consists of three natural basins: the Strait of Georgia, Puget Sound, and the Strait of Juan de Fuca. The SeaSound Project of The Whale Museum is an experiment in sharing real-time underwater sound from different "nodes" of the network via the Internet. 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, underwater noise, bottomfish ecology, and local climatic conditions.

There are other hydrophone networks in the region of activity as well. For example, there is a hydrophone at the Port Townsend Marine Science Center located beneath the pier in about 10 m of water. It was deployed in October 2006, and assesses average underwater sound levels and automatically detects unusual sounds. All of 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 marine mammal species, particularly whales, before starting any pile driving.

11.2.3.2 Shut-down Safety Zone Establishment

Prior to the commencement of any steel pile driving, a shut-down safety zone for the Port Townsend Ferry Terminal will be established. For impact pile driving, the shut-down safety zone consists of the 22 m area where the underwater SPLs are anticipated to equal or exceed 180 dB (impulse) for cetaceans. The 190 dB (pinniped) injury isopleth is contained within the 22 m shut-down safety zone. A bubble curtain will be deployed to attenuate SL noise.

For vibratory pile removal and driving, no injury will occur (SL sounds are less than 180 dB), and so will result in a Level B acoustical harassment ZOI only. This zone is calculated to extend to the 120 dB (nonpulse) isopleth for vibratory pile removal and driving. Based on analysis of in-water noise data from the Port Townsend Ferry Terminal test pile project, vibratory pile removal and driving at Port Townsend is expected to reach the 120 dB RMS threshold at approximately 6.8 km (4.2 miles), or sooner (Laughlin 2010).

11.2.3.3 Visual Monitoring and Shut-down Procedures

WSF has developed a monitoring plan that will collect sighting data for each distinct marine mammal species observed during pile driving activities. 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 at all times during pile removal and driving. Qualifications for marine mammal observers include:

- Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance. Use of binoculars may be necessary to correctly identify the target.
- Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience).
- Experience or training in the field identification of marine mammals (cetaceans and pinnipeds)
- Sufficient analytical and writing skills to interpret and report collected marine mammal data.

- Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.
- A college-level education (Bachelors degree or higher) in marine mammal, wildlife, fisheries, or related fields is recommended, but not required.

WSF proposes the following Marine Mammal Monitoring Plan and shut-down procedures for steel impact pile driving:

- To verify the required monitoring distance, the safety zone will be determined by using a range finder or hand-held global positioning system device. The shut-down safety zone will be monitored from a full-view vantage point at the end of the Port Townsend terminal.
- If the safety zone is obscured by fog or poor lighting conditions, pile driving will not be initiated until the entire safety zone is visible.
- The safety zone will be monitored for the presence of marine mammals before, during, and after any pile-driving activity.
- The safety zone will be monitored for 30 minutes prior to initiating the start of pile driving. If marine mammals are present within the safety zone prior to pile driving, the start of pile driving will be delayed until the animal(s) leave the safety zone.
- The 464 m Level B acoustical harassment ZOI will be monitored throughout the time required to impact drive a pile. If a marine mammal is observed entering the 464 m ZOI during impact driving, the animal will be observed to determine if it is approaching the 22 m shut-down safety zone. If the animal is approaching the shut-down safety zone, impact pile driving operations will be discontinued until the animal has moved away from the shut-down safety zone. Impact pile driving will resume only after the marine mammal is determined to have moved outside the shut-down safety zone by a qualified observer or after 15 minutes have elapsed since the last sighting of the marine mammal(s) within the shut-down safety zone.
- If marine mammals are observed, their location within the zone, and their reaction (if any) to pile-driving activities will be documented.
- Monitoring of the safety zone will continue for 20 minutes following the completion of pile driving.

11.2.4 Noise Attenuation

WSF provides bubble curtain performance criteria to the contractor that complies with the NMFS Impact Pile Driving Sound Attenuation Specification – Revised: October 31, 2006. These criteria include:

1. Piling shall be completely engulfed in bubbles over the full depth of the water column at all times when an impact pile driver is in use. Bubble curtains are not required during vibratory pile driving.

2. The lowest bubble ring shall be in contact with the mud line for the full circumference of the ring. The weights attached to the bottom ring shall ensure the 100 percent mud line contact. No parts of the ring or other objects shall prevent the full mud line contact.
3. Air shall be delivered from bubbler ring assemblies (“bubblers”) at intervals shown on the Plans.
4. Bubblers shall be constructed of two-inch (minimum) inside diameter aluminum pipe with one-sixteenth-inch diameter bubble release holes in four rows with three-quarter-inch spacing in the radial and axial directions as indicated on the Plans. Bubblers shall be durable enough to withstand repeated deployment during pile driving and shall be constructed to facilitate underwater setup, knockdown, and reuse on the next pile. Material shall be as specified on the Plans.
5. One or more compressors shall be provided to supply air in sufficient volume and pressure to self-purge water from the bubblers and maintain the required bubble flux for the duration of pile driving. Compressors shall be of a type that prevents the introduction of oil or fine oil mist by the compressed air into the water. The presence of oil film or sheen on the water surface in the vicinity of the operating bubbler will indicate that Contractor has failed to meet this requirement. Contractor shall immediately stop work until the source of oil film or sheen is identified and corrected.
6. Bubbler feed lines (secondary feed lines) shall be sized taking into account backpressure at the exit point, in-line friction losses and losses through fittings.
7. The system shall provide a bubble flux of 3.0 cubic meters per minute per linear meter of pipe in each layer (32.91 cubic feet per minute per linear foot of pipe in each layer). The total volume of air per layer is the product of the bubble flux and the circumference of the ring:

   $$Vt = 3.0\ m^3/min/m * \text{Circum of the aeration ring in meters}$$

   Or

   $$V_t = 32.91\ ft^3/min/ft * \text{Circum of the aeration ring in meters}$$

8. The bubble ring manifold shall incorporate a shut-off valve, flow meter, and a throttling globe valve with a pressure gauge for each bubble ring supply as shown and detailed on the Plans.
9. Prior to first use of the bubble curtain during pile driving, the fully assembled system shall be test-operated to demonstrate proper function and to train personnel in the proper balancing of the air flow to the bubblers. The test shall also confirm the calculated pressures and flow rates at each manifold ring. The Contractor shall submit an inspection/performance report to WSF within 72 hours following the performance test.
10. A qualified biologist may be present during all impact pile-driving operations to observe and report any indication of dead, injured, or distressed fish, including direct observation of these fish or increases in bird foraging activity.
11. If a barge is used to house the pile-driver, it shall be isolated from the noise-producing operations. This isolation shall be such that noise from the pile-driving operation is not transmitted through the barge to the water column.

12. The WSDOT Office of Air Quality and Noise shall prepare a noise monitoring plan for the project. To comply with provisions of the plan, the State will conduct hydroacoustic monitoring during construction to document performance of the bubble curtain. The Contractor shall coordinate pile driving, and cooperate, with the monitoring process and provide access to the work as directed by the Engineer.
13. The WSDOT Office of Air Quality and Noise shall submit a monitoring report to WSF and the ESA section 7 consulting biologist(s) at NMFS and the USFWS within 60 days of completing hydroacoustic monitoring. The report shall include the information outlined in the pre-approved "Underwater Noise Monitoring Plan."

Under certain conditions, bubble curtains may not provide the appropriate level of attenuation (a 10 dB or more reduction). In the event that the hydroacoustic monitoring demonstrates the proper attenuation is not being achieved, the injury and safety zone will be modified to account for the reduced attenuation.

11.2.4.1 Acoustic Monitoring

WSF plans to conduct acoustic monitoring for impact pile installation, and for vibratory installation of 24 in. and 72 in. steel piles at Port Townsend (data has already been collected for vibratory timber pile removal, and for vibratory installation and removal of 30 in. steel piles at this location). Background data was collected in 2010 during the Port Townsend test pile driving project (Laughlin 2010; Stockham et al. 2010) and during a 2010 dolphin replacement project at Port Townsend. Data from these studies was used to establish the safety zone and Level B acoustical harassment ZOIs to be implemented during this proposed project.

11.2.5 Soft Start

It should be recognized that although marine mammals will be protected from Level A take by monitoring a 22 m shut-down safety zone, a "soft start" prior to beginning a set of pile driving will allow any marine mammal that may be in the immediate area to leave before pile driving reaches full energy. The soft start requires contractors to initiate noise from vibratory hammers for 15 seconds at reduced energy followed by a 1-minute waiting period. The procedure will be repeated two additional times. If an impact hammer is used, contractors will be required 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.

Pile driving will take approximately 20 minutes, followed by 20 minutes of monitoring for marine mammal presence. Marine mammal monitoring for 30 minutes is also required before pile driving begins. During a set of pile driving, these time periods will overlap. Therefore, if the driving of a new pile begins before the 50-minute (or less) total observation period is complete, and no marine mammals are observed within the safety zone, no soft-start will be required. If the total 50-minute observation period has lapsed before beginning the next pile, a soft-start will be required.

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 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 that requires monitoring. This monitoring plan is detailed in Section 11.2.3, Marine Mammal Monitoring, and attached separately 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.

Underwater noise generated by vibratory and impact pile driving at the Port Townsend terminal is the primary issue of concern relative to local marine mammals. As discussed in Sections 11.2.4 and 11.2.5, WSF has already conducted research on the effectiveness of various sound attenuation devices and on the sound propagation from both vibratory and impact hammers operating at Port Townsend. The results from these studies were used to develop the safety zone and Level B acoustical harassment ZOIs for this transfer span replacement project, and provide support data for future ferry terminal projects.

WSF does plan to coordinate with local marine mammal sighting networks (Orca Network, the Center for Whale Research, and/or the Whale Museum Whale Hotline) to determine the location of the Southern Resident killer whales (and other whales) prior to initiating pile-driving activity. These organizations receive sighting information primarily on killer whales and other whales (e.g., gray and minke whales); however, their sighting database also contains sea lion data. All sightings received by the Orca Network are posted online usually within a few days and e-mail notifications are sent out almost daily with current sightings. Sightings may also be reported to the Whale Museum Whale Hotline where the information is cataloged into their database which is available upon request to the public and researchers. The Whale Museum receives sighting information from various sources including the Orca Network and all sightings are sent annually to NMFS.

Communication between WSF and the aforementioned organizations will reduce the potential for harassment at Port Townsend by providing WSF with real-time data on the presence and location of marine mammals, particularly the ESA-listed Southern Resident killer whales, prior to commencing pile-driving activities.

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Appendix A
Sheets 1 and 2

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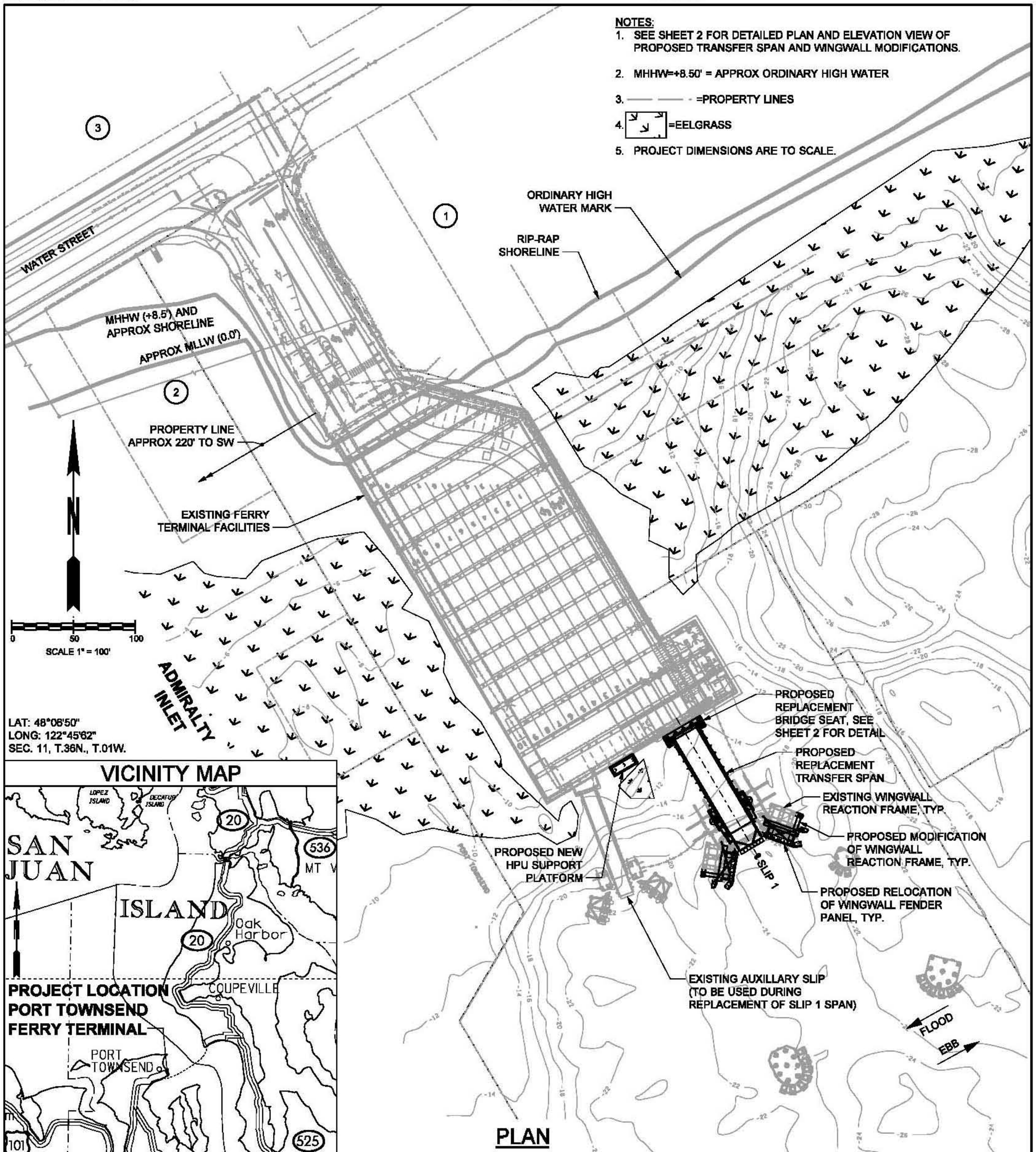

PURPOSE: TO ENSURE SAFETY & CONTINUED OPERATION OF THE PORT TOWNSEND FERRY TERMINAL.	**REFERENCE:**	Washington State Department of Transportation
PROPOSED: REPLACE EXISTING TRANSFER SPAN & MODIFY WINGWALLS	**APPLICANT:** WSDOT / FERRIES DIVISION	
LOCATION: CITY OF PORT TOWNSEND	**COUNTY:** JEFFERSON COUNTY, WA	
DATUM: USC&SG MLLW=0.00', MHHW=8.5'	**NEAR /AT:** PORT TOWNSEND FERRY TERMINAL	
ADJACENT PROPERTY OWNERS: CITY OF PORT TOWNSEND (1)	**WATER BODY:** ADMIRALTY INLET	
ARTHUR FAMILY TRUST (2)		
K&B O'HANA OF WASHINGTON LLC (3)	**DATE:** 05/17/11	**SHEET:** 1 **OF:** 2

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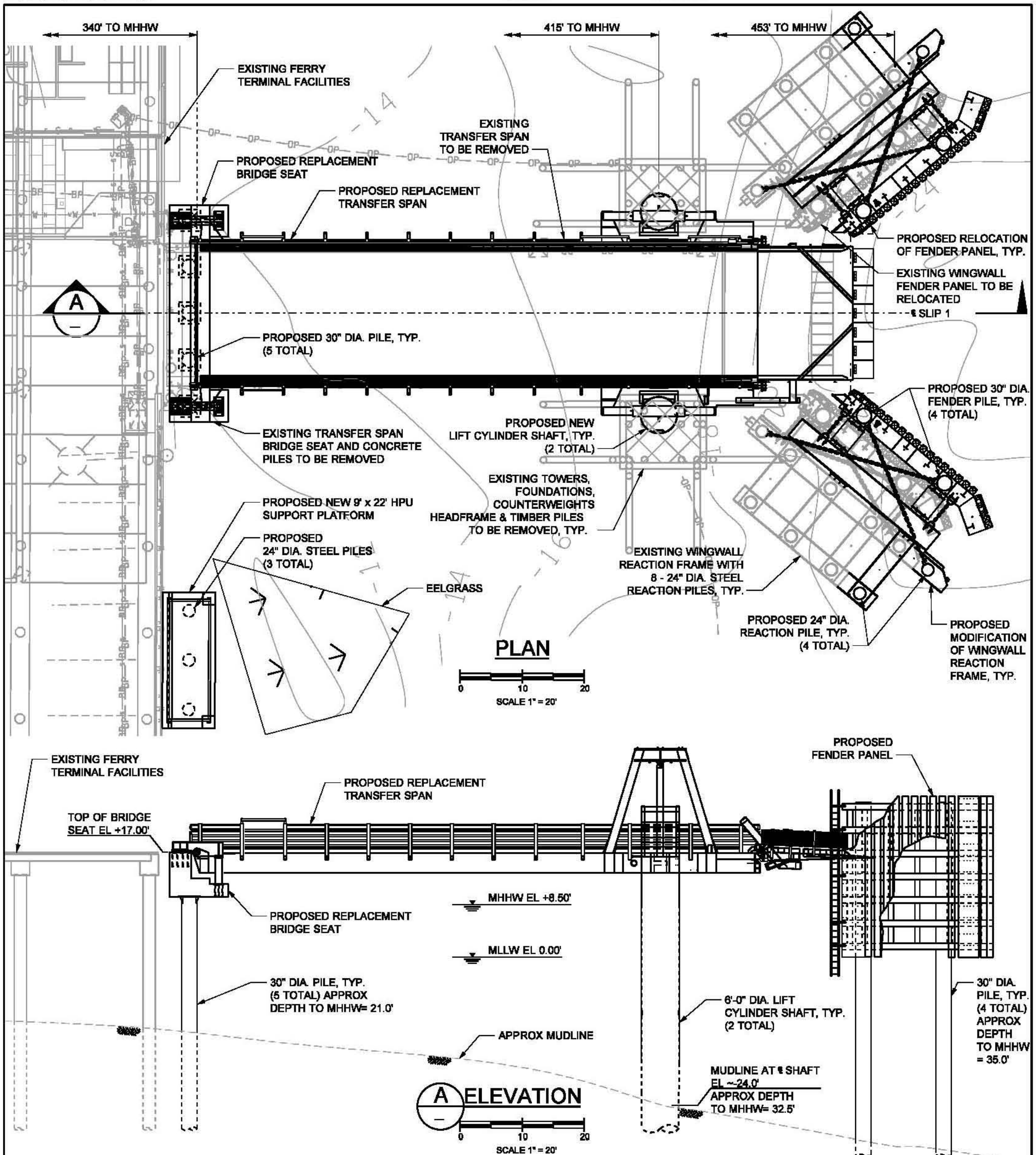

PURPOSE: TO ENSURE SAFETY & CONTINUED OPERATION OF THE PORT TOWNSEND FERRY TERMINAL	**REFERENCE:**	**Washington State Department of Transportation**
PROPOSED: REPLACE EXISTING TRANSFER SPAN & MODIFY 2 WINGWALLS	**APPLICANT:** WSDOT / FERRIES DIVISION	
LOCATION: CITY OF PORT TOWNSEND	**COUNTY:** JEFFERSON COUNTY, WA	
DATUM: USC&SG MLLW=0.00', MHHW=8.5'	**NEAR /AT:** PORT TOWNSEND FERRY TERMINAL	
ADJACENT PROPERTY OWNERS: CITY OF PORT TOWNSEND	**WATER BODY:** ADMIRALTY INLET	
ARTHUR FAMILY TRUST		
K&B O'HANA OF WASHINGTON LLC	**DATE:** 05/18/11	**SHEET:** 2 **OF:** 2

Appendix B

Marine Mammal Monitoring and Mitigation Plan

Port Townsend Ferry Terminal
Slip 1 Transfer Span Project
Marine Mammal Monitoring Plan

August 9, 2011

In accordance with the August 15, 2011, Washington State Ferries Port Townsend Slip Transfer Span Project Incidental Harassment Authorization Request, marine mammal monitoring will be implemented during this project.

Qualified marine mammal observers will be present on site at all times during pile removal and driving. Marine mammal behavior, overall numbers of individuals observed, frequency of observation, and the time corresponding to the daily tidal cycle will be recorded.

Shut-down Safety Zone Establishment

This project includes impact driving of 24" and 30" hollow steel piling, vibratory removal of 12" timber piling, vibratory removal and driving of 24" and 30" hollow steel piling, and vibratory driving of 72" hollow steel cylinder shafts.

Prior to the commencement of any steel impact pile driving, a shut-down safety zone for the Port Townsend Ferry Terminal will be established. The shut-down safety zone consists of the 22 m area (attached Figure 1) where the underwater SPLs are anticipated to equal or exceed 180 dB (impulse) for cetaceans. The 190 dB (pinniped) injury isopleth is contained within the 22 m shut-down safety zone. The impact pile driving Level B acoustical harassment ZOI extends to 464 m (Figure 2). A bubble curtain will be deployed to attenuate SL noise.

For vibratory pile removal and driving, no injury will occur (SL sounds are less than 180 dB), and so will result in a Level B acoustical harassment ZOI only. This zone is calculated to extend to the 120 dB (nonpulse) isopleth for vibratory pile removal and driving. Based on analysis of in-water noise data from the Port Townsend Ferry Terminal test pile project, vibratory pile removal and driving at Port Townsend is expected to reach the 120 dB_{RMS} threshold at approximately 6.8 km (4.2 miles) (Figure 3), or sooner (Laughlin 2010).

Visual Monitoring and Shut-down Procedures

WSF proposes the following Marine Mammal Monitoring Plan and shut-down procedures for steel impact pile driving:

- To verify the required monitoring distance, the shut-down safety zone will be determined by using a range finder or hand-held global positioning system device. The shut-down safety zone will be monitored from a full-view vantage point at the end of the Port Townsend terminal.
- If the shut-down safety zone is obscured by fog or poor lighting conditions, pile driving will not be initiated until the entire safety zone is visible.
- The shut-down safety zone will be monitored for the presence of marine mammals before, during, and after any pile-driving activity.

- The shut-down safety zone will be monitored for 30 minutes prior to initiating the start of pile driving. If marine mammals are present within the shut-down safety zone prior to pile driving, the start of pile driving will be delayed until the animal(s) leave the shut-down safety zone.
- The 464 m Level B acoustical harassment ZOI (Figure 2) will be monitored by two biologists throughout the time required to impact drive a pile. The biologist's locations are shown in Figure 4.
- If a marine mammal is observed entering the 464 m ZOI during impact pile driving, the animal will be observed to determine if it is approaching the 22 m shut-down safety zone. If the animal is approaching the shut-down safety zone, impact pile driving will be discontinued until the animal has moved away from the shut-down safety zone.
- Impact pile driving will resume only after the marine mammal is determined to have moved outside the shut-down safety zone by a qualified observer or after 15 minutes have elapsed since the last sighting of the marine mammal(s) within the shut-down safety zone.
- If marine mammals are observed, their location within the zone, and their reaction (if any) to pile-driving activities will be documented.
- Monitoring of the shut-down safety zone will continue for 20 minutes following the completion of impact pile driving.

WSF proposes the following Marine Mammal Monitoring Plan for in order to estimate project take levels Level B acoustical harassment ZOI:

- To verify the required monitoring distance, the vibratory Level B acoustical harassment ZOI will be determined by using a range finder or hand-held global positioning system device.
- If the Level B acoustical harassment ZOI is obscured by fog or poor lighting conditions, pile driving will not be initiated until the ZOI is visible.
- The vibratory Level B acoustical harassment ZOI will be monitored for the presence of marine mammals 20 minutes before, during, and 30 minutes after any pile-driving activity.
- If marine mammals are observed, their location within the ZOI, and their reaction (if any) to pile-driving activities will be documented.
- The impact pile driving 464 m Level B acoustical harassment ZOI (Figure 2) will be monitored by two biologists throughout the time required to impact drive a pile. The biologist's locations are shown in Figure 4.
- During vibratory timber pile removal, the source level is expected to attenuate to the 120 dB_{RMS} threshold within ~2.2 km. Two biologists will monitor this area (Figure 5).
- During 24" steel vibratory pile removal, the source level is expected to attenuate to the 120 dB_{RMS} threshold within ~4.0 km. Two biologists will monitor this area (Figure 6).

- During all other vibratory steel pile removal and driving, the source levels are expected to attenuate to the 120 dB_{RMS} threshold within ~6.8 km, or sooner. Two biologists will monitor this area (Figure 7).
- The rationale for the monitoring locations is based on familiarity with these positions from previous Port Townsend projects, and on observed concentrations of marine mammals within the ZOI.

Minimum Qualifications for Marine Mammal Observers

Qualifications for marine mammal observers include:

- Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance. Use of binoculars may be necessary to correctly identify the target.
- Advanced education in biological science, wildlife management, mammalogy or related fields (Bachelors degree or higher is preferred), but not required.
- Experience or training in the field identification of marine mammals (cetaceans and pinnipeds).
- Sufficient training, orientation or experience with the construction operation to provide for personal safety during observations.
- Ability to communicate orally, by radio or in person, with project personnel to provide real time information on marine mammals observed in the area as necessary.
- Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience).
- Writing skills sufficient to prepare a report of observations that would include such information as the number and type of marine mammals observed; the behavior of marine mammals in the project area during construction, dates and times when observations were conducted; dates and times when in water construction activities were conducted; dates and times when marine mammals were present at or within the defined shut-down safety or Level B acoustical harassment ZOI; dates and times when in water construction activities were suspended to avoid injury from impact pile driving; etc.

References

WSDOT. 2010. Port Townsend Test Pile Project. Underwater Noise Monitoring Draft Final Report. Jim Laughlin. Washington State Department of Transportation Office of Air Quality and Noise. November 10, 2010. Seattle, WA.

Figures

Figure 1 – Approximate 22 m impact pile driving marine mammal shut-down safety zone.

Figure 2 – Approximate 22 m (red circle) impact pile driving shut-down safety zone and 464 m (green) Level B acoustical harassment ZOI.

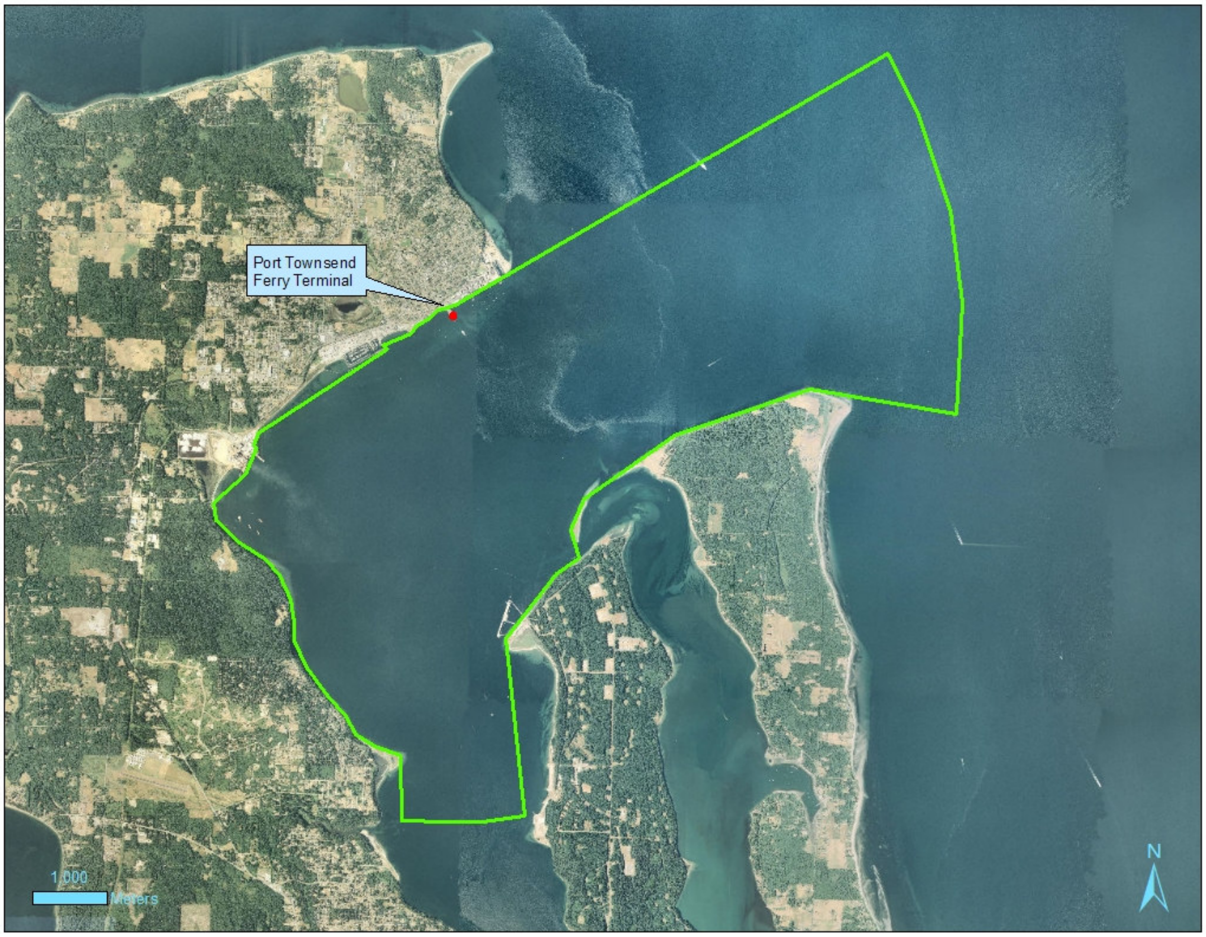

Figure 3 – Vibratory steel pile removal and driving Level B acoustical harassment ZOI.

Figure 4 – Impact pile driving marine mammal monitoring locations (blue circles).

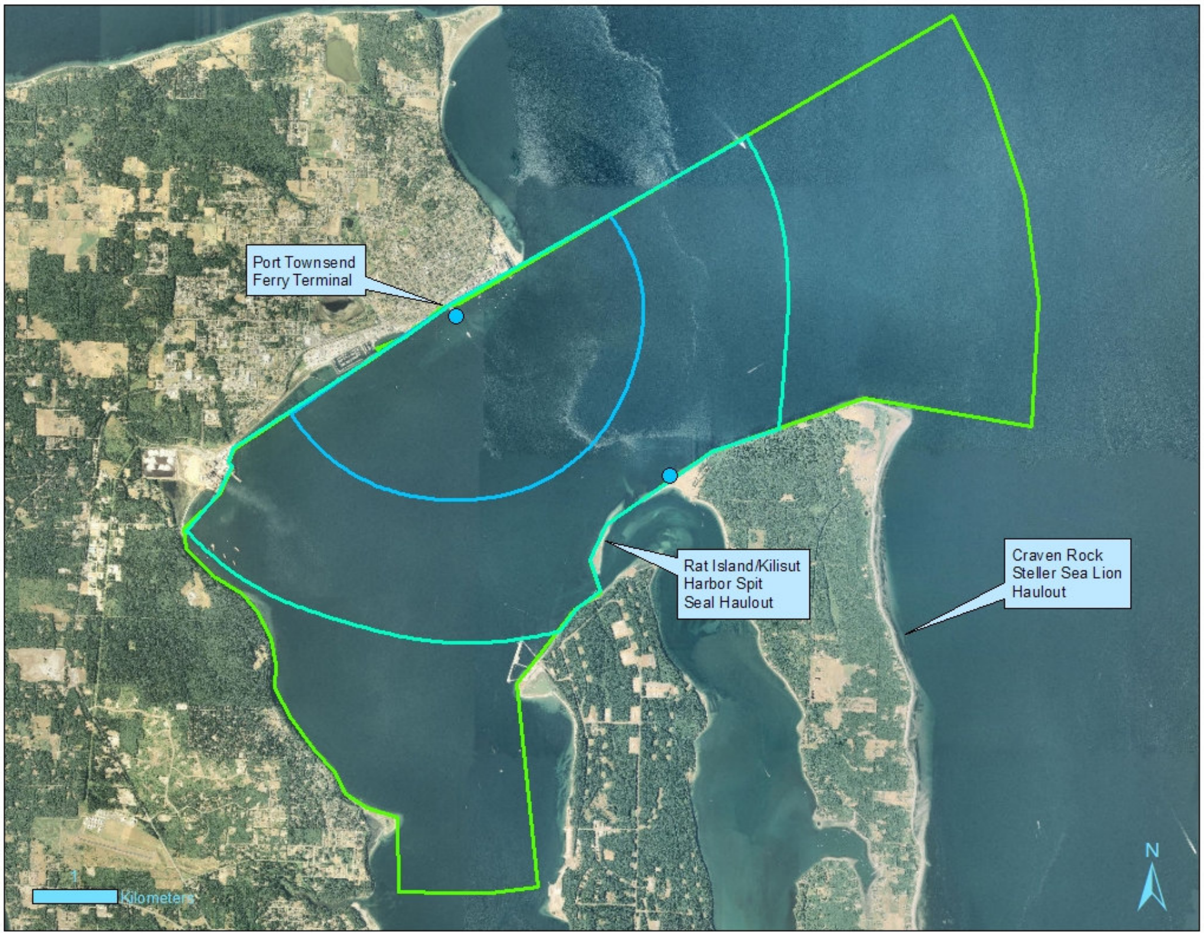

Figure 5 – Vibratory timber pile removal 2.2 km ZOI (blue line) and marine mammal monitoring locations (blue circles).

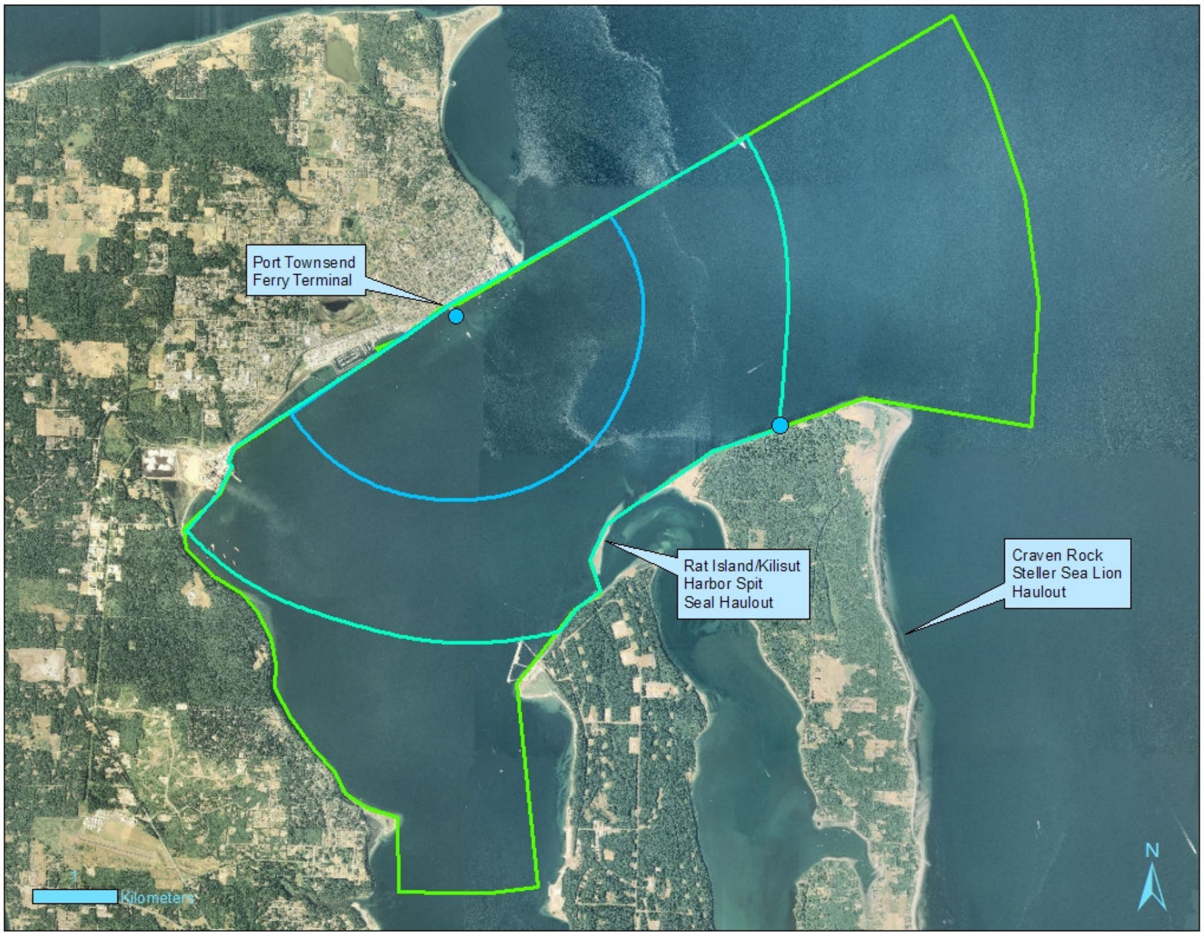

Figure 6 – Vibratory 24" steel pile removal 4.0 km ZOI (turquoise line) and marine mammal monitoring locations (blue circles).

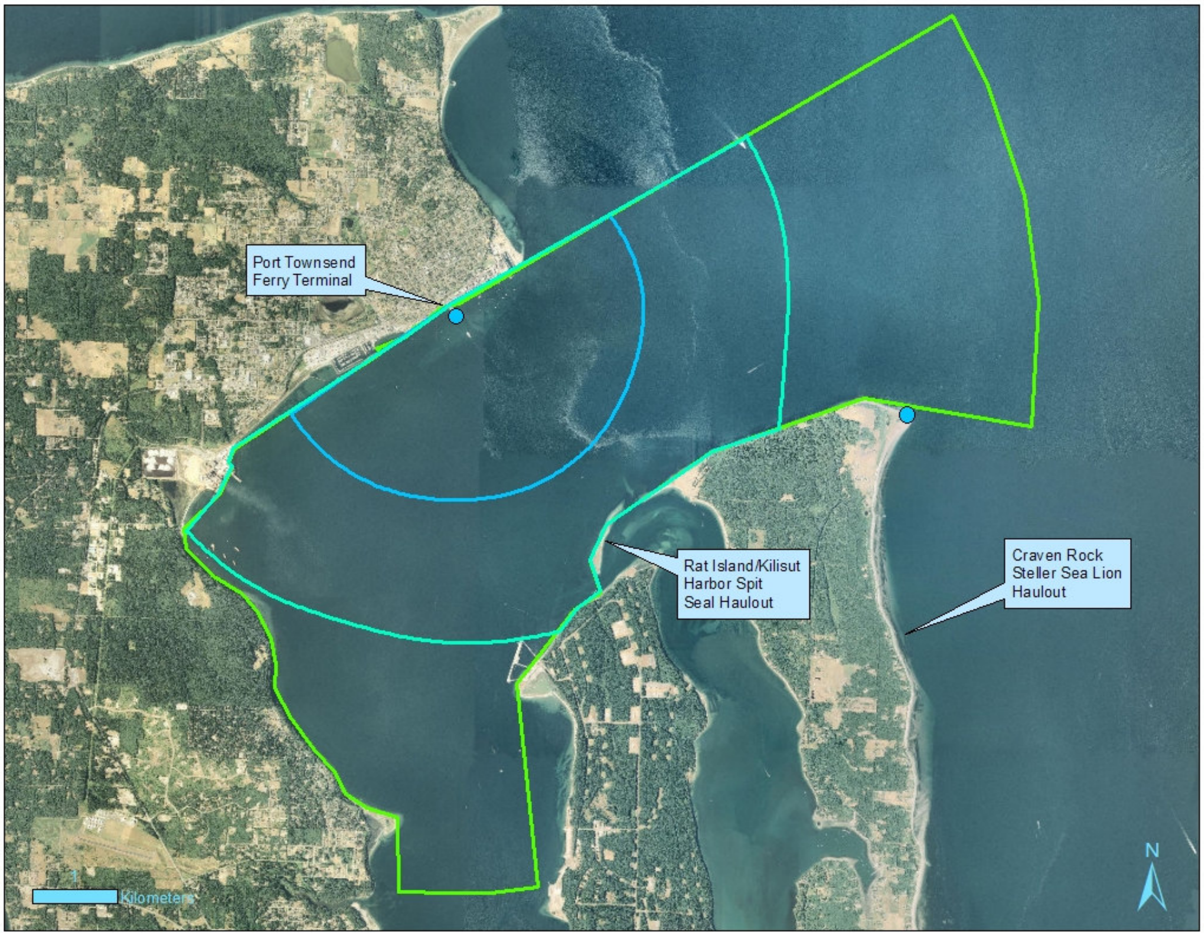

Figure 7 – Remaining vibratory steel pile removal and driving 6.8 km ZOI (green line) and marine mammal monitoring locations (blue circles).