EXHIBIT 6

Orca Dreams LLC

Biological Assessment

Joint-Use Dock

Reverse Osmosis Desalination System

Revised October 24, 2017

Prepared for:

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October 24, 2017

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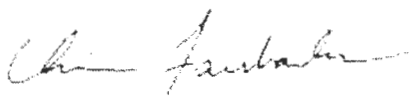

Chris Fairbanks MSc.

October 24, 2017

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1.0 Executive Summary

Orca Dreams, LLC intends to build two projects on their property identified as Tax Parcel Numbers (TPN) 340411003, TPM 340411005, and 353344008. These projects are:

1. A four-slip joint-use dock
2. A Reverse osmosis desalination system

These independent actions may be constructed concurrently, or may be constructed separately. Drawing sets for each project are attached to this Biological Assessment.

The proposed four-slip joint-use dock will be located on the southwest shore of San Juan Island in a small cove adjacent to Haro Strait. The components of the dock are a fixed pier, ramp and a floating dock (1,577.8 sq.ft.) all in a straight alignment in a west-southwest direction and a private navigation buoy to mark rocks near the seaward end of the dock (see attached revised drawing set dated 6-7-17). As many as eight broken creosote-treated piling will be removed and twelve 10-inch steel piling will be set with a vibratory hammer or set in a drilled hole where bedrock is encountered; an impact-hammer will not be used. All decks will be surfaced with light-permeable grating with at least 63 percent functional grating. The float will be held in position with four steel guide piling and two auger or duckbill anchors with elastic cords extending to the float. A new concrete abutment will be constructed at the landward end of the dock landward of the Ordinary High Water Line.

The Reverse Osmosis (RO) desalination system will be located on the upland of the Orca Dreams LLC property to serve the three parcels listed above. As part of this system, a seawater intake will be secured to a 6-inch galvanized steel piling placed at the depth of -7 feet relative to Mean Lower Low Water (MLLW) and a brine diffuser will be secured to a 6-inch galvanized steel piling placed at the depth of -4 feet MLLW. The intake and diffuser will be placed approximately 60 feet apart. The two 6-inch steel piles will be driven with a vibratory pile driver. If bedrock is encountered, the pilings will be set in drilled holes. Once the piles are installed the contractor will install the intake pump and diffuser assemblies on the pilings and install the seawater supply pipe, saltwater return pipe and electrical power conduit either onto the proposed fixed pier (as described above) or, secured onto the seafloor to MLLW. Landward of MLLW, the conduit and pipes will be buried in a trench at the depth of 2 feet below the surface of the beach. The RO desalination project drawings are attached. Details of attachment of the pipes and conduit with the proposed dock are illustrated on the joint-use dock drawings.

Conservation/mitigation measures have been prepared to avoid and minimize impacts to ESA listed species, their critical habitat and habitat identified by the San Juan County Critical Areas Ordinance. This Biological Assessment (BA) has been prepared to analyze the affect that may occur to species listed under the Endangered Species Act (ESA) and their critical habitat due to the placement and use of the proposed joint-use dock, and installation and operation of an RO desalination system in the marine environment and in the upland area. This BA includes recommendations for Determination of Effects which are summarized below.

Table 1 Summary of effect determination on ESA listed species and critical habitat.

SPECIES	EFFECT	TAKE
Marbled murrelet (*Brachyramphus marmoratus*)	NLTAA*	None
Marbled murrelet critical habitat	Not applicable	
Coastal Puget Sound Bull trout (*Salvelinus confluentus*)	No Effect	None
Coastal Puget Sound Bull trout critical habitat	Not applicable	
Puget Sound ESU chinook salmon (*Oncorhynchus tshawytscha*)	NLTAA	None
Puget Sound ESU chinook salmon critical habitat	Will not adversely modify	
Hood Canal summer-run chum salmon (*Oncorhynchus keta*)	No Effect	None
Hood Canal summer-run chum salmon critical habitat	Not applicable	
Puget Sound Steelhead trout (*Oncorhynchus mykiss*)	No Effect	None
Bocaccio rockfish (*Sebastes paucispinis*)	NLTAA	None
Yelloweye rockfish (*Sebastes ruberrimus*)	NLTAA	None
Southern resident killer whale (*Orcinus orca*)	NLTAA	None
Southern resident killer whale critical habitat	Will not adversely modify	
Humpback whale (*Megaptera novaeangliae*)	NLTAA	None
Streaked horned lark (*Eremophila alpestris strigata*)	No Effect	None
Streaked horned lark critical habitat	Not applicable	
Yellow-billed cuckoo (*Coccyzys americanus*)	No Effect	None
Yellow-billed cuckoo critical habitat	Not applicable	

NLTAA: Not Likely to Adversely Affect.

2.0 Project Location

The Orca Dreams joint-use dock and RO desalination system Project (Project) is located on southwest shore of San Juan Island, Washington in the NW ¼ of the NW ¼ Section 4 T34N; R03W (See attached drawings).

3.0 Project Purpose

The purpose of the proposed projects are:

1. To provide safe moorage for four vessels ranging between 18 and 35 feet in length for the residents of the five existing single-family homes who will use private vessels for recreational boating in the local waters.
2. To provide sufficient potable water for five existing residences plus one future single-family residence located on three parcels of property with Tax Parcel Numbers (TPN): 353344008, 340411003, and 340411005.

4.0 Project Description

4.1 Joint-use Dock

Vessels will use the moorage facility to access the upland property and for local recreational boating. The moorage facility will provide moorage for four vessels during the months of May

through October and the floating portion of the dock will be removed during November through April during the winter season. Boats will be used occasionally and not likely used on a daily basis. The dock will be in place for approximately 184 days each year and boats will transit to and from the dock approximately 50% of those days (92 days) for an estimated maximum of 368 round trips each year. This equates to two round trips per day while the float is in place. There will be no boating activity here for 181 days each year while the float is removed from the area.

4 boats x 92 = 368 round trips
368 round trips ÷184 days = 2 round trips per day

In addition, a private navigation buoy will be installed approximately 95 feet seaward from the seaward end of the float that will mark the proximity of underwater rocks that maybe a navigational hazard during extreme low tide events (Sheet 4 and 9 of 11). The buoy will be similar to the buoy illustrated below in Figure 1. The buoy will be anchored with an imbedded anchor and a series of mid-water floats will elevate the anchor line to avoid scouring of the seafloor (Sheet 9 of 11).

Figure 1. Example of a private navigation buoy that will be installed to mark submerged rocks.

Dock Components

Components of the joint-use dock are listed below in Table 2 along with dimensions and construction material.

Table 2. Components of proposed dock, materials, dimensions and footprint area.

Component	Material	Dimension	Area (sq ft)
Abutment	Concrete and 2-inch pin-piles	6 ft - 9 in wide 2 ft long X 1ft-8-in high	14 -7 overlap
Fixed pier	Aluminum	6 ft wide x 144 ft long	864
Ramp	Aluminum	4 ft wide x 60 ft long	240

Float	ACZA treated wood Plastic grated deck Plastic encapsulated foam floats	8 ft wide x 60 ft long	480
Piling	8 Galvanized steel 4 epoxy coated steel	10-inch diameter	6.5
		Less ramp/float overlap	-19.7
		Total foot print	**1,577.8**

The fixed pier and float will be decked with 'SunWalk', a plastic molded material manufactured by True Harbor LLC (http://www.trueharbor.net) that provides 46 percent open area and allows 69.9 percent of the available light to penetrate to 18 inches below the panel, and 86.2 percent of available light measured 60 inches below the panel (Appendix A). The fixed pier will be placed approximately 5 feet above the beach at the landward end and approximately 14 feet above the seafloor at the waterward end. Eight 10-inch galvanized steel piling will support the fixed pier (Sheets 3 and 4 of 11).

The ramp will be welded aluminum with fiberglass grated decking and will span approximately 60 feet between the fixed pier and float (Sheets 4 and 6 of 11). The functional grating area of the ramp is 96.5 percent.

The float will be constructed with a treated wood frame with 'SunWalk' molded plastic grated deck and plastic encapsulated, foam-filled float tubs (Sheets 4, 7 and 8 of 11). Four epoxy-coated guide piling and two anchors with elastic cords will hold the float in place (Sheet 4 of 11). These anchors will be either auger or duckbill type earth anchors.

Grating Open Area.

NMFS and FWS request that docks have grating with open area of at least 60% or light penetration that is the same or more compared to grating with 60% open area - from the Army Corps' *"Interim Abbreviated B.E. for Overwater Structures in Inland Marine Waters"* dated 24 October 2012. Sun Walk decking was tested for light penetration to the floor at various distances and light angle. Results of the test are that at a distance of 18 inches to the floor the Total Average Light Available was 67.9% and at 60 inches, the Total Average Light Available was 86.2%. Please see Appendix A: Reliable Analysis Inc. test of Light Availability.

Functional Grating.

Sheet 4 of the attached Project drawings illustrate that the entire deck of the fixed pier, ramp and float will be covered light permeable grating. The grating will be supported by aluminum cross members that will block a portion of the light (Sheets 5-8). Table 3 below is a list of the total area and functional grating area of each component of the proposed dock.

Table 3. Functional grating in percent of each component of the proposed dock.

Dock Component	Area (square feet)	Functional Grating
Fixed pier	864	96.5 %
Ramp	240	96.5 %
Float	480	63.0 %

Joint-use dock Construction Technique & Sequencing

Pre-Fabrication

The pier, ramp, float, and navigation buoy will be prefabricated in the contractor's Seattle yard and transported to the site on the construction barge.

Site Preparation

The shoreline slopes downward to the tidelands in front of the project site. The tidelands vary from solid rock to sand, gravel and mud bottom. Remnants of an existing pier structure (as many as eight creosote pilings) will be removed and placed on the construction barge and transported to contractor's yard for upland disposal.

On site Construction

On-site construction will consist of driving or drilling the pier piling near shore and driving outboard piles. A total of twelve 10-inch steel piling will be driven with a vibratory hammer or where bed rock is encountered, the piling will be set in drilled holes; an impact hammer will not be used. Once piling are installed the barge mounted construction crane will be used to hoist the pier sections to set them in place and bolted to the piling and existing pier landing at the top of the beach. Once the pier is in place the moorage float will be set in the water and bolted together then positioned in place. The float will be secured using piling and anchors set in place using the barge mounted construction crane. After the float sections are bolted together and secured to the float piles, the ramp will be set in place. The shoreward end of the ramp will be bolted to the pier and the water-ward end set on the moorage float. Plan view and cross sections of the proposed project are shown in the attached project drawing packet (Sheets 4-8 of 11).

The buoy will be anchored with an imbedded anchor and a series of mid-water floats will elevate the anchor line to avoid scouring of the seafloor (Sheet 9 of 11).

Equipment

All construction equipment and materials used in this project would be stationed on the construction barge. A barge mounted crane will be used to set the pier piles, pier, moorage float and ramp in place. Portable power tools and hand tools will also be used to connect the pier to the piling and to secure the floats and ramp in place.

Materials

Piling will be galvanized and epoxy-coated steel driven in place with a vibratory hammer; the pier will have a welded aluminum frame with a molded plastic (SunWalk) or fiberglass grated

deck. The ramp will be welded aluminum with fiberglass grated deck; the float will have a treated wood frame with a 'SunWalk' molded plastic grated deck with molded plastic, foam-filled float tubs (Table 4). Design details of the fixed pier, ramp and float are provided on Sheets 4-8 of 11 (attached).

Work Corridor

The barge would operate offshore to avoid grounding and disturbing bottom sediment and avoid disturbing beach features that could occur with ground-based equipment. The barge will not be allowed to ground at any time during construction.

Table 4. Materials List and Specification of construction materials.

PART	SPECIFICATIONS	TREATMENT
Auger or Duckbill Anchors	Solid steel shaft and flutes	Galvanized
Anchor Cables	Elastic bungee cords	None
Pre-fab Pier Sections	4 X 4 & 4 X 6 welded aluminum square tube	None
Pile Cap Beam	W6X15 steel "I"-Beam	Galvanized
Float Nailers	2 X 4 #2 or better	ACZA (Chemonite)
Float Joist	2 X 8 & 2 X 6 #2 or better	ACZA (Chemonite)
Float Blocking	2 X 8 #2 or better	ACZA (Chemonite)
Float Walers	4 X 12 #2 or better	ACZA (Chemonite)
Float Flotation	High-density foam-filled plastic tubs	None
Ramp Framing	4 X 4 & 4 X 6 welded aluminum square tube	None
Float and Ramp Grating	Molded plastic and/or fiberglass	None
Compression Rods	½-inch &/or ¾-inch solid steel	Galvanized
Piles	(10) 10-inch diameter steel pipe	Galvanized and epoxy coated
Hardware, Nuts and Bolts	Solid steel	Galvanized or Stainless

Staging Area and Equipment Wash outs

All staging area activities will occur on the barge with no need for equipment washouts.

Stockpiling Areas

The barge will hold all construction materials during project and all construction debris will be held in a 20 c/y steel garbage container secured on the crane barge for disposal upland later.

Running of Equipment

Equipment will be running off and on throughout the on-site construction phase. All equipment will be kept in good running order and will only be running when required.

Clean-Up and Re-vegetation

All construction debris will be removed and loaded into a 20 c/y steel garbage container secured on the crane barge for holding during construction, then transported by the crane barge to the contractor's Seattle yard, off-loaded into trucks and shipped to an approved upland disposal site. No re-vegetation is proposed at this time.

Project Timing

Construction will take place in approved work windows during daylight hours unless work needs to be coordinated with evening low tides to facilitate construction. Pile driving will occur only after 2 hours from sunrise and will stop before or at 2 hours before sunset.

Duration of Construction

Onsite project construction will take a maximum of 3-4 weeks.

4.2 Reverse Osmosis Desalination System

The proposed RO desalination system will be sized to provide potable water to six single-family residences. Based on the Washington State Department of Health's requirements, the maximum system demand for six residences, including irrigation around the main house existing on TPN 340411005, will be approximately 2,310 gallons of water per day (gpd). The system will be capable of producing 3,000 gallons of fresh water per day. A maximum of 12,068 gallons of seawater will be drawn from Haro Strait each day and pumped 1,030 feet to a treatment facility that will be installed within an existing barn. Water from an existing well (well #1) will also be pumped to the treatment house where it will be mixed with desalination product water (potable water produced by the plant) where the blended water will be chlorinated and pumped 360 feet to the existing 40,000-gallon concrete water storage tank. The remaining brine, a maximum of 9,072 gallons per day, will be pumped back into Haro Strait.

The seawater intake, brine discharge pipes and electrical conduit will be configured as illustrated on pages 4 – 7 of the attached drawings. The pipes and conduit will be installed in a 2.5-foot wide by 3-foot deep trench from the valve vault and extend 120 feet seaward to Mean Lower Low Water (MLLW). From MLLW, the pipes and conduit will daylight and be anchored to the seafloor with earth anchors placed at 10-foot intervals. The brine discharge line will extend 100 feet from MLLW to the diffuser assembly attached to a 6-inch pile at the depth of -5 feet MLLW. The seawater intake line and conduit will extend 160 feet from MLLW to the seawater intake assembly attached to a 6-inch pile at the depth of -7 feet MLLW. Landward of the valve vault, the pipes and conduit will be buried in a 2.5-foot wide by 3-foot deep trench the entire distance to the existing barn that will house the RO desalination system.

The system is designed to include of two 1,500-gpd RO desalination units with the primary elements of the system consisting of the following:

1. A 10-gallon per minute (gpm) 3/4 hp submersible pump mounted inside a 6-inch HDPE pipe section which is secured to a new 6-inch steel marine piling. The intake will be screened as required by Washington State Department of Fish and Wildlife (WDFW). The piling will be located at approximately -7 feet MLLW 280 feet seaward of the valve vault. The pump and screen will be accessible for removal and cleaning from a boat.
2. 2-inch diameter HDPE pipes for seawater intake and brine discharge will be laid on the sea floor from the assembly piling to approximately MLLW. The pipe and conduit

bundle will be secured with embedded earth-anchors. From MLLW, the pipe and conduit bundle will be buried in a 2.5-foot wide by 3-foot deep trench across the beach to the valve vault that will be buried landward of the MHHW. From the valve vault to the barn/desalination facility, the water pipes and electrical conduit will also be buried in a trench (pages 3-5 of attached drawings).

3. Desalination equipment will consist of a seawater strainer, a sand filter with backflushing capability, an 80-gallon fiberglass pressure tank, two bag filters in plastic housings using a 10-micron and a 2-micron filter, two 1,500-gpd US Watermaker desalination units in parallel (seawater flow to each unit is 4.2 gpm) - these RO units will be US Watermaker's Workboat Series units, a 2-cubic foot acid neutralizing unit, 40-gallon chlorine batch tank with chlorine injection pump mounted on top, a Seametrics pulse meter for controlling the pump injection rate, a 120 gallon product water accumulation tank and a 5 gpm ½-hp submersible product water pump.
4. A 2-inch HDPE brine return pipe from the desalination plant in the barn will be installed parallel with the seawater pipe to the valve vault and to the saltwater diffuser installed near the landward end of the proposed float.
5. The brine diffuser will be mounted inside a 6" HDPE pipe section which is secured to a new 6-inch piling at the tidal elevation of -4 feet MLLW. The diffuser design allows for access for removal and cleaning from a boat.

Project Sequence

Construction of the RO desalination system will be completed with the following sequence:

1. Pre-Fabrication: The pump and diffuser assemblies and the stainless-steel sleeve will be prefabricated in the contractor's yard in Friday Harbor. They will be transported to the site by truck.
2. Site Preparation: The pipeline route and vault site will be cleared of vegetation prior to trench excavation for the pipelines.
3. On Site Construction: On-site construction will consist of driving or drilling the intake assembly and diffuser support piles. Two 6-inch steel piles will be driven with a vibratory pile driver, where bedrock is encountered, the pilings will be set in drilled holes. Once the piles are installed the contractor will install the pump and diffuser assemblies on the pilings and install the seawater supply pipe, saltwater return pipe and electrical power conduit either onto the fixed pier or on the seafloor.
4. Equipment: All construction equipment (except for the small track hoe) and materials used in this project will be stationed on either a construction barge or a small boat. A barge mounted crane will be used to set the steel piles. Portable power tools and hand tools will also be used to secure the pump and diffuser assemblies in place on the pilings.
5. Materials: Piles will be 6-inch galvanized or epoxy-coated steel. The submersible pump will have a stainless-steel shell, screen, suction and discharge housing. The diffuser, the 6-inch protective pump and diffuser sleeve, the seawater and saltwater return piping and

electrical conduit will all be HDPE pipe. The straps used to secure the protective sleeves to the pilings will be stainless steel.

6. Work Corridor: The small boat and barge will operate offshore to avoid grounding and disturbing bottom sediment.
7. Staging Areas and Equipment Wash Outs: All staging area activities for the setting of the steel pilings and the installation of the pump and diffuser assemblies will occur on the barge or small boat with no need for equipment wash outs. The staging area for the pipe trenching will be in the upland area at least 200' from the shoreline.
8. Stockpiling Areas: The barge will hold all construction materials during the setting of the pilings and all construction debris will be held in a 20 c/y steel garbage container secured on the crane barge for disposal upland later. Construction debris from the installation of the pump and diffuser assemblies as well as the pipe laying operation will be collected on board the small boat for disposal upland later. All other construction debris from the construction of the pipelines in the trench will be collected on shore and hauled to an approved upland disposal site.
9. Running of Equipment: Equipment will be running off and on throughout the on-site construction phase. All equipment will be kept in good running order and will only be running when required.
10. Clean-Up and Re-Vegetation: All construction debris will be removed and ~~as~~ disposed of as described above. Disturbed soil will be reseeded with native grass mix and mulched with straw; no other re-vegetation is proposed.
11. Project Timing: All proposed construction will take place in approved work windows during daylight hours unless work needs to be coordinate with evening low tides to facilitate construction. Pile driving will occur only after 2 hours from sunset and will stop at 2 hours before sunset.

Duration of Construction

On-site construction will take a maximum of 3-4 weeks.

5.0 Existing Conditions

The Project is located on the southwest shore of San Juan Island, to the south of False Bay. This shoreline is exposed to the west and southwest.

5.1 Marine Conditions

The dock will be situated in the same location as the old Mar Vista Resort dock, inside a small cove that is open to the west and northwest and which is generally protected from the predominant south and southwest wind and waves. The shoreline inside the cove has a 'pocket beach' that is confined by rock outcrops which hold the beach sediment in place. The beach is composed of a mix of gravel and sand and there is no appreciable net-shore drift

(https://fortress.wa.gov/ecy/coastalatlas). Large pieces of driftwood have accumulated on the upper beach which indicates that wood tends to be held in this location (Photo 1).

The sand and gravel beach has appropriate sized material for forage fish spawning. This site was identified as a suitable spawning beach by Friends of the San Juans. However, no eggs were found in the two surveys conducted at this site (Friends 2004). This beach has not been mapped as a potential spawning beach and has not been mapped as a documented spawning beach on the WDFW web-based maps. potential COA → beach will be investigated for eggs prior to const.

Rocky outcrops that are exposed during low tides are occasionally used as haulouts for harbor seals and California sealions.

Photo 1. Gravel and sand beach and driftwood of the Project site is held within the pocket beach by rock outcrops.

Dive Surveys

Four dive surveys have been conducted on site to document marine vegetation, characterize seafloor composition, to verify the presence/absence of pinto abalone (*Haliotis kamtschatkana*) and to determine the value of habitat in the project area for pinto abalone. A video survey of the sea floor and marine vegetation conditions was conducted to accurately map the margins of the existing eelgrass bed in the area, and location of rocky outcrops.

The first dive survey was conducted on March 8, 2014 along five transects based along the alignment of the proposed dock. The diver found low densities of the marine algae *Ulva*, *Laminaria*, and *Fucus* attached to rocks in the area under the proposed fixed pier and ramp. Hard bare sand was observed under the proposed float alignment. Native eelgrass *Zostera marina* was observed approximately 25 feet to south of the proposed float. This eelgrass bed was sparse and patchy. A map of the dive survey is attached as Sheet 3 of 11.

A second Eelgrass/Macroalgae survey was conducted in the project area on August 20, 2014 during the eelgrass growing season and is attached as Appendix B. A dense band of the algae *Laminaria* and *Ulva* was observed in the area of the proposed dock from the depths of MLLW to -7 feet MLLW. A small patch of 10 eelgrass shoots within a 5-square foot area was observed approximately 30 feet north of the proposed dock.

Margins of the eelgrass meadow were mapped using a boat-towed underwater video camera that was interfaced with a GPS receiver and position data is captured with the video image. This video survey was conducted on January 8, 2016. The margins of the eelgrass meadows, marine algae, location of rocky habitat, and position of the proposed dock was overlayed onto a Google Earth image and illustrated below in Figure 2. A full report of this video survey is attached as Appendix C.

A third dive survey was conducted on February 9, 2016. The objective of the third dive survey was to assess the value of the rocky habitat near the project site for pinto abalone and to verify the presence or absence abalone. Three belt transects were assessed (see Appendix C) and no abalone were observed. The rocky habitat seaward of the proposed float is moderate to good habitat for abalone. The sandy seafloor directly below the proposed float, ramp and fixed pier is poor quality habitat for abalone.

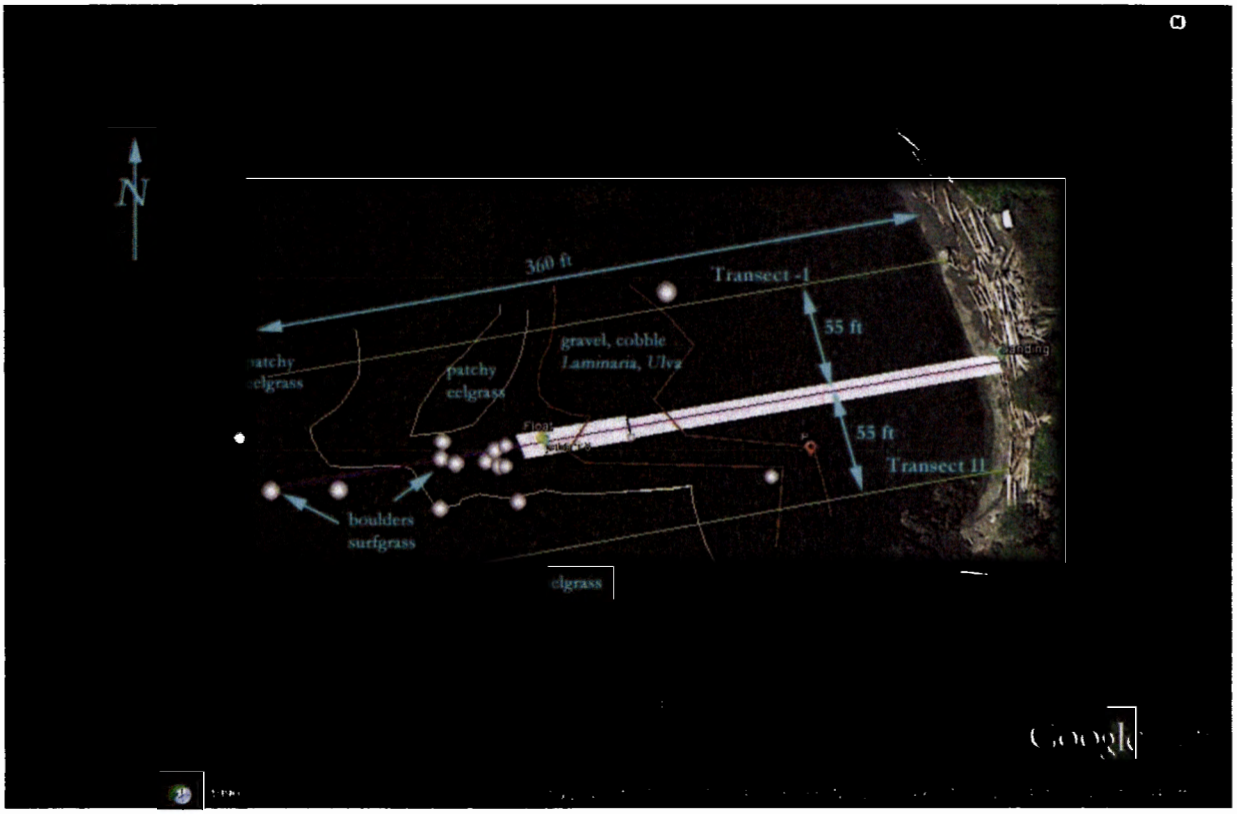

Figure 2. Location of patchy and sparse eelgrass meadows relative to the position of the proposed dock.

A fourth dive survey was conducted on August 24, 2017. The objective of the fourth dive survey was to document the marine vegetation along five transects set at approximately 15-foot intervals relative to the centerline of a proposed dock. Results of this survey was consistent with the previous surveys; a dense band of unattached drifting algae, predominantly the green alga *Ulva*, was present in the shallow subtidal area over a gravel and sand seafloor. The native eelgrass, *Zostera marina*, was present approximately 30 feet south of the proposed RO desalination intake and diffuser support piling. A sparse bed of eelgrass was present approximately 45 feet to the north of the proposed dock. Kelp and surf grass (*Phyllospadix scouleri*) was observed attached to boulders within the study area. The report for this eelgrass survey is attached as Appendix D.

Eelgrass Health

The eelgrass meadow in False Bay has been studied for several years. Recently, the prevalence of leaf infections of eelgrass plants caused by the marine slime mold, *Labyrinthula zosterae* has been the focus of investigations. This slime mold has been identified as the cause of eelgrass wasting disease where large areas of eelgrass meadows have been decimated. The presence of leaf infections from the slime mold in an eelgrass population is not uncommon. Groner and others (2016) compared the prevalence of leaf infections at eleven sites in the San Juan Archipelago in July 2013 and plants with infected leaves were present at all sites. The prevalence of infection ranged from 6 percent to 79 percent. In False Bay, 47 percent of the eelgrass plants had infected leaves. The prevalence of slime mold infections in False Bay was

also assessed in 2012 and 2016. The comparison of the results of these three studies is listed below in Table 5 and indicates that infection rates are variable from year to year. Although leaf infections due the presence of the slime mold is common in the eelgrass meadow, the occurrence of wide scale wasting disease is not necessarily inevitable. Environmental factors such as salinity, water temperature, sulfide and nutrient concentration, light and epiphytic growth may contribute to outbreaks of wasting disease (Sullivan 2011).

Table 5. Comparison of the prevalence of eelgrass plants with leaves infected with the slime mold *Labyrinthula zosterae* in False Bay over five years.

	2012 [a]	2013 [b]	2016 [c]
False Bay	33%	47%	37.7%

a. Groner, M.L., et al. 2014.
b. Groner, M.L., et al. 2016.
c. Graham, O., M. Eisenlord, D. Harvell. 2016.

The eelgrass bed in the False Bay Reserve has been mapped by Washington State since 1980. Recent monitoring by WDNR Nearshore Habitat Program has found this eelgrass bed to be stable over the past decade (WDNR 2016). A map of the WDNR study sites is illustrated in Figure 3 with indicators of eelgrass study areas that are increasing, declining or stable; The False Bay Reserve eelgrass is a stable bed (WDNR 2016).

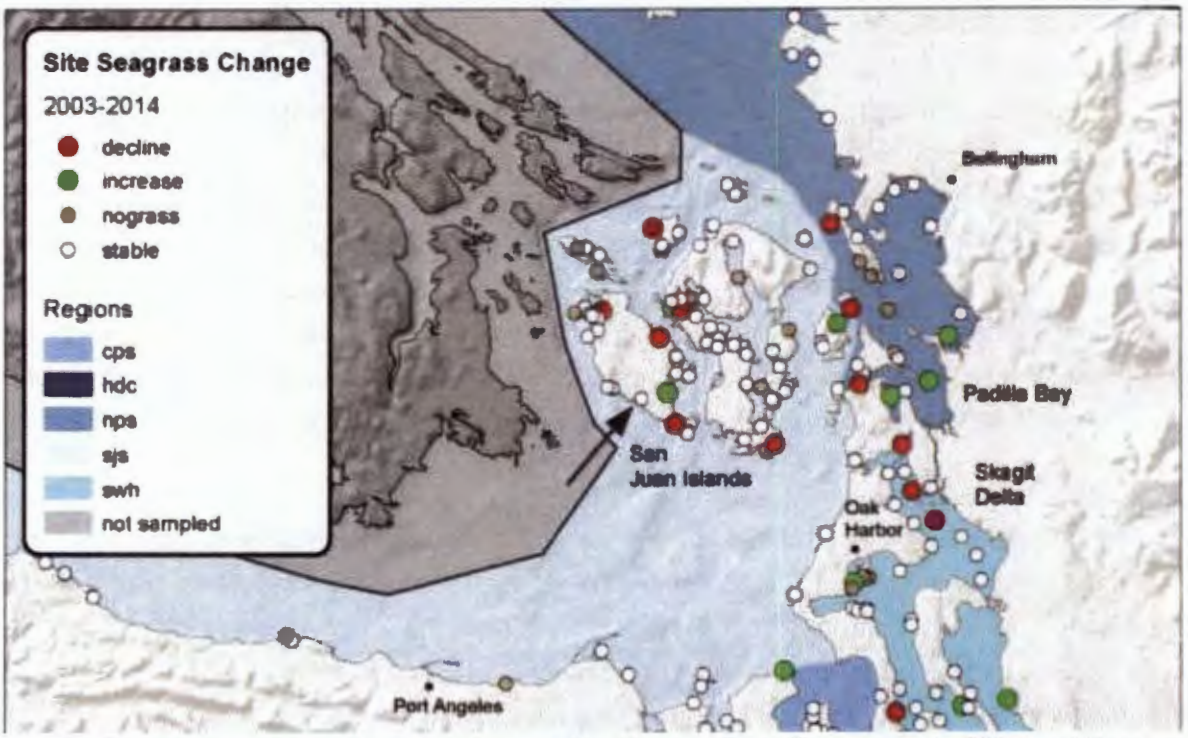

Figure 3. Change over ten years of seagrass at Washington State Department of Natural Resources Aquatic Vegetation Program study sites. False Bay and the Orca Dreams LLC project site is indicted by the black arrow at center. From WDNR 2016.

WDFW Priority Habitats and Species

A review of Washington State Department of Fish and Wildlife Priority Habitats and Species database identifies the following habitat and species to be observed in the Project Action Area:

Table 6. Washington State Dept. of Fish and Wildlife Priority Habitat and Species database

Species	Priority Area	Federal Status
Bald eagle (*Haliaeetus leucocephalus*)	Breeding area Management buffer	Species of concern
Golden eagle (*Aquila chrysaetos*)	Breeding area	Candidate
Harbor seal (*Phoca vitulina*)	Haulout	Monitored
Island marble butterfly (*Euchloe ausonides*)	Occurrence	Species of concern
Pinto abalone (*Haliotis kamtschatkana*)	Presence	Species of concern
Dungeness Crab *Metacarcinus magister*	Presence	Managed species
Red Sea Urchin *Strongylocentrotus*	Presence	Managed species
Marine intertidal habitat	Aquatic habitat	

Washington State Department of Ecology's Coastal Atlas (https://fortress.wa.gov/ecy/coastalatlas/tools) provided the following information:

1. No appreciable net-shore drift
2. No saltmarsh plants or habitat
3. Patchy eelgrass fringe
4. Patchy kelp
5. No listed water quality of sediment quality issues

San Juan County Critical Areas

San Juan County critical areas have been identified that occur on or near the project site. These critical areas are listed below in Table 7.

Table 7. San Juan County critical areas identified in project area.

Critical Area	Status	Impact
Net shore-drift and feeder bluff	No appreciable net-shore drift in project area	No impact
Northern abalone (*Haliotis kamtschatkana*)	Present in rocky intertidal habitat	Not likely to impact
Dungeness Crab *Metacarcinus magister*	Present	Not likely to impact
Red Sea Urchin *Strongylocentrotus*	Present	Not likely to impact
Eelgrass outer line	Present	Not likely to impact
Bald eagle (*Haliaeetus leucocephalus*)	Breeding area Management buffer	Not likely to impact

The project site has been mapped with no appreciable net shore-drift for 1,850 feet to the north of the proposed dock and for 2.5 miles to the south of the proposed dock. The project will not alter wave energy approaching the project site and will therefore have no effect on drift cells or feeder bluffs.

Northern abalone (also known as the pinto abalone) are likely present near the project area associated with the rocky intertidal habitat of rock island to the west of the dock. Three belt transects were surveyed for the presence of abalone however, no abalone were observed. The proposed dock will be located in an area of poor quality abalone habitat and the project will not likely impact abalone or abalone habitat (See Appendix C).

Dungeness crab and red sea urchin are present in the project area. Crab are mobile and will be able to avoid impacts during construction. The projects will not block movement of crab along the shoreline or intertidal zone. The projects will not likely impact Dungeness crab or crab habitat. Red sea urchins are present on boulder and rocky habitat that will not be impacted by construction of the projects. The projects will not likely impact red sea urchins or sea urchin habitat.

Forage Fish

Probability of presence of juvenile salmon and forage fish has been studied by Beamer and Fresh (2012). Using habitat descriptions outlined for the high resolution model in their report, the project site is a pocket beach along the Strait of Juan de Fuca. For the low resolution model, the project site is a passage habitat on the exterior shoreline of the study area. The probability of observing juvenile chinook and chum salmon, Pacific herring, Pacific sand lance or surf smelt is moderate when compared to the range of probability for all sites studied in the San Juan archipelago (Table 8). The predicted probability means that these fish may be captured in a beach seine between the months of March and October following the methods outlined by Beamer and Fresh (2012) rather than the probability of capture during a single beach seine event.

Table 8. Probability of use of Project Area by juvenile fish as reported by Beamer and Fresh (2012). Probability of use means for example that a juvenile Chinook salmon has a 0.249 probability (24.9%) of being captured in a beach seine between March and October following the methods outlined in the report.

Species	Low Resolution Model	High Resolution Model	Range[1]	
			Low	High
Juvenile Chinook salmon	0.249	0.268	0.027	0.625
Juvenile chum salmon[2]	0.751	0.640	0.152	0.960
Juvenile Pacific herring	0.229	0.104	0.000	0.625
Juvenile surf smelt	0.298	0.300	0.021	0.545
Juvenile Pacific sand lance	0.158	0.073	0.014	0.625

1. Range of probability of High Resolution Model output for all habitat types and all shoreline types in San Juan Islands.
2. Chum salmon stock was not identified; these juvenile fish may have originated in any river system in the northern Salish Sea.

Vessel Traffic

The Strait of Juan de Fuca and Haro Strait are heavily used by commercial and recreational vessels and is a direct transportation route to Canada. The number of commercial ships, passenger ships, tugs and barges, and commercial fishing vessels that travel through the eastern section of the Strait of Juan de Fuca has been estimated by Glosten Associates Inc. (2014) and Northern Economics, Inc. (2014). The number of private vessels and day-charter vessels however, cannot be estimated because there is no requirement to report activities of private vessels. The average number of commercial vessels per year in the eastern part of the Strait of Juan de Fuca is listed below.

Table 9. Average Annual Commercial Vessel Traffic in the eastern portion of the Strait of Juan de Fuca.

Vessel	Average Annual	Units
Commercial Ships[1]	4,193	Traffic days[2]
Tribal fishers crab and shrimp	2,780	Trips
Tribal fishers salmon	302	Trips
Total:	**7,275**	

1. Commercial ships include cargo, tankers, tugs, tug and barge, passenger and fishing vessels.
2. Traffic day is defined as vessels in the study area for a 24-hour period. Generally, a single vessel moves through the study area and therefore multiple vessels will be contribute to a single 'vessel traffic day'. Therefore a 'traffic day' will be the sum of several trips through the study area.

Commercial whale watching boat traffic has substantially increased in recent years to a fleet of approximately 72 boats. Typically, during the summer, an average of 22 boats follow a pod of killer whales during the daylight hours along the west side of San Juan Island (Foote et al. 2004).

The number of private vessels, charter vessels and smaller boats such as skiffs, kayaks and canoes cannot be estimated because there is no requirement to report activities of private boats. The west side of San Juan Island is very popular for viewing, sailing, recreational fishing, and diving and the number of private boats in the study area during the summer season is significant. The additional boat trips associated with the proposed Orca Dreams LLC private dock will be insignificant or discountable relative to the number of commercial and private vessels operating along the west side of San Juan Island.

5.2 Terrestrial Habitat Conditions

Landward of the pocket beach where the proposed dock will be constructed is a moderately high bluff of unconsolidated silt and sand mixed with gravel (USDA soils web map). When saturated with water, this material may slough especially where the toe of the bluff is eroded (Photo 2). The existing driftwood protects the toe of the bluff from wave action that would otherwise erode this soil. Grass, shrubs and trees are growing on the bluff including:

Nootka rose	Snowberry	Douglas fir
Elderberry	Himalayan blackberry	Willow
Oceanspray	Sword fern	
Serviceberry	Alder	

Photo 2. Evidence of soil movement at the toe of the bluff.

5.3 Reverse Osmosis Desalination System

The intake and diffuser components of the RO system will be installed in a small cove that is open to the west and northwest that is generally protected from the predominant south and southwest wind and waves. The shoreline inside the cove has a 'pocket beach' that is confined by rock outcrops which hold the beach sediment in place. The beach is composed of a mix of gravel and sand and there is no appreciable net-shore drift (https://fortress.wa.gov/ecy/coastalatlas). Large pieces of driftwood have accumulated on the upper beach which indicates that wood tends to be held in this location (Photo 1).

Water Quality and Salinity

The project site is located at the south end of Haro Strait at the boundary with the eastern portion of the Strait of Juan de Fuca. Strong tidal currents mix outflowing water with inflowing water from the Pacific Ocean. No impairments to water quality are reported by Washington State Department of Ecology (WDOE). Salinity of the water in the eastern portion of the Strait of Juan de Fuca ranges from 26 parts per thousand to 31 parts per thousand (Thomson 1981). Fresh water from the Fraser River and other tributaries to the Salish Sea dilute the ocean

seawater during the spring/summer runoff season and in the winter, salinity of the seawater is generally higher.

6.0 Effected Area and Action Area

Construction of each project will generate noise during the period of construction. Placement of piling will generate both underwater and airborne noise. Construction of each project will disturb sediment and soil that may be transported into the marine environment. The action area for each project is considered separately as listed below.

6.1 Joint-use Dock Action Area

- Underwater Noise:
  - Vibratory pile driving: 1.34 miles
  - Rock drilling: 0.40 miles

The project will place twelve 10-inch steel pile into intertidal and subtidal areas. Washington State Department of Transportation guidance (WSDOT 2015) for establishing the Action Area for driving 12-inch steel piling with a vibratory hammer will be used, the smallest sized pile addressed by WSDOT. Underwater noise produced by driving a 12-inch steel pile with a vibratory hammer is estimated to be 155dB$_{RMS}$ measured 33 feet (10 meters) from the piling (CalTrans 2007). Underwater noise thresholds for injury and disturbance for selected groups that may be in the project area are listed below in Table 10 along with the distance of attenuation of underwater noise to the disturbance threshold.

Table 10. Underwater noise threshold for injury and disturbance for selected groups and distance required for underwater noise to attenuate to disturbance threshold.

Functional Hearing Group	Injury Threshold	Disturbance Threshold (vibratory pile driving)	Distance to attenuation from 155 dB$_{RMS}$ to Disturbance Threshold[1]
Cetaceans	179 dB$_{RMS}$	120 dB$_{RMS}$	1.34 miles
Pinnipeds	181 dB$_{RMS}$	120 dB$_{RMS}$	1.34 miles
Fish ≥ 2 grams	187 dB$_{RMS}$	150 dB$_{RMS}$	71 feet
Fish < 2 grams	183 dB$_{RMS}$	150 dB$_{RMS}$	71 feet
Marbled Murrelet	202 dB$_{RMS}$	150 dB$_{RMS}$	71 feet

1. Transmission Loss = 15log(R_2/R_1) Solving for distance to specified level of noise: R2 = R1*10^(($dB_{at\ R1}$ – $dB_{threshold}$)/15) (NMFS 2012).

Project noise will not reach the threshold of harm to fish (183 dB). Noise will however, be greater than the disturbance threshold of fish for a distance of 71 feet from the work site. Project noise will not reach the threshold for harm of 179dB$_{RMS}$ for whales and 181dB$_{RMS}$ for pinnipeds. Using the practical spreading loss model (NMFS 2012), underwater noise will fall below the behavior effects threshold of 120dB$_{RMS}$ for marine mammals at a distance of 1.34 miles. Therefore, the Action Area of behavior threshold for marine mammals will be 1.34 miles where underwater sound transmission is not obscured by land (Figure 4).

Figure 4. 1.34-mile Action Area associated with attenuations of underwater noise produced by driving steel piling with a vibratory hammer.

If bedrock is encountered, the piling will be placed in holes bored into rock. Underwater noise produced by drilling is significantly less than vibratory pile driving. Alaska LNG (2015) reported that underwater noise generated from drilling 10-inch diameter holes did not exceed the 120 dB at the sound source. Nedwell and Brooker (2008) reported underwater noise of 162 dB at 1 meter from drilling a 46-inch hole into bedrock. Using the data from the Nedwell and Brooker report as a conservative estimate, the distance to attenuation to the behavior threshold for whales is 0.39 miles. Table 11 lists the SPL produced by each action, method of placement of the piling with the distance to attenuation, and the area to be monitored for presence of marine mammals.

Table 11 Sound Pressure levels and Zone of Influence for placement of 6-inch piling and 10-inch piling with a vibratory pile driver and drilling.

Action	Method	Underwater Sound Pressure Level	Distance to attenuation to Disturbance Threshold	Action Area to be monitored
Placement of twelve 10-inch steel piling	Vibratory pile driver	155 dB_{RMS} [1]	1.34 miles	1.34 miles
	Drilling 12-inch diameter hole	162 dB_{RMS} [2]	0.39 miles	0.40 miles

The average ambient noise levels on the west side of San Juan Island was reported by Veirs and Veirs (2005, as cited in WSDOT 2012) to be 118dB_{RMS} during the summer months of July and

August and 116dB$_{RMS}$ during the non-summer months of October through April. Appling the practical spreading loss model, underwater noise will attenuate to background level over a distance of about 1.8 miles through open water during July and August and 2.5 miles during October through April.

Airbourne Noise

As many as eight creosote-treated wood piling will be pulled with a vibratory hammer as needed and twelve 10-inch steel piling will be driven with a vibratory hammer. Airborne noise generated by these actions may reach the disturbance threshold of 90dB$_{RMS}$ (unweighted) for harbor seals within 139 feet of the activity and will not likely reach the disturbance threshold of 100dB$_{RMS}$ (unweighted) for other pinnipeds at 50 feet from the action. WSDOT (2010) measured airborne noise generated by driving an 18-inch steel piling with a vibratory driver to be 88.6 dB L_{eq}/RMS at 39 feet. This measurement was standardized to an L_{max} noise of 93.8 dB at 50 feet. Transmission loss through air over water (TL=20LogR) will reduce airborne noise to 90dB at 89 feet beyond the 50-foot distance where the L_{max} noise was estimated. Airborne noise generated from a vibratory driver setting an 18-inch pile will attenuate to the disturbance threshold of 90dB$_{rms}$ for harbor seals within 139 feet from the source. Airborne noise generated from placement of 10-inch steel piling will likely be less.

The closest documented harbor seal haulout is approximately 3,000 feet (0.57 mi) from the project site although harbor seals may occasionally haulout on the beach or on an exposed rock approximately 200 feet from the project site. The closest documented sea lion haulout is approximately 12 miles west of the project site (Jeffries et al. 2000).

Boat operations and Dock use

The applicant has prepared an extensive Spill Prevention, Containment and Control Plan to avoid the potential for fuel leaks and subsequent pollution at this site (Appendix E). Boat operators will be responsible for operating their vessels at safe speeds and to approach the dock from the southwest entrance where a safe deep-water channel has been identified (Figure 5). This approach will minimize wave energy from boat wakes along the shoreline. Operating vessels at slow speed near the dock will also minimize the potential for prop scour. Fuel and petroleum products will not be transferred at the dock to avoid risk of accidental spill.

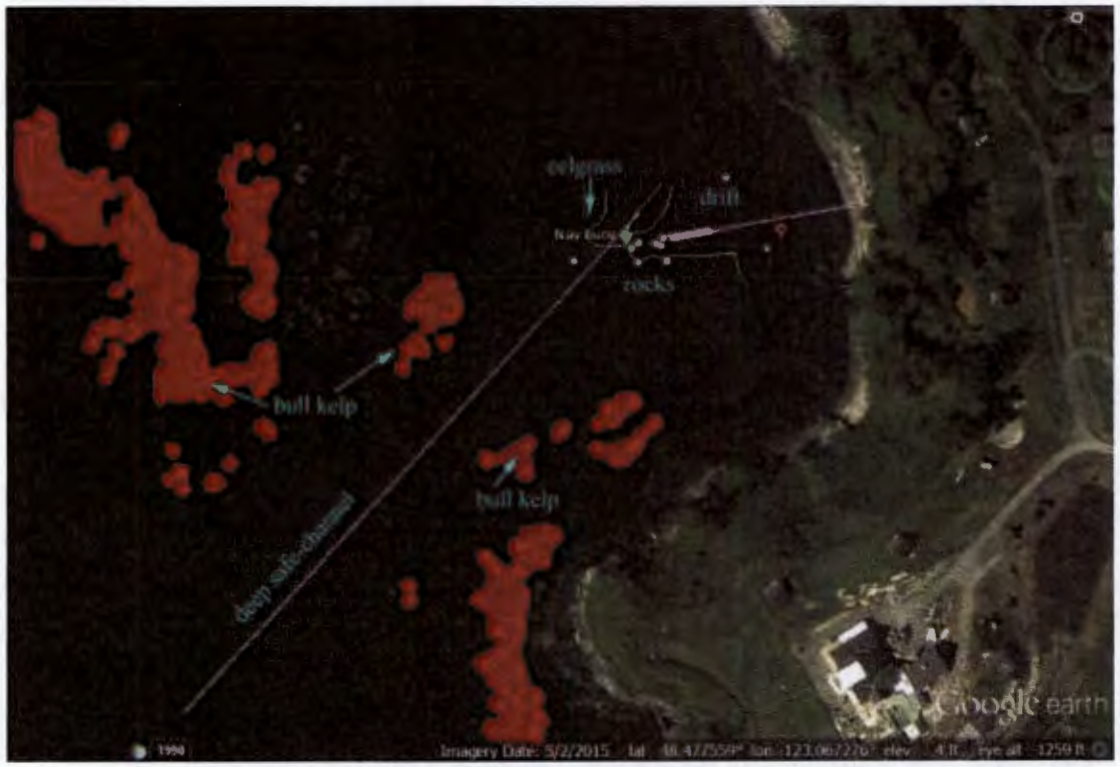

Figure 5. Deep safe-channel that boat operators will use to approach the dock. Following this channel will prevent impacts to marine vegetation, pocket beach and the marine preserve.

6.2 Reverse Osmosis Desalination System

- Underwater Noise:
  - Vibratory pile driving: 1.34 miles
  - Rock drilling: 0.40 miles

The proposed RO desalination system will require placement of two 6-inch steel piling. The force and driving time required to place the 6-inch piling will be significantly less than the force required to set a 12-inch pile, the smallest piling monitored in studies completed by CalTrans (2007). Underwater noise produced by driving a 12-inch steel pile with a vibratory hammer is estimated to be 155dB$_{RMS}$ measured 33 feet (10 meters) from the piling (CalTrans 2007). Underwater noise thresholds for injury and disturbance for selected groups that may be in the project area are listed in Table 10 (in discussion above) along with the distance of attenuation of underwater noise to the disturbance threshold based underwater noise produced from driving 12-inch piling.

The distance for underwater sound levels produced by installing a 6-inch piling to attenuate to the disturbance threshold level will likely be less than that estimated for a 12-inch piling however since the data is lacking for smaller piling, the estimated 1.34-mile action area will be used for placement of the two RO desalination piling.

Project noise will not reach the threshold of harm to fish (183 dB), however noise will be greater than the disturbance threshold of fish for approximately 71 feet from the work site. Project noise will not reach the threshold for harm of 178dBRMS for whales and 181dBRMS for pinnipeds. Using the practical spreading loss model (NMFS 2012), underwater noise will fall below the disturbance threshold of 120dBRMS for marine mammals at a distance of 1.34 miles. Therefore, the Action Area of behavior threshold for marine mammals will be 1.34 miles where underwater sound transmission is not obscured by land (Figure 6).

If drilling is required, the marine mammal monitoring area will be reduced to a radius of 0.40 miles as illustrated on Figure 6. If SRKW or humpback whales enter the 0.40-mile monitoring area, drilling operations will be stopped until the whales have left the area.

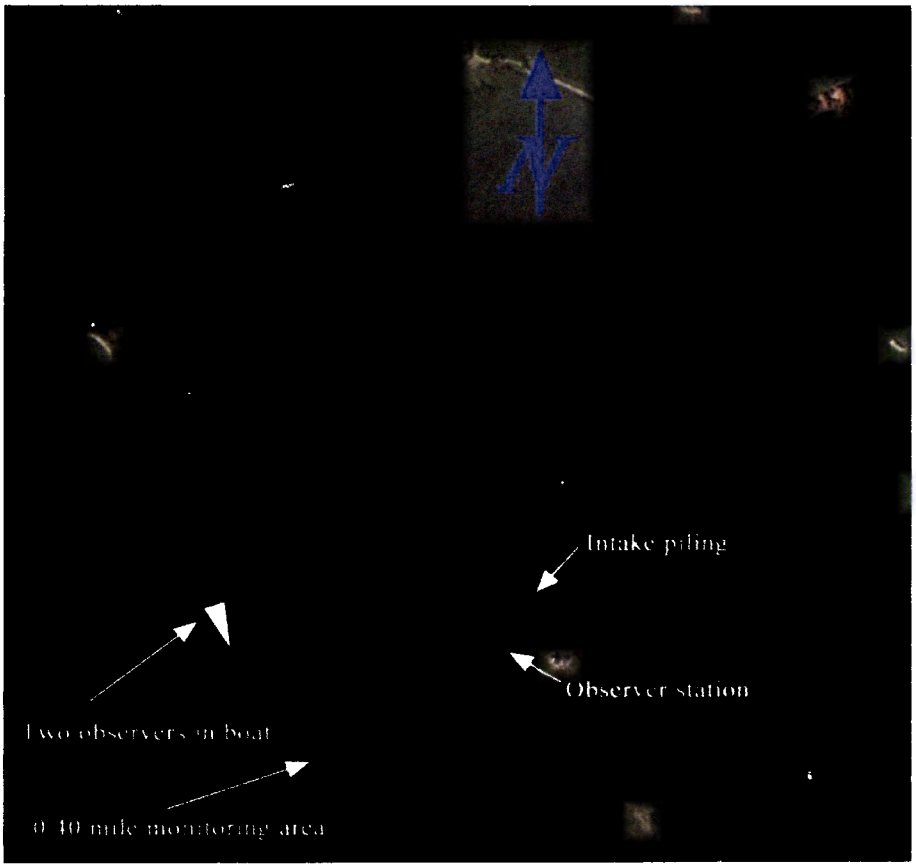

Figure 6. Area to be monitored during drilling operations is a 0.40- mile radius from the sound source. If southern resident killer whales or humpback whales enter the area, drilling operations will be stopped.

Airborne Noise

Two 6-inch piling will be installed with a vibratory hammer. If bedrock is encountered, the piling will be placed into a drilled hole. Airborne noise generated by these actions may reach the disturbance threshold of 90dB$_{RMS}$ (unweighted) for harbor seals within 50 feet of the activity and

may reach the disturbance threshold of 100dBRMS (unweighted) for other pinnipeds at 50 feet from the action (WSDOT 2017). These measurements were recorded when 18-inch steel piles were being driven with a vibratory hammer. Airborne Noise generated from 6-inch steel piles will likely be less.

The closest documented harbor seal haulout is approximately 3,000 feet from the project site although harbor seals may occasionally haulout on the beach or on an exposed rock approximately 200 feet from the work site. The closest documented sea lion haulout is approximately 12 miles west of the project site (Jeffries 2000).

7.0 Affected Species and Critical Habitat

The Project may disturb listed species and their critical habitats during construction phase due to noise generated from pile driving, operation of heavy equipment and minor disturbance of sediment on the seafloor and shoreline. After construction, use of the joint-use dock will have a minimal impact to listed species and critical habitat. ESA listed species and critical habitat that may be affected by the proposed project are provided below in Table 11.

Table 12. United State Endangered Species Act listed species that may be affected by the Orca Dreams LLC joint-use dock Project.

Species	Status[1]	Jurisdiction
Marbled murrelet (*Brachyramphus marmoratus*)	T	USFWS
Streaked horned lark (*Eremophila alpestris strigata*)	T	USFWS
Streaked horned lark critical habitat		USFWS
Yellow-billed cuckoo (*Coccyzys americanus*)	T	USFWS
Coastal Puget Sound Bull trout (*Salvelinus confluentus*)	T	USFWS
Coastal Puget Sound Bull trout critical habitat		USFWS
Puget Sound ESU Chinook salmon (*Oncorhynchus tshawytscha*)	T	NMFS
Puget Sound ESU Chinook salmon critical habitat		NMFS
Hood Canal summer-run chum salmon	T	NMFS
Puget Sound steelhead trout (*Oncorhynchus mykiss*)	T	NMFS
Bocaccio rockfish (*Sebastes paucispinis*)	T	NMFS
Yelloweye rockfish (*Sebastes ruberrimus*)	E	NMFS
Southern resident killer whale (*Orcinus orca*)	E	NMFS
Southern resident killer whale critical habitat		NMFS
Humpback whale (*Megaptera novaeangliae*)	E	NMFS

1. Status: Threatened or Endangered.

7.1 Birds

Marbled Murrelet

Marbled murrelets (*Brachyramphus marmoratus*) were listed as threatened by the USFWS in 1992. Marbled murrelets are year-round residents on Washington marine waters. These birds forage in sheltered waterways and harbors generally within 1.2 miles of shore, selecting feeding areas that are closer to shore than other alcid seabirds that forage in Washington waters. Pacific sand lance (*Ammodytes hexapterus*) is the primary prey species of marbled murrelets, constituting over 65% of their diet, especially during the breeding season. Other prey species include pacific herring (*Clupea harengus*), seaperch (*Cymatogaster aggregata*), euphausiids and other marine invertebrates (Burkett 1995).

Marbled murrelets breed from April 1 to September 15 and nest in mature and old growth forests within 60 miles of marine waters. Potential threats to marbled murrelet populations include loss of old-growth forest, disturbance during nesting, nest predation, oil spills, entanglement in gill nets, and disturbance during foraging (Ralph et al. 1995). Marbled murrelets forage and winter in marine habitats around the San Juan Islands in relatively low densities with the highest numbers generally observed in fall (Speich and Wahl 1995). There are no known marbled murrelet nest sites in the Action Area and wooded areas in the Action Area are 2nd or 3rd growth forests and have low potential for murrelet-nesting habitat (SJC CAO maps).

Critical Habitat

Critical Habitat for the marbled murrelet has been designated in 1996 to protect nesting areas with the primary constituent elements (PCEs) described as (1) trees with potential nesting platforms and, (2) forested areas within 1/2 mile of potential nest trees with a canopy height of at least 1/2 of the site potential tree height. Marine forage areas are not specifically designated as critical habitat however, forage habitat is implied as important through general PCEs including but not limited to, the following:

- Space for individual and population growth, and for normal behavior;
- Food, water, air, light, minerals or other nutritional or physiological requirements;
- Cover or shelter;
- Sites for breeding, reproduction, rearing of offspring; and
- Habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

The Action Area associated with the proposed Orca Dreams joint-use dock does not include designated critical habitat for marbled murrelet and the forested uplands have been mapped as unsuitable or have low potential by San Juan County. The Project, therefore, would have no effect on critical habitat for marbled murrelet.

Streaked Horned lark (Eremophila alpestris strigata)

Streaked horned lark was listed as threatened on October 3, 2013. Once considered common, the horned lark is now considered 'a common bird in steep decline'. Horned larks favor bare, dry ground and areas of short, sparse vegetation; they avoid places where grasses grow more than a couple of inches high. Common habitats include prairies, deserts, tundra, beaches, dunes, and heavily grazed pastures. Horned larks also frequent areas cleared by humans, such as plowed fields and mowed expanses around airstrips. Habitat used by larks is generally flat with substantial areas of bare ground and sparse low-stature vegetation primarily comprised of grasses and forbs with height generally less than 13 inches. Larks eat a wide variety of seeds and insects and appear to select habitats based on the structure of the vegetation rather than the presence of any specific food plants. The decline of the horned lark population is due to a number of activities including:

- Development; converting open grasslands to agriculture, residential and commercial buildings
- Degradation of habitat due to fire suppression and invasion by undesirable and non-native plants.
- Degradation of habitat due to improperly timed controlled burning and mowing regimes

Critical Habitat

Critical Habitat was designated on October 3, 2013 (FR v.78, no.192) PCEs specific to the streaked horned lark are areas having a minimum of 16 percent bare ground that have sparse, low-stature vegetation composed primarily of grasses and forbs less than 13 in (33 cm) in height found in:

- Large (300-ac (120-ha)), flat (0-5 percent slope) areas within a landscape context that provides visual access to open areas such as open water or fields, or
- Areas smaller than described in above, but that provide visual access to open areas such as open water or fields.

San Juan County and the project area is not specifically included in the designated critical habitat for streaked horned lark. However, a key attribute of habitat used by horned larks is open landscape with visual access to open water similar to that of the open area of the Orca Dreams LLC property on the west side of San Juan Island. A horned lark was observed at Spencer Spit on Lopez Island on September 9, 2016 however, no observations of the horned lark on San Juan Island has be recorded (ebird.org).

Yellow-billed Cuckoo (*Coccyzys americanus*)

The Yellow-billed cuckoo (*Coccyzys americanus*) was listed as threatened by USFWS in 2014. Historically, western yellow-billed cuckoos occurred west of the Continental Divide, from British Columbia south into northern Mexico. They no longer occur in much of their historic range, and are now a rare visitor in Washington State. Between 1950 and 2000, only 12 sightings have been recorded, four in western Washington and eight in eastern Washington.

These birds breed along rivers in Arizona, California, and New Mexico. They migrate to wintering grounds in South America. Habitat loss, specifically near-water habitat, and pesticide use have been the primary causes for the decline of the yellow-billed cuckoo. Critical habitat designation is currently in review and would include protecting of 80 separate units in western States. No critical habitat areas are proposed in Washington State.

7.2 Salmonids

The Salish Sea supports several species of anadromous salmonids. These include Chinook salmon (*Oncorhynchus tshawytscha*), chum salmon (*O. keta*), coho salmon (*O. kisutch*), pink salmon (*O. gorbuscha*), sockeye salmon (*O. nerka*), steelhead trout (*O. mykiss*), and sea-run cutthroat trout (*O. clarki clarki*). Two anadromous char species, bull trout (*Salvelinus confluentus*) and Dolly Varden (*S. malma*) are also known to use these waters. Dolly Varden and bull trout are similar in appearance and are often mistaken for the other.

While there is no suitable habitat for spawning in the Action Area, adult and juvenile salmonid species migrate and rear throughout the Salish Sea. Salmonid species, as well as other marine species, require good water quality. No specific surveys were conducted to determine presence of salmonids in the project vicinity however, it is likely that these fish may be present throughout the year in the Action Area.

Coastal/Puget Sound Bull Trout and Dolly Varden

Coastal/Puget Sound Bull trout were listed as threatened under the Endangered Species Act (64 FR 58909) on November 1, 1999. Washington State Dolly Varden was proposed for listing as threatened due to similarity of appearance to Bull trout (66 FR 1628) on January 09, 2001. Bull trout and Dolly Varden are managed jointly by WDFW because they co-exist, and have very similar life histories and habitat requirements (WDFW 1998).

Coastal/Puget Sound Bull Trout Critical Habitat

Bull trout may be present in the Action Area however, their designated critical habitat does not include the nearshore areas of the San Juan Islands.

Puget Sound Chinook Salmon

Puget Sound Chinook salmon was listed as threatened under ESA (64FR 14308) on August 2, 1999 and a recent five-year review of this listing completed on August 15, 2011 concluded that Puget Sound Chinook salmon should remain listed as threatened (76FR 50448). Spawning populations of Chinook salmon are distributed along the Pacific Coast of North America from the Ventura River in southern California to Point Hope, Alaska, and in northeast Asia from the Anadyr River south to Hokkaido, Japan (Wydoski and Whitney, 2003). Chinook salmon can be found throughout the year in the Salish Sea.

Factors leading to the decline of Chinook salmon populations in Puget Sound include:

- Degradation of spawning and rearing habitat due to human activities
- Limited access to historic spawning habitat due to development activities
- Altered stream flow regimes and water temperatures
- Loss of riparian vegetation and soils that alter hydrologic and erosion rates
- Increased sedimentation,
- Decreased large woody debris (LWD) in rivers and loss of potential recruitment of LWD
- Filled estuarine rearing areas
- Channelizing and diking of rivers leading to loss of rearing and spawning habitat
- Dams blocking access to historic spawning and rearing channels, and altering hydrologic regimes, water temperature and sediment transport
- Over exploitation of Chinook stocks by commercial and recreation fisheries have contributed to lower numbers of returning adult salmon
- Introduction of non-native species have increased populations of predator and competitive species
- Hatchery programs have led to competition between artificially produced fish with naturally reproduced fish, mixed separate genetic stocks, and transmit disease between hatchery and naturally produced fish.

Puget Sound Chinook Salmon Critical Habitat

The final designation of critical habitat for Puget Sound evolutionary significant unit of Chinook salmon was published on September 2, 2005 (70 FR 52630). The Project Action Area is within the nearshore marine critical area (Unit 19). This unit includes all nearshore zones (including areas adjacent to islands) of the Strait of Georgia (south of the international border), Puget Sound, Hood Canal, and the Strait of Juan de Fuca from extreme high water out to a depth of 100 feet (30m). PCEs of the nearshore marine critical habitat include:

- Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation
- Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

Hood Canal Summer-Run Chum Salmon

The naturally spawned population of summer-run chum salmon in Hood Canal and tributaries including Olympic Peninsula rivers between Hood Canal and Dungeness Bay were listed as threatened on March 25, 1999 (64FR 14508). Chum salmon are distributed throughout the shoreline of the North Pacific Ocean from Sacramento to Japan and the Mackenzie River in the Arctic Ocean (Wydoski and Whitney 2003). Generally, in Puget Sound, chum salmon enter their natal stream in the fall. Summer-run and late-run populations however, have also been identified in southern Puget Sound and Hood Canal and tributaries including Dungeness and Elwha rivers (Wydoski and Whitney 2003). Summer-run chum salmon enter the rivers during the low-flow period of late summer and early fall and are confined to the lower reaches of the streams for spawning during late August through late October. Eggs incubate in the gravel redds for five to

six months and emerge between January and May (69FR 74600). Fry migrate downstream within hours or days of emergence to rear in the shallow estuarine habitat, tidal creeks and sloughs favoring eelgrass and marine algae communities in which chum smolts have been observed from January through July (Johnson et al. 1997). Threats to this population include:

- Degradation of spawning habitat
- Reduced river flows
- Increased development on the Kitsap Peninsula
- Predation by increased populations of pinnipeds

Use of the nearshore habitat of the San Juan Islands by Hood Canal summer-run chum salmon is uncertain (Redman *et al.* 2005) and the San Juan Islands and nearshore habitat is not identified as critical habitat for Hood Canal summer-run chum salmon.

Steelhead Trout

The Puget Sound population of steelhead trout (*Oncorhynchus mykiss*) was listed as threatened under the Endangered Species Act on June 11, 2007 (72FR 26722) and a recent five-year review of this listing completed on August 15, 2011 concluded that Puget Sound steelhead trout should remain listed as threatened (76FR 50448). The biological review team determined that naturally spawning winter and summer run steelhead populations and two hatchery steelhead stocks within Puget Sound constitute a Distinct Population Segment (DPS) that is reproductively isolated from other groupings of West Coast steelhead. Historically, steelhead trout were distributed along the marine waters and inland rivers of west coast North America and northern Asia from northern Mexico to the Kamchatka peninsula. Human development has negatively impacted spawning and rearing habitat, and has created barriers to upstream migration in much of the historic range (Wydoski and Whitney 2003, 71FR 15666). Steelhead is a sea-run form of *O. mykiss* and rainbow trout is the freshwater resident form. Offspring from either form may either reside in its natal freshwater system or migrate out to marine waters after rearing in freshwater from one to seven years (Wydoski and Whitney 2003).

Factors contributing to Puget Sound steelhead decline are:

- Destruction and modification of spawning and rearing habitat in freshwater and estuarine systems;
- Over fishing for commercial, recreational, scientific or educational purposes;
- Disease and predation by especially non-native species;
- Inadequacy of existing regulatory mechanisms e.g. fisheries management and land use regulations;
- Other natural and manmade factors such as Pacific Decadal Oscillation and climate change.

Puget Sound Steelhead Trout Critical Habitat

Critical habitat designation has been recently issued and became effective on March 25, 2016 (81FR 9251). Steelhead are believed to move rapidly from their freshwater rearing habitat to offshore waters and therefore nearshore areas are not included in the designated critical habitat

for Puget Sound steelhead trout. Critical habitat that has been designated includes freshwater rearing and spawning habitat. The Project Action Area is not within designated critical habitat and, therefore, the proposed project will not adversely modify critical habitat for Puget Sound steelhead trout.

7.3 Rockfish

- Bocaccio (*Sebastes paucispinis*)
- Yelloweye (*Sebastes ruberrimus*)

Puget Sound/Georgia Basin Distinct Population Segments (DPSs) of bocaccio rockfish have been listed as endangered and yelloweye rockfish have be listed as threatened under the Endangered Species Act effective on July 27, 2010 (75FR 22276).

The Puget Sound/Georgia basin DPS of these three species of rockfish have declined due to:

- Over fishing for commercial and recreational purposes
- Degradation of habitat for juvenile and adult fish
- Degradation of water quality including episodic low dissolved oxygen and elevated contaminant levels.
- Inadequacy of existing regulatory mechanisms.

Rockfish have a long-life span and mature late in life. As the fish mature, the female is able to reproduce more larvae. Reproductive success however, is sporadic and dependent on environmental stresses. Rockfish are generally congregated around specific habitat and tend to stay within a small home range exhibiting a high fidelity to specific locations. These attributes make rockfish highly susceptible to overfishing; fishers target known rockfish habitat and harvest larger fish with higher reproductive potential. Populations that are depleted of the age structure with a robust genetic diversity may require decades to recover.

Adult bocaccio and yelloweye rockfish are associated with high-relief rocky habitat and are most abundant at depth greater than 150 feet. This habitat is extremely limited in Puget Sound with only 83.8 square miles. Much of this habitat has been impacted by derelict fishing gear, construction of bridges and utility infrastructure (Palsson et al. 2009).

Juvenile bocaccio rear in shallow nearshore water with rock, cobble substrate with attached algae and kelp beds. The rock and algae provide refuge from predators where food sources are plentiful (Love et al. 1991). Puget Sound kelp beds have been impacted by shoreline development, industrial development and water quality degradation.

Very little information is available regarding the early life history of yelloweye rockfish; young juveniles (1 to 4 inches) have been observed along areas of high relief in water depth greater than 15 feet (Love et al. 1991). Generally, juvenile and subadult yelloweye rockfish are more commonly observed in shallower water, and are associated with rocky reefs, kelp canopies, and artificial structures such as piers and oil platforms as compared with than adult yelloweye rockfish (www.nmfs.noaa.gov/pr/species/fish/yelloweyerockfish.htm).

Contaminants and toxins such as mercury and hydrocarbons have been found in adult rockfish collected in the San Juan Islands. These contaminants may reduce reproductive success in bocaccio and yelloweye rockfish similarly to other rockfish species that have been studied. Sewage, nutrients and animal wastes also impact water quality causing dissolved oxygen to be reduced. Fish kills have been documented in Hood Canal due to low dissolved oxygen and periods of low dissolved oxygen are becoming more widespread in Puget Sound (Palsson et al. 2009).

Critical Habitat

Final designation of the critical habitat for bocaccio and yelloweye rockfish was published in the Federal Register on November 13, 2014 (79FR219). Critical habitat for adult bocaccio and adult and juvenile yelloweye include benthic habitat deeper than 98 feet (30m) with complex high relief rocky or rough habitat. This habitat is essential for conservation and possesses the following primary constituent elements:

- Quantity, quality and availability of prey species to support individual growth, survival, reproduction and feeding opportunities
- Water quality and sufficient levels of dissolved oxygen to support growth, survival, reproduction and feeding opportunities
- Type and amount of physical structure and rugosity that supports feeding opportunities and predator avoidance.

Juvenile bocaccio settlement habitat includes nearshore areas with sand, rock and/or cobble that also supports kelp communities. This habitat provides juvenile rockfish with feeding opportunities, refuge from predators, and enable behavioral and physiological changes needed for juvenile fish to occupy deeper habitat as they transition to adult fish. This habitat also possesses the primary constituent elements listed above.

The Action Area includes:

1. Critical habitat for adult bocaccio and adult and juvenile yelloweye where benthic habitat deeper than 98 feet (30m) with complex high relief rocky or rough habitat.
2. Nearshore critical habitat for juvenile bocaccio where juvenile settle and rear.

PCEs of this critical habitat may temporarily be altered during the short period of construction because of placement of piling. After construction has been completed the nearshore habitat, marine vegetation, sediment and water quality will not be impacted. Benthic habitat deeper than 98 feet will not be affected. The Project will not adversely modify the PCEs of critical habitat for bocaccio rockfish.

7.4 Marine Mammals

Southern Resident Killer Whale

NOAA Fisheries has listed southern resident killer whales as endangered under the ESA on November 15, 2005 (70 FR 69903). This listing became effective on February 16, 2006 and a

five-year review published in January 2011 found that the status should remain as endangered. Eastern North Pacific killer whale populations are classified as one of three distinct forms: residents, transients, and offshores. The southern resident killer whale population is distributed in the Pacific coastal waters from central California to the Queen Charlotte Islands, and may be a subspecies of *Orcinus orca* (Krahn et al. 2004). The southern resident population is comprised of about 80 animals within a single clan (J) which is composed of three pods (J, K, and L). Since the late 1990s, the three southern resident killer whale pods have spent much of the year (≥ 7 months) in the inland waters of Washington and British Columbia, Canada. This geographic region is bounded by Race Rocks at the southern end of Vancouver Island and Port Angeles on the Olympic Peninsula (i.e., the east end of the Strait of Juan de Fuca), the Fraser River Delta in British Columbia, the San Juan Islands, and the north end of the Quimper Peninsula in Washington. Southern resident killer whales typically arrive in this region along major corridors of migrating Pacific salmon by late spring (May-June) and depart during winter (December-February). During early fall, southern resident killer whales expand their routine movements into Puget Sound to likely take advantage of chum and chinook salmon runs (Wiles 2004). Southern resident killer whales face a number of potential threats including:

1. Reductions of quality and quantity in prey availability;
2. Exposure to environmental contaminants, and;
3. Disturbance by whale-watching vessels and underwater noise (Wiles 2004).

These whales have experienced large historic declines in their main prey, salmon, which has obvious consequences for the community. Furthermore, organochlorine pollutants, primarily PCBs and DDT residues, are another threat. Southern resident killer whales are now considered among the most highly contaminated marine mammals in the world and exceed the chemical toxicity concentrations believed to cause health problems in other marine mammals. Hearing is crucial for the wellbeing of killer whales, yet threshold levels at which underwater noise becomes harmful to killer whales are unknown (Krahn et al. 2004). Recent models designed to evaluate vessel noise levels relative to killer whales' hearing detection capabilities predicted that the sounds of fast boats are audible to killer whales at distances of up to 10 miles, can mask their calls up to 8.7 miles away, can elicit behavioral responses within 660 feet, and may cause temporary hearing impairment after 30 – 50 min of exposure within 1,480 feet (Krahn et al. 2004). Several studies have linked vessel noise and traffic with short-term behavioral changes in southern resident killer whales. These include changes in swimming speed and call duration, unpredictable travel paths, alteration of dive times, movement to open water, and unusual surface pattern behaviors (Wiles 2004).

Southern Resident Killer Whale Critical Habitat

Proposed critical habitat for southern resident killer whale was published on June 15, 2006 (71FR 34571) that specifies three areas for designation:

- The summer core area in Haro Strait and waters around the San Juan Islands
- Puget Sound
- Strait of Juan de Fuca

Primary constituent elements of SRKW critical habitat are:

1. Water quality to support growth and development;
2. Prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth; and,
3. Passage conditions to allow for migration, resting, and foraging.

The Action Area of the Orca Dreams project is within summer core area of critical habitat for SRKW. A map of total sightings of SRKW in the inland waters from 1990 through 2013 has been compiled by the Whale Museum (Figure 7). One quadrant on the west side of San Juan Island includes the Action Area; the total number of sightings recorded over the 23-year period in this quadrant is listed below in Table 12 for each month with a general description of sighting frequency of SRKW in Haro Strait viewed from the west side of San Juan Island.

During June, July, August and September SRKW are frequently observed along the west side of San Juan Island and may enter the Action Area. The possibility of SRKW entering the Action Area during October through May is substantially less relative to the summer months. The Project may temporarily increase turbidity during the short period of construction however after construction is completed, water quality will not be impacted. Conservation measures listed in Section 9.0 directly address water quality impacts directly related to installation of the RO desalination project.

SRKW prey species are primarily salmon and the Project will not affect the quality or quantity of salmon. Light permeable grating on the pier, ramp and dock and positioning the dock 25-feet or more away from eelgrass beds will allow sufficient light to reach the seafloor to support growth of marine vegetation that offers refuge and forage habitat for juvenile salmon and is critical habitat for Chinook salmon.

SRKW frequently travel along the west side of San Juan Island and may pass through the Action Area. As piling are being installed, underwater sound will be transmitted into the critical habitat for SRKW and may be at a level that will affect SRKW behavior for a distance of 1.34 miles from the project site.

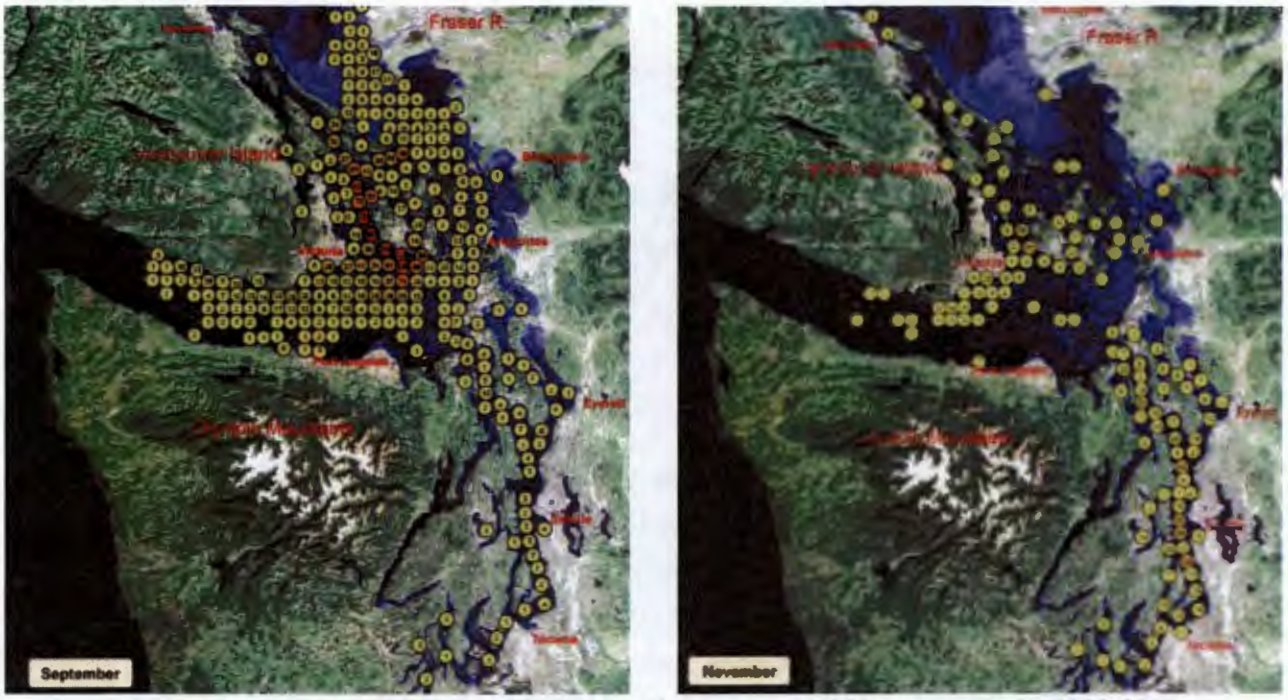

Figure 7. Total number of sightings of SRKW in September and November from 1990-2013. Work will be completed after November 1 when significantly fewer SRKW are near the Project Action Area.

Table 13. General description and frequency of sightings of SRKW in Haro Strait near the Project Action Area.

Month	SRKW Sightings in Haro Strait from San Juan Island	Sightings within quadrant which includes Action Area 1990-2013[1]
June	Frequent	339
July	Frequent	368
August	Frequent	253
September	Frequent	260
October	Occasional	48
November	Occasional	5
December	Occasional	1
January	Occasional	2
February	Occasional	4
March	Occasional	8
April	Occasional	33
May	Often	161

1. http://www.westcoast.fisheries.noaa.gov/publications/protected_species/marine_mammals/killer_whales/occurrencemap.pdf

Humpback Whales

Humpback whales (*Megaptera novaeangliae*) are currently protected globally as endangered under ESA. These whales were first listed as endangered in 1970 under the Endangered Species

Conservation Act of 1969, the precursor to ESA. NOAA recently convened a Biological Review Team (BRT) to review the status of the species and assessing the risk of extinction. This BRT has recommended that the consideration of humpback whales as a global monotypic species should be recategorized as 15 Distinct Population Segments (DPS) (Bettridge et al. 2015, 80 FR 22303). Each recommended DPS is named for the area where breeding occurs for the population. Five DPS feed in the North Pacific Ocean during the summer months; two of these feed in the coastal waters of Washington and Southern British Columbia:

- Central America DPS
- Mexico DPS

The Central America DPS feed almost exclusively offshore of California and Oregon with a few individuals in the northern Washington and southern British Columbia feeding grounds. The Mexico DPS feed throughout the North Pacific from California to the Aleutian Islands with concentrations of this DPS observed in the northern Washington and southern British Columbia feeding grounds Bettridge et al. 2015). Humpback whales observed in the Salish Sea may belong to either of these populations.

Threats to the five North Pacific DPS include:

- Vessel collision
- Fishing gear entanglement

The BRT recommended, and NOAA is proposing, that the Central America DPS of humpback whale should be listed as threatened and that the Mexico DPS should be considered not at risk of extinction. Until these determinations are finalized, humpback whales will continue to be considered endangered.

Humpback whales were once considered common to the US/BC Strait of Juan de Fuca transboundary area including Puget Sound and the Strait of Georgia. Historical catch data shows several thousands of whales harvested from whaling stations located on the coasts of Vancouver Island and Washington State. Until 2003, sightings in the transboundary waters have been uncommon, although a few humpback whales have entered and spent prolonged periods in these waters in recent years. In 2004, 30 sightings of humpback whales were reported in the Salish Sea and eleven individuals have been identified from photographs (Falcone et al. 2005). From January through December 2015 a total of 323 sightings were reported through Orcanet.org. Many of these sightings are of a number of individual whales and many are repeated sightings of the same individuals. Two of the reported sightings in May 2015 are within or near the Project action area. Humpback whale sighting are most common in May through August however, humpback whales have been reported throughout the year. Underwater noise from construction activities may affect humpback whale behavior for a distance of 1.34 miles from the proposed project site.

Humpback Whale Critical Habitat

Critical habitat for the humpback whale has not been designated and NOAA does not propose to designate critical habitat for the two DPS that may be using the Salish Sea as summer feeding ground.

8.0 Analysis of Effects

Construction and use of the two Orca Dreams projects may impact listed species and their critical habitat through:

- Underwater noise generated by pile driving
- Airborne noise generated by pile driving and construction activity
- Temporary disturbance of sediment associated with piling removal and trenching RO system components in the intertidal zone
- Transport of disturbed soil into the marine environment through stormwater
- Potential degradation of water quality due to accidental spilling of fuel and petroleum products
- Reduced natural light under the floating dock
- Altered wave energy near the floating dock during low tide events
- Increased salinity near the return water diffuser
- Increased temperature of return water

8.1 Direct Effects

Pile driving can generate underwater Sound Pressure Levels (SPL) that may cause severe damage and mortality to fish (Longmuir and Lively 2001). The intensity of SPL produced by pile driving is dependent on several factors including:

- Type and size of pile
- Type and size of pile driving equipment
- Firmness of substrate
- Depth of water

Vibratory hammers produce less intense sound pressure levels with rapid repetition over a period of several seconds to several minutes whereas as both the hydraulic and drop-hammer impact pile driving produces a very short intense sound pressure levels. Marine mammals may display avoidance response to the SPL associated with vibratory pile driving, communication between individuals and groups may be masked and echolocation efficiency may be reduced (Griffin and Bain 2006). SPL produced by hydraulic and drop-hammer impact pile driving may cause permanent harm to marine mammals, birds and fish that are in the project area.

The proposed project will remove as many as eight creosote-treated wood piling, place twelve ten-inch steel pilings, and two six-inch steel piling. The steel piling will be set in place with a vibratory-hammer pile driver, or drilled into rock. Each 10-inch steel pile will require

approximately two hours of vibratory pile driving for a total of approximately 24 hours over a period of six days. The six-inch piling will require less one hour of vibratory pile driving to set each pile. The vibratory pile driver will be in operation for a few hours each day over a maximum of six days. Drilling is a slower process and may require three to four hours to set each 10-inch piling. If drilling is required for all piling, then the drilling will occur for four hours each day for over a maximum of 12 days. To avoid impacts to ESA listed marine mammals and seabirds, observers will be on site during pile driving activities and will notify the construction manager if killer whales or humpback whales are approaching or enter the 1.34-mile action area. Pile driving activities will stop if killer whales or humpback whales enter the action area (conservation measure 6). If seals, sea lions or marbled murrelet enter into a 200-foot buffer zone around the project site, pile driving will be stopped until the individual leaves the buffer zone (conservation measure 6).

Airborne noise from construction activities will attenuate to ambient levels over the distance of approximately one mile. Construction noise will be discernable over this distance but will not be at a level at or above the behavior threshold of ESA listed species beyond 139 feet from the vibratory pile driving equipment, the source of the highest noise.

To control sediment during piling removal activity, a steel collar will be placed around the existing pile as it is being removed. Sediment will be contained inside the collar and will settle back into the area of the removed pile (conservation measure 5).

To control sediment during trenching in the intertidal zone, digging will not be done below the water surface; digging will be done only at tidal levels when the beach is exposed, and work can be completed 'in the dry' (conservation measure 7). The trench will be back filled prior to being inundated by the rising tide. Silt fence and straw wattles will be used as needed to capture and control fine sediment along the upland trenching corridor so that the transport of sediment from upland work areas will not enter the marine environment.

Construction activities will be conducted in a manor to minimize impact to water quality to the extent possible. Conservation measures listed in Section 9.0 will be strictly followed to minimize impacts to water quality and to prevent spills of petroleum products.

The dock will be secured with a 25-foot minimum buffer zone from eelgrass beds and shade from the dock and moored vessels will not reduce the natural light available for the growth of the existing eelgrass beds. The fixed pier, ramp and floating dock will be constructed with light permeable grating to allow sufficient sunlight to reach the seafloor under each of the dock components to allow growth of marine algae.

The float may act as a breakwater by attenuating wave energy and thereby altering the character of the pocket beach. The float will however be removed for the winter months when wind-driven wave energy will be greater than during the summer months. Winter-wave action will maintain the existing character on the beach. Wakes created by boats approaching the dock may also impact the pocket beach by increasing wave energy and altering the character of the beach. Boat operators will approach the dock from the south through a deep safe-channel and at a slow and safe speed. Wakes created at slow speed will not have significant energy to substantially alter the existing character of the pocket beaches. During low-tide events, the floating dock will be close to the sea floor and movement of the dock may cause a 'pumping' action that could alter the character of the sediment under the float. Pumping action would dislodge sand and fine sediment leaving the coarse sediment in place. Potentially, the coarse sediment would provide attachment substrate for marine algae.

Dock Use

Occasional use of the dock may impact critical habitat for listed species by:

- Degrading water quality due to accidental spills of fuel and petroleum products
- Damaging marine vegetation by physical disturbance from grounding and prop wash
- Attenuation of wave energy that maintains beach conditions.

Discharges of petroleum products will not be allowed and is addressed below in conservation measure 12. Biodegradable hydraulic fluid will be used in equipment operating waterward of the OHWM. Transfer of fuel and petroleum products will not be allowed at the dock as stated below in conservation measure 12. Boat operators using the Orca Dreams private dock agree to follow the Spill Containment, Prevention and Control Plan attached as Appendix E which prohibits transfer of petroleum products at the dock (conservation measure 12).

A recent bathymetric survey of the project area was completed to identify property boundaries and the depth in 2-foot increments from the Line of Ordinary High Tide (LOHT) to the depth of 10 feet MLLW and including the extreme low water (-4.2 feet MLLW) based on Friday Harbor tidal station. Figure 8 is a portion of the survey map relative to the location of the proposed dock. The landward end of the dock is located at the -5 foot tidal elevation.

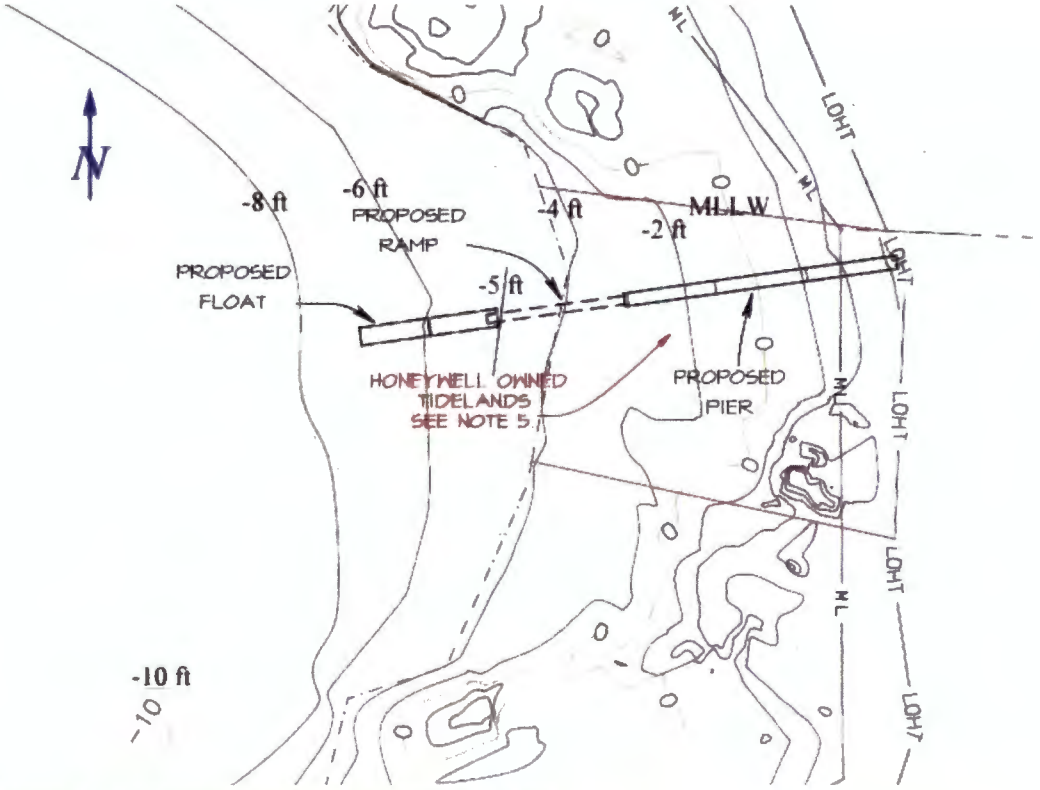

Figure 8. Bathymetry near the proposed dock.

The line of Extreme Low Tide (ELT) is drawn at -4.2 feet MLLW based on Friday Harbor tide records. The lowest predicted tide between May 1, 2017 and October 31, 2027 is -3.4 feet MLLW and will occur on June 15, 2022 (*Tides and Currents software*). The proposed float will draw 10 inches to 12 inches, that is, the bottom of the dock will be 12 inches below the water surface. Therefore, the landward edge of the bottom of the dock will be 0.6 feet above the seafloor during the lowest tide on June 15, 2022 and will not contact the seafloor. The float has also been designed with float stops at the landward end to prevent the float from contacting the seafloor.

During periods of low tide, prop wash from vessels departing or approaching the dock may disturb the seafloor and marine vegetation. Two marine vegetation dive surveys were conducted in the Project area and found that the sea floor was sand under the seaward end of the proposed floating dock transitioning to gravel and cobble near the midpoint of the float. A dense band of the algae *Laminaria* and *Ulva* were observed from MLLW to -7 feet MLLW in the area of the proposed dock. The dock will be located with a 25-foot buffer between the dock and the margins of the native eelgrass beds so boats maneuvering near the dock will not disturb the eelgrass beds. Boat operators will approach the dock from the south in a deep water safe-channel that is clear of bull kelp and will operate the boat at a slow speed to minimize boat wakes, boat velocity, and thrusted needed to maneuver the boat.

RO Desalination System Operation Effects

Operation of the RO desalination system may include:

- Entrainment and Impingement of marine organisms at the intake screen
- Discharge of brine into marine waters
- Discharge of chemicals used for maintenance of filter membranes
- Increased temperature of brine return

Small and slow swimming marine organisms may be entrained with seawater at the intake pump or may be impinged on the intake screen. The intake filter will either be a screen with perforations of 0.087 inch or slotted with the opening width of 0.069 inch. Either of these filter system is finer that the WDFW standard of 0.125 inch (1/8th inch); none the less, small organism and larval stages of marine organisms will likely be impinged on the intake screen. The significance of this impact is not known (Strathmann 2009). The Orca Dreams RO desalination system will pump a maximum of 12,068 gallons per day (gpd) of seawater from Haro Strait which is a very small volume of water taken from a relatively large waterbody. The volume of intake will be 60 cubic yards per day at maximum capacity. The volume of water in the small bay of the proposed location of the RO system intake and discharge is conservatively estimated at 18,000 cubic yards (Figure 9). The volume of intake at maximum capacity will be 0.33 percent of the volume of the small bay per day. At this rate, the impact of impingement onto the filter screens and entrainment into the intake will be very low.

Figure 9. The area of the polygon illustrated above is 18,000 square yards. Assuming an average depth of 1 yard within the polygon, the volume of water is 18,000 cubic yards. At maximum capacity, the RO desalination system will withdraw 60 cubic yards of water per day which is 0.33 percent of the volume within the polygon.

Discharge water from the proposed RO desalination system will have elevated concentration of salinity of approximately 33% higher than the ambient seawater and at maximum will return brine at the rate of 6.3 gallons per minute (gpm). Seawater in the Haro Strait is diluted by freshwater input from the Fraser River and salinity of seawater in the San Juan Islands is generally near 29 parts per thousand (Thomson 1981). Assuming this salinity, the discharge water would be approximately 38.6 parts per thousand. Measurements of salinity at the brine return outfall were recorded at two RO desalination systems in San Juan County and reported by Strathmann (2009). The brine discharge from a system on Lopez Island with the capacity of 14,400 gpd had an elevated salinity when measured at the outfall screen however, salinity was equivalent to the ambient level when measured 18 inches on the down-current side of the outfall. The volume of brine discharge was not recorded on this study. The second study site was conducted at a RO desalination system at Cattle Point with a capacity of 21,600 gpd. The discharge rate was 30 gpm and the current of the receiving water was slow at 2 feet per minute. The salinity of return brine near the discharge port was 31.3 parts per thousand and salinity measured 3 feet away from the discharge port was equivalent to the ambient levels. The Orca Dreams RO desalination system will have a maximum capacity of 3,000 gpd which, is much smaller than either of these two systems that were studied and will be in an area of high velocity currents. The brine return water will likely be diluted to ambient salinity levels within 2 to 3 feet from the discharge diffuser pipe.

Brine discharge has a higher density than the ambient seawater and may flow down and pool on the seafloor where the seafloor contour may capture the brine and where tidal currents are not sufficient to mix the brine with ambient seawater. The Orca Dreams outfall is located where the tidal currents are relatively strong and will mix the return brine within 2 to 3 feet from the discharge diffuser pipe. The sea floor is consistently sloped away from the shoreline and brine will not pool on the seafloor.

RO membrane filters will be cleaned by flushing them with the desalinated product water. The freshwater will be looped back into the raw water side of the system and run through the RO membrane filters (personal communication with Jim Bruel, USWatermaker). This treatment method inhibits growth of fouling organisms on the filters and removes any deposition. This flushing cycle water will then be returned through the brine discharge system. The filters will be left in place for their design life-expectancy and will be periodically replaced as recommended in the maintenance schedule. The proposed system will not utilize pretreatment chemicals for antifouling or post-treatment of brine water therefore only salts occurring in the seawater will be discharged into the receiving marine water. Seawater will be pumped through high density polyethylene pipes (HDPE) and pumps with stainless steel components; there will be no exposure to copper.

The Orca Dreams RO desalination system will not use heat and the return pipes will be buried and therefore, will not be exposed to sunlight. Although a slight increase of temperature may occur due to pressure being applied to the seawater, the return brine traveling through nearly 1,000 feet of buried pipe will be near the temperature of the ambient seawater. The study conducted on the Cattle Point RO desalination system recorded temperature as well as salinity. At the 30 gpm outfall, the temperature was 0.2°C above ambient temperature and at 3 feet from the outfall, the water temperature was equal to ambient water temperature (Strathmann 2009).

8.2 Indirect Effects

The proposed project may indirectly affect ESA listed species by impacting:

- Salmonid migration routes due to overwater structures;
- Forage fish spawning habitat, and;

The fixed pier will be elevated above the intertidal zone and will have light permeable grating. Salmon migration under the fixed pier will not likely be disrupted. The ramp and float will also have light permeable grating that will minimize sharp contract between lighted and shaded areas. During the short period of extreme low water events, fish may avoid swimming directly under the float. Disruption of the shallow water migration route of salmon will be minimal or insignificant.

Forage fish spawning has not been observed along this shoreline of San Juan Island by WDFW (web-based maps) or by The Friends of the San Juans (2004) and, therefore, the proposed Project will have no impact on forage fish spawning habitat.

9.0 Conservation Measures

The following conservation measures have been incorporated into the project to protect and minimize the impact to the aquatic habitat.

1. Timing limitations: In-water work will only be allowed from September 1 through March 1 for the protection of salmon and bull trout.
   a. Work below the ordinary high water line shall not occur from March 2 through August 31 of any year for the protection of migrating juvenile salmonids.
2. A qualified diver will mark the margins of the eelgrass beds to ensure that the dock is positioned with a minimum 25-foot buffer from the eelgrass beds.
3. Pile removal will follow the EPA Best Management Practices for Pile Removal & Disposal (EPA 2007) (attached as Appendix F)
4. A rubber cushion will be placed between the vibratory pile driver and the pile to reduce the generation of both airborne and underwater noise.
5. A collar will be placed around existing creosote-treated piling prior to removal to capture sediment and minimize any increase of turbidity associated with pile removal.

6. Observers qualified in identification of marine mammals and seabirds will be on site during all pile removal, driving, and drilling operations to watch for presence or absence of killer whales, other marine mammals, and marbled murrelet within the 1.34-mile action area. During vibratory pile removal and driving, one land-based biologist will monitor the area from the terminal work site, and one boat with a qualified PSO shall navigate the along the boundary of the action area in a semicircular path (See Figure 4). A 30-minute pre-construction marine mammal monitoring period will be required before the first pile driving, pile removal, or drilling activity of the day. A 30-minute post-construction marine mammal monitoring period will be required after the last pile driving, pile removal, or drilling activity of the day. If the construction personnel take a break between subsequent pile driving, pile removal, or drilling activities for more than 30 minutes, then additional pre-construction marine mammal monitoring will be required before the next start-up of pile driving, pile removal, or drilling activities. If marine mammals are discovered near or within the action area, observers will advise operators of their presence in order to abide by the shutdown procedure listed below. All presence/absence of marine mammals will be recorded and reported (See Marine Mammal Monitoring plan attached as Appendix D for more specifications).
    a. One observer will be stationed at the top of the bluff at the promontory just south of the project site (Figures 2 and 3).
    b. Two additional observers will be stationed in a boat and will be cruising in Haro Strait along the boundary of the 1.34-mile action area, or the 0.40-mile monitoring area if drilling operations are occuring.
    c. Observers will communicate with the contractor with both cellular telephones and VHF radios. Communication checks will occur daily.

    Shutdown Procedures:
    a. If a killer whale or large whale is observed approaching or within the 1.34-mile action area, all pile driving, pile removal, activities will stop.
    b. If drilling operations are occurring, if a killer whale or large whale is observed approaching or within the 0.40-mile monitoring zone, drilling operations will stop.
    c. If a delay, power down, or shutdown occurs due to southern resident killer whale/s approaching or entering the 1.34-mile action area or 0.40-mile monitoring area for drilling, activities will not resume until the SRKW (1) is observed to have left the action area or monitoring zone or (2) has not been seen or otherwise detected within the area for 30 minutes.
7. Excavation in the intertidal zone will be completed 'in the dry' during low-tide events and the when the work area is exposed. A small track-hoe will be used to dig a trench for placement of pipes and electrical conduit between the valve vault and MLLW. The trench will be filled before being inundated by the rising tide.
8. The following BMPs described in Stormwater Management Manual for Western Washington Volume II; Construction Stormwater Pollution Prevention (Ecology 2014) will be followed to minimize the amount of fine sediment from entering marine water due to disturbance of soil in the RO desalination system work corridor.

a. BMP C101: Preserve Natural Vegetation
b. BMP C153 Material Delivery
c. BMP C230: Straw Bale Barrier
d. BMP C233: Silt Fence
e. BMP C235 Straw Wattles

9. The contractor will have a prepared Spill Control and Countermeasure Plan (SCC Plan) that addresses specific actions to prevent petroleum products from being discharged into surface waters. Biodegradable hydraulic fluid will be used in equipment operating waterward of the OHWM. The contractor will also have oil-absorbent materials on site to be used in the event of a petroleum product spill and measures to avoid petroleum products or other deleterious materials from enter surface waters will be taken. This plan is attached as Appendix G.
10. Eelgrass and macroalgae will not be adversely impacted due to any project activities:
    a. The construction barge will not be allowed to ground in the Project area.
    b. Propwash will not be directed toward eelgrass bed that are mapped near the Project area
    c. Barge anchors and cables will not be placed in the eelgrass bed that is mapped to the south of the dock alignment.
11. All construction materials will be removed from the work site and natural material will be return to their original position at the end of construction.
12. Petroleum products will not be transferred on or near the joint-use dock. Fuel and lubricating oil will be purchased and transferred at licensed fuel stations.
13. A private navigation buoy will be installed to mark the location of rocks that are seaward of the proposed float.
14. Boat operators will use the clear channel along the southern approach to the proposed dock to prevent collision with submerged rocks and avoid impacts to the False Bay Reserve.
15. The float and ramp will be removed from the site on or near November 1 and reinstalled on or near May 1.
16. The BMPs in the Orca Dreams Spill Containment, Prevention and Control Plan (Appendix E) will be strictly followed.

10.0 Determination of Affects

The following table lists the summary of the effects analysis recommended by this Biological Assessment for federally listed ESA species. A request for an Incidental Harassment Authorization under Marine Mammal Protection Act has been submitted to the National Marine Fisheries Service and is attached as Appendix H. This request includes mitigation measures to avoid and minimize impacts to marine mammals due to underwater and airborne noise caused by construction activities.

Table 14. Determination of Affects to ESA listed Species and their Critical Habitat.

SPECIES	EFFECT	TAKE
Marbled murrelet (*Brachyramphus marmoratus*)	NLTAA*	None
Marbled murrelet critical habitat	Not applicable	
Streaked horned lark (*Eremophila alpestris strigata)*	No Effect	None
Streaked horned lark critical habitat	No Effect	None
Yellow-billed cuckoo (*Coccyzys americanus*)	No Effect	None
Coastal Puget Sound Bull trout (*Salvelinus confluentus*)	No Effect	None
Coastal Puget Sound Bull trout critical habitat	Not applicable	
Puget Sound ESU chinook salmon (*Oncorhynchus tshawytscha*)	NLTAA	None
Puget Sound ESU chinook salmon critical habitat	Will not adversely modify	
Hood Canal summer-run chum salmon (*Oncorhynchus keta*)	No Effect	None
Hood Canal summer-run chum salmon critical habitat	Not applicable	
Puget Sound Steelhead trout (*Oncorhynchus mykiss*)	No Effect	None
Bocaccio rockfish (*Sebastes paucispinis*)	NLTAA	None
Yelloweye rockfish (*Sebastes ruberrimus*)	NLTAA	None
Southern resident killer whale (*Orcinus orca*)	NLTAA	None
Southern resident killer whale critical habitat	Will not adversely modify	
Humpback whale (*Megaptera novaeangliae*)	NLTAA	None

NLTAA: Not Likely to Adversely Affect.

Table 15 is the first half of a matrix of Project activities with potential exposure to stressor, with duration and frequency of exposure. Table 16 is the second half of the matrix connecting project activities with listed species and response to stressors and the conservation measures which will avoid and minimize negative effects on these species.

Table 15. Exposure matrix connecting Project activities with stressors and duration of exposure.

Activity	Exposure				
	Stressor	**Extent**	**When**	**Duration**	**Frequency**
Site Preparation	Stormwater may transport fine sediment from the disturbed upper beach into marine waters; raising turbidity in nearshore zone	Within 50 yards of shoreline and Project boundary	Initial site preparation and removal of existing creosote piling (8)	5 days	Once; first week of construction phase
On site Construction Pile driving and removal	Noise from pile driving and construction activities	Pile driving may cause underwater sound pressure waves discernable within 2 miles of the project.	Second week of Project; contractor will determine sequencing of project maximize efficiency of time and equipment	2 weeks maximum	As many as eight wooden piling will be removed and twelve 10-inch diameter steel pile will be driven or set into drilled holes.
On site Construction Disturbing fine sediment in the nearshore environment	Mobilization of fine sediment in marine water; raising turbidity in nearshore zone	Construction activities may disturb sediment in the intertidal and subtidal area of the work site.	Second and third week of Project as work barge is moved and when 8 creosote piling are removed.	3 weeks maximum	Up to four occurrences per day as equipment is positioned for work. 8 creosote-treated existing piling will be removed.
On site Construction Prop wash	Disturbance of submerged marine vegetation from construction activities and prop wash	Marine algae was observed in the dock area and a bed of native eelgrass was observed approx. 25 ft to the south and to the north of the dock.	Second and third week of Project as work barge is moved.	2 weeks maximum	Up to four occurrences per day as equipment is positioned for work
Use of heavy Equipment; accidental leaks and spillage of petroleum products	Contamination of marine water due to accidental spill of petroleum products	Any loss of petroleum products will be contained on site	During duration of project	At no time	At no time

Table 16. Exposure matrix connecting Project activities with ESA listed species and life stage and their response to stressor. Conservation measures are included.

Activity	Life History Form present in Action Area	Response(s) to Stressor	Minimization Measures	Performance Standards
Site Preparation Removal of existing piling.	**Chinook:** juv/subadult **Rockfish** juv **Prey:** forage fish larvae, juv, adult; macroinvertebrates **Murrelet** adult feeding **Killer whale:** passage and feeding **Humpback whale:** passage and feeding	Fish may move offshore into deeper water, prey species may avoid areas with elevated turbidity, sediment may degrade forage fish spawning habitat Marine mammals may be disturbed by underwater SPL	Conservation Measure (CM) 1. Timing; work below OHWM will occur between September 1 and Feb 15. CM 3, 5 and 8 sediment will be controlled and elevated turbidity will be minimized	Elevated turbidity will be minimized and undetectable beyond 150 feet of the work site
On site Construction Pile driving	**Chinook:** juv/subadult **Rockfish** juv **Prey:** forage fish larvae, juv, adult; macroinvertebrates **Murrelet** adult feeding **Killer whale:** passage and feeding **Humpback whale:** passage and feeding	Fish, prey, and marine mammals may be disturbed or harmed by underwater SPL	Piling will be driven with a vibratory hammer to reduce underwater noise CM-4: A rubber cushion will be placed between the vibratory pile driver and pile to reduce noise CM 6. Trained observers will watch for marine mammals and marbled murrelet	Pile driving will not occur when killer whales or humpback whales are within the 1.34-mile action area. or, when marbled murrelets are within 160 feet of the work site. Pile driving will only occur within allowed times.
On site Construction Disturbing sediment	**Chinook:** juv/subadult **Rockfish** juv **Prey:** forage fish larvae, juv, adult; macroinvertebrates **Murrelet** adult feeding **Killer whale:** passage and feeding **Humpback whale:** passage and feeding	Fish may move offshore into deeper water, prey species may avoid areas with elevated turbidity, sediment may degrade forage fish spawning habitat	CM 10. Barge will not be allowed to ground, anchors and cables will not be placed in eelgrass bed or allowed to drag across marine vegetation beds.	Elevated turbidity will be minimized and undetectable beyond 150 feet of shoreline
On site Construction Prop wash	**Chinook:** juv/subadult **Rockfish** juv **Prey:** forage fish larvae, juv, adult; macroinvertebrates **Murrelet** adult feeding **Killer whale:** passage and feeding **Humpback whale:** passage and feeding	Propwash may disturb sediment and displacing eelgrass plants.	CM 10. Prop wash from barge and tug will not be directed into eelgrass bed	The eelgrass bed located to the south of the dock alignment will not be disturbed

Activity	Life History Form present in Action Area	Response(s) to Stressor	Minimization Measures	Performance Standards
Use of heavy Equipment; accidental leaks and spillage of petroleum products	**Chinook:** juv/subadult **Rockfish** juv **Prey:** forage fish larvae, juv, adult; macroinvertebrates **Murrelet** adult feeding **Killer whale:** passage and feeding **Humpback whale:** passage and feeding	Fish may move offshore to avoid contaminated water. Petroleum may degrade forage fish spawning habitat	CM 9; Contractor will have a SWPP plan with contingency plan for accidental loss of petroleum products. Biodegradable hydraulic fluid will be used in all equipment operating waterward of OHWM	No loss of petroleum products will occur.

10.1 Effects on Listed Species

Marbled Murrelet

The proposed Orca Dreams LLC private dock will have no effect on designated critical habitat for marbled murrelet; there is no critical habitat in the Action Area. The Project will not decrease production of forage fish on which the marbled murrelet feed; spawning of forage fish have not been documented on the gravel beach in the Project site. The dock will be used by the owner and guests from May 1 and October 31 of each year. Assuming that boats will travel to and from the dock on half of the days, approximately 368 round boat trips will be associated with the dock each year. When compared to the number of vessels traveling in the eastern Strait of Juan de Fuca, the additional vessel traffic associated with the Orca Dreams LLC private dock will be insignificant or discountable. The proposed project may affect but not likely to adversely affect the population of marbled murrelet.

Streaked horned lark

Observations of streaked horned larks on San Juan Island have not been recorded however, the meadow habitat near the project site may be appropriate as foraging habitat. Individual birds may be temporarily disturbed by air-borne noise during construction of the projects but these projects will have no effect on the population of streaked horned lark.

Yellow-billed cuckoo

The Orca Dreams projects will have no effect on yellow-billed cuckoo. It is extremely unlikely that these birds will be present in the action area. Any disturbance by air-borne noise will be temporary.

Coastal/Puget Sound Bull Trout

The Orca Dreams projects will have no effect on Coastal/Puget Sound bull trout. Juvenile native char are isolated from the project area because of their freshwater distribution. It is unlikely that adult bull trout or Dolly Varden will be found in the Action Area, although they may occasionally migrate through the Action Area. The San Juan Archipelago is not within the critical habitat area for bull trout.

Puget Sound Chinook Salmon

The Orca Dreams projects may affect, but not likely to adversely affect, Puget Sound Chinook salmon. Chinook salmon utilize the Action Area for migration and rearing, but there is no appropriate spawning habitat for Chinook salmon in the Action Area. The short duration of construction will occur during the allowable work window and although juvenile Chinook salmon may be present, it is unlikely that fish will be harmed.

Project activities will occur within designated critical habitat for Chinook salmon. PCEs of the nearshore marine critical habitat include:

- Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation
- Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

The fixed pier will not alter critical habitat and light permeable decking will be used on the floating dock that will allow from 67.9 percent to 86.2 percent of the available light to reach the seafloor. PCEs of Chinook salmon critical habitat may be altered however, the projects will not adversely modify the PCEs of critical habitat for Puget Sound Chinook salmon.

Hood Canal Summer-run Chum Salmon

The Orca Dreams projects will have no effect on Hood Canal summer-run chum salmon. Chum salmon may migrate through the Action Area during their migration to, or from their ocean rearing phase but, there is no appropriate spawning habitat in the Action Area. The critical habitat which includes the migration route for this run of chum salmon has been designated along the Olympic Peninsula shoreline. It is unlikely that individuals of Hood Canal summer-run chum salmon utilize the Action Area.

Puget Sound Steelhead trout

The Orca Dreams projects will have no effect on Puget Sound steelhead trout. Steelhead trout may migrate through the Action Area during their migration to, or from their ocean rearing phase but, there is no appropriate spawning habitat in the Action Area. The short-term that steelhead trout will be in the action area will not impact individual or the population of Puget Sound steelhead trout. The Project will not occur within the designated critical habitat for steelhead trout and therefore will not adversely modify critical habitat for steelhead trout.

Rockfish

The Orca Dreams projects may affect, but not likely to adversely affect rockfish. Adult and juvenile rockfish habitat is found in the kelp beds that are located within the Action Area. The Project will, however, not alter rocky kelp habitat.

Southern Resident Killer Whale

The Orca Dreams projects may affect, but not likely to adversely affect southern resident killer whales. SRKW may be present in the Action Area on occasion and the Action Area is within the summer-core area of the critical habitat of southern resident killer whales. Underwater sound levels may alter the behavior of whales within the 1.34-mile action area during the construction period. The joint-use dock is in shallow water less than 20-feet deep and therefore not within

killer whale critical habitat. The Projects will not likely to adversely affect critical habitat for southern resident killer whales.

Humpback Whale

The Orca Dreams projects may affect, but not likely to adversely affect humpback whales. Humpback whales may be present in the Action Area on occasion and underwater sound levels may alter the behavior of whales within two miles during the construction period.

11.0 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 and reauthorized in 2005, requires Federal agencies to consult with NOAA-Fisheries on activities that may adversely affect Essential Fish Habitat (EFH). The objective of this EFH assessment is to describe potential adverse effects to designated EFH for federally managed west coast groundfish, Pacific salmon and coastal pelagic species. EFH includes those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. EFH has been further interpreted as:

- Aquatic areas and their associated physical, chemical, and biological properties that are used by fish;
- Aquatic areas historically used by fish where appropriate substrate includes sediment, hard bottom, structures underlying the waters, and;
- Associated biological communities and habitat necessary to support a sustainable fishery and the managed species' contribution to a healthy ecosystem.

The Orca Dreams projects is within estuarine, nearshore and marine habitat that is EFH for many species of west coast groundfish, Pacific salmon and coastal pelagic species. The projects will construct a floating dock, ramp and fixed pier, an RO desalination system intake and discharge in the shallow nearshore habitat on the west side of San Juan Island. The projects will not make alterations to the existing environmental conditions or biological communities, will not alter substrate, and will not impact water quality and therefore, the Project will not adversely affect EFH of west coast groundfish, Pacific salmon and coastal pelagic species.

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Appendix A

Light Availability Test

SunWalk Decking

RELIABLE ANALYSIS INC.
Tel: (248)-269-7003 • Fax: (248)-269-7005
E-mail: wseto@ralab.com

REPORT NUMBER	820468
PURCHASE ORDER	1018
TEST DATE	8/28/08 – 8/29/08
REPORT DATE	9/3/08
TOTAL PAGE (S) NUMBER	1/6

REPORT FOR

True Harbor
2145 Cole Street
Birmingham, MI 48009

Attn: Dick Cantley
Ph: (248) 649-4922
Email: dick.cantley@trueharbor.net

Work Requested

Perform a Light Availability Test on one (1) sample submitted in accordance with laboratory procedures described in the Cambridge Material Testing Technical report, as provided by the customer.

Sample Description

One (1) sample was received for testing in good condition on August 25, 2008, and was identified as:
1. RA#1

Terms

Surface Light: Light which passes through the slots of the dock surface.

Partially Illuminated Area (PIA): The area under the dock that is illuminated by the light passing through the slots in the surface of the dock. It is calculated as the total dock area minus the Edge Light Area.

Frame Shadow Area (FSA): The shadow area under the dock that is created by the frame, which supports the dock panel.

Corrected PIA: The FSA is subtracted from PIA which determines the Corrected PIA.

Edge Light: Light which illuminated the floor beneath the dock panel, but did not pass through the panel. The light intensity in the edge light was the same with or without the panel in place and was assigned as 100%.

Light Availability Due to Surface Light was calculated as the Corrected PIA multiplied by the Light Intensity Ratio.

Total Light Available was calculated by adding the Light Available due to Surface Light and the Edge Illumination %.

Work Performed

Testing was conducted at two (2) ground-to-surface heights: 18 inches and 60 inches. A 150-watt light source was positioned above the geometric center of the panel. Three light readings were taken from the top of the panel at its center and at both sides. The light was then moved up to cover the panel with equal amounts of light intensity. Readings of 228 lux on the left side, 236 lux center and 229 lux at right were recorded. The light source fixture was pivoted to the following angles: 90°, 75°, 60°, 45°, 30°, 20°, 10°, and 0°. The light source at 90° simulated the sunlight at noon and the light source at 0° simulated sunrise, and/or sunset. The distance between the light and the center of the dock remained constant throughout all angles. A light meter was used at each angle to measure the light intensity with and without the dock in place. The reading with the dock in place was divided by the reading without the dock to calculate the Light Intensity Ratio. The LIR was then multiplied by the Corrected Partially Illuminated Area giving us the Light Availability due to Surface Light %. This was added to Edge Illumination % to give us the total light available at all angles. The total light available % was averaged to get the Total Average Light Availability %. See figure 1 (pg 6) for schematic of test procedure.

Test Results

Light Availability – True Harbor Panel
18 – Inch dock height

Incident Light Angle	0°	10°	20°	30°	45°	60°	75°	90°
Surface Light								
Partially Illuminated Area %	0	0	0	66.6	83	100	100	100
Frame Shadow Area %	0	0	0	8	4	0	0	0
Corrected Partially Illuminated Area	0.0	0.0	0.0	58.6	79.0	100.0	100.0	100.0
Light Intensity								
Light Intensity (Lx) - without dock	0	0	0	105	111	124	138	133
Light Intensity (Lx) - with dock	0	0	0	35	39	62	69	82
Light Intensity Ratio	0.00	0.00	0.00	0.33	0.35	0.50	0.50	0.62
Light Availability due to Surface Light %	0.0	0.0	0.0	19.3	27.8	50.0	50.0	62.0
Edge Light								
Edge Illumination (inches)	48	48	48	16	8.16	0	0	0
Edge Illumination %	100	100	100	33.3	17	0	0	0
Total Light Available %	100.0	100.0	100.0	52.8	44.8	50.0	50.0	32.5

Total Average Light Availability % 0 - 90° 69.9

Test Results (continued)

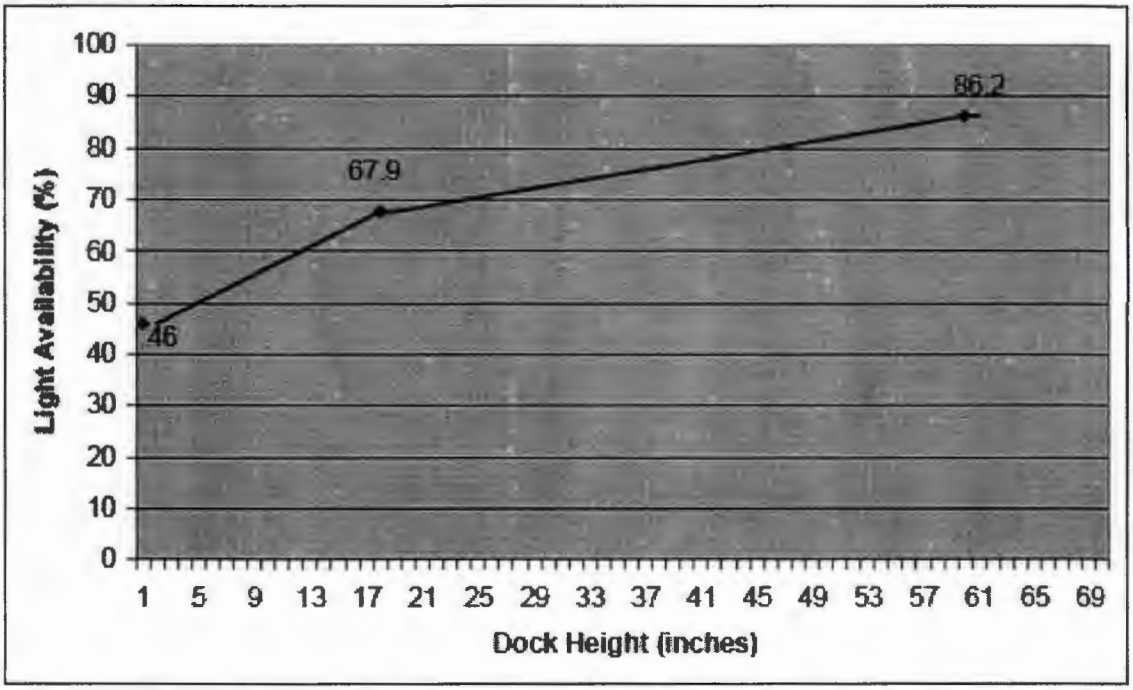
Light Availability – True Harbor Panel
60 – Inch dock height

Incident Light Angle	0°	10°	20°	30°	45°	60°	75°	90°
Surface Light								
Partially Illuminated Area %	0	0	0	0	0	97	100	100
Frame Shadow Area %	0	0	0	0	0	4	0	0
Corrected Partially Illuminated Area	0.0	0.0	0.0	0.0	0.0	93.0	100.0	100.0
Light Intensity								
Light Intensity (Lx) - without dock	0	0	0	0	0	58	55	62
Light Intensity (Lx) - with dock	0	0	0	0	0	35	37	38
Light Intensity Ratio	0.00	0.00	0.00	0.00	0.00	0.63	0.67	0.61
Light Availability due to Surface Light %	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**58.1**	**67.3**	**61.3**
Edge Light								
Edge Illumination (inches)	48	48	48	48	48	1.5	0	0
Edge Illumination %	100	100	100	100	100	3	0	0
Total Light Available	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**61.1**	**67.3**	**61.3**

Total Average Light Availability % 0 - 90° 86.2

Test Results (continued)

The tables on pages 2 and 3 show the results of the measurements and calculations for the light availability under the True Harbor Dock Panel. The Total Average Light Available at 18 inches was 67.9% and at 60 inches the Total Average Light Available was 86.2%. Below is a graph extrapolating the expected light availability over the height range of 0 to 60 inches.



* The slots in the part accounted for an estimated 46% on the dock surface, allowing for a start point in the test.

Test Equipment

Description	Manufacturer	Model Number	Serial Number	Cal. Due
Light Meter	Extech	401025	Q389952	08/27/09
Digital Protractor	Pro 360	360		09/07/08

Sample Disposition

The samples are being held for customer pickup or disposal.

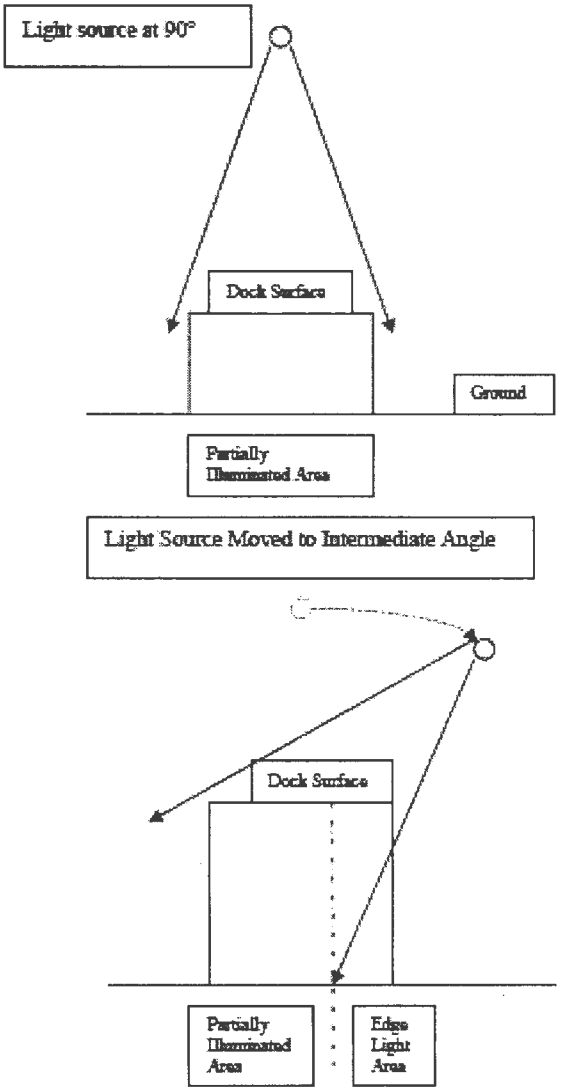
Reliable Analysis, Inc.

Winston Seto

Winston Seto
Lab Manager

Tested By: Aaron Yarbrough
Written By: Aaron Yarbrough

Drawing of Test Set up and Procedure for Light Availability



Appendix B

Preliminary Eelgrass Survey
Conducted August 20, 2014

August 24,2014

Doug Thomson
Department of Fisheries
16018 Mill Creek Blvd
Mill Creek, WA 98012

Re: Honeywell pier, ramp and float proposal
WDF: Preliminary Underwater Survey

Dear Doug Thomson

On August 20, 2014 at 11:50am I conducted a Preliminary eel grass/macro algae habitat survey at the site of the Honeywell pier, ramp and float proposal on San Juan Island.

Depth calculations: Measurements were made with Oceanic Pro plus 3.0 dive computer and checked with an oil-filled depth gauge.

Bottom type:
0' to 60' sand turning to 2" minus pebbles
60' to 100' sand with to 6" minus rocks
100' to 180' sand with areas of 4" minus rocks
180' to 240' hard sand
240' to 320' hard sand with large rock outcroppings 4' plus
Vegetation: ulva, some fucus and laminaria on the larger rock outcroppings
Small patches of zostera marina (5 to 10 turions) were observed to the south of the survey outside the transects starting at 190' to 320'
There was heavy vegetation from 160' to 320' due to the summer growth of ulva and laminaria
The rock outcroppings appeared to have surfgrass (phyllospadix) attached to the surface

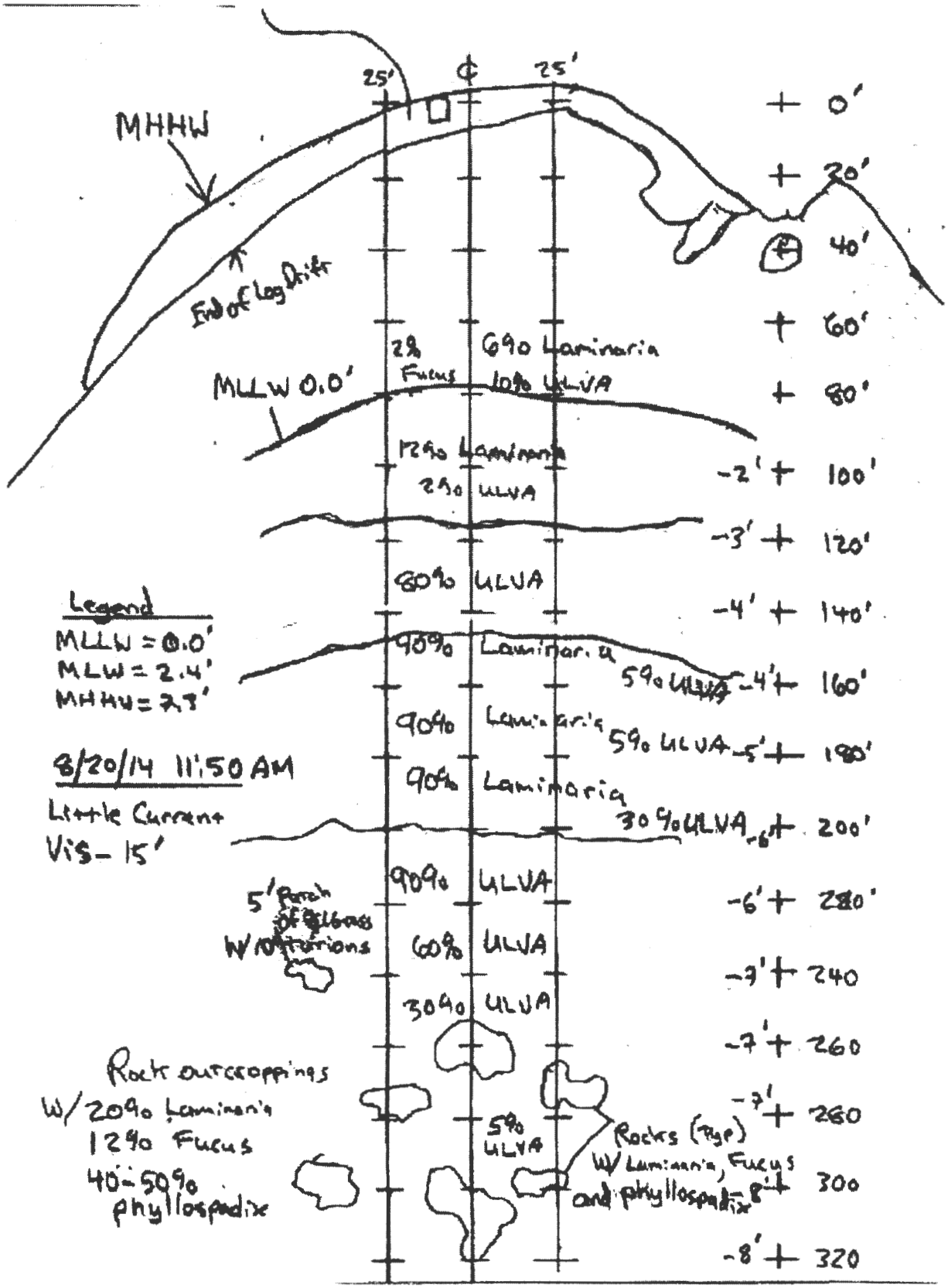
Survey pattern: Three 320' transects set at 25' from centerline with readings @ 20' intervals at the proposed pier, ramp and float location.

Visibility and Current: visibility 15' with little current and some turbidity

If you need any further information, please contact me at 360-378-4989.

Sincerely,

Bob Wells
Wells Construction
P.O. Box 4326
Roche Harbor, WA. 98250


25'
℄
25'
MHHW
End of Log Dist.
MLLW 0.0'
2% Fucus
690 Laminaria
10% ULVA
+ 0'
+ 20'
+ 40'
+ 60'
+ 80'
-2' + 100'
-3' + 120'
-4' + 140'
-4' + 160'
-5' + 180'
-6' + 200'
-6' + 220'
-7' + 240
-7' + 260
-7' + 260
-8' + 300
-8' + 320
12% Laminaria
2% ULVA
80% ULVA
90% Laminaria
5% ULVA
90% Laminaria
5% ULVA
90% Laminaria
30% ULVA
90% ULVA
60% ULVA
30% ULVA
5% ULVA
Legend
MLLW = 0.0'
MLW = 2.4'
MHHW = 7.7'
8/20/14 11:50 AM
Little Current
Vis- 15'
5' Patch of Algae W/ Urchins
Rock outcroppings
W/ 20% Laminaria
12% Fucus
40-50% phyllospadix
Rocks (Typ)
W/ Laminaria, Fucus and phyllospadix

Appendix C

Orca Dreams LLC
Video and Dive Survey
February 2016

Orca Dreams LLC
Video and Dive survey
February 2016

Introduction

This assessment of existing environmental condition of the seafloor in the proximity of a proposed joint-use community dock was conducted using a boat-towed underwater video camera and by diving along specific transects. The purpose of the assessment was to accurately map the margins of eelgrass beds in the area and to assess the value of habitat with regard to pinto abalone (*Haliotis kamtschatkana*). A video survey was conducted on January 8, 2016 during a period of calm weather and when tidal exchange was minimal. The dive survey was conducted on February 9, 2016 also during a period of calm weather and minimal tidal exchange.

The video survey and dive assessment was conducted by Chris Fairbanks, Fairbanks Environmental Services, Inc. Mr. Fairbanks has a master's degree in marine and estuarine sciences and has conducted similar studies throughout the Salish Sea since 1992.

Native eelgrass (*Zostera marina*) is present to the south and to the north of the proposed dock. The margin of these eelgrass beds are approximately 25 feet from the edge of the proposed dock. The seafloor is primarily silt and sand under the proposed float. The sediment transitions to small cobble landward from the landward end of the float. Further landward, the sediment transitions to a mix of sand and gravel and the beach is composed of sand and gravel.

A field of boulder and rock outcrops are present waterward of the end of the proposed float. These rocks have a variety of algae including the encrusting coralline alga *Lithothamnion* spp. Surf grass (*Phyllospadix* spp.) is also attached to this rocky substrate. This habitat is moderate to good habitat for pinto abalone however, no abalone were observed during a dive conducted on February 9, 2016.

Methods

Video Survey

An underwater video camera (Ocean Systems Deep Blue) was towed from a small boat along eleven pre-planned transects. The video signal was interfaced with a GPS receiver and recorded onto a laptop computer. The surveyed area center on the centerline of the proposed dock with five transects on both sides of the dock (Figure 1). Coordinates for the endpoints of the transects are listed in Table 1. Each transect was approximately 360 feet long and described as:

T-1: 55 feet north of, and parallel the centerline of the proposed dock.
T-2: 40 feet north of, and parallel the centerline of the proposed dock.
T-3: 25 feet north of, and parallel the centerline of the proposed dock.

T-4: 15 feet north of, and parallel the centerline of the proposed dock.
T-5: 5 feet north of, and parallel the centerline of the proposed dock.
T-6: Centerline of the proposed dock.
T-7: 5 feet south of, and parallel the centerline of the proposed dock.
T-8: 15 feet south of, and parallel the centerline of the proposed dock.
T-9: 25 feet south of, and parallel the centerline of the proposed dock.
T-10: 40 feet south of, and parallel the centerline of the proposed dock.
T-11: 55 feet south of, and parallel the centerline of the proposed dock.

The video recordings were post-processed and locations of significant features were plotted onto a Google Earth image. The margins of existing eelgrass beds were drawn and illustrated on Figure 2.

Table 1. Coordinates of each end point for each transect used for the video survey.

Transect	Waypoint	Latitude 48°-28.xxx'	Longitude 123°-4.xxx'	Waypoint	Latitude 48°-28.xxx'	Longitude 123°-3.xxx'
T-1	A-1	.690	.034	B-1	.700	.949
T-2	A-2	.688	.033	B-2	.698	.948
T-3	A-3	.685	.032	B-3	.695	.947
T-4	A-4	.684	.032	B-4	.694	.947
T-5	A-5	.682	.031	B-5	.692	.946
T-6	A-6	.681	.031	B-6	.691	.943
T-7	A-7	.680	.031	B-7	.691	.945
T-8	A-8	.679	.030	B-8	.689	.944
T-9	A-9	.677	.030	B-9	.688	.944
T-10	A-10	.675	.029	B-10	.685	.943
T-11	A-11	.672	.028	B-11	.683	.942

End of float: 48°-28.685' 123°-4.000'

Dive Survey

A dive survey was conducted on February 9, 2016 when tidal exchange was low, marine vegetation cover was at a minimum and water clarity was good. The dive survey was based on a belt-transect. A 200-foot long tape was laid on the seafloor from the buoy marking the seaward end of the proposed dock and run out further seaward over a field of boulder and rock outcrops that were observed in the video survey (Figure 2). Starting at the buoy, a diving biologist swam seaward on the north side of the transect to a distance of approximately 175 feet and then swam back to the buoy on the south side of the transect. Observations were made along a band of at least one meter on both sides of the transect. and made observations of habitat type, marine vegetation and epibenthic invertebrates.

A second belt transect was surveyed on the west side of an exposed rock west of the proposed project (Figure 2). This site was selected for three primary reasons:

1. Proximity to the project site
2. Exposure to strong wave action
3. Mapped as a perennial bull kelp area by Friends of the San Juans

A third belt transect was surveyed on the east side of the same exposed rock (Figure 2). This site was selected for because

1. Proximity to the project site
2. Mapped as a perennial bull kelp area by Friends of the San Juans

Results

Video Survey

The native eelgrass, *Zostera marina*, is growing in meadows to the south and to the west and north of the proposed dock (Figure 3). The margin of these meadows are approximately 25 feet from the perimeter of the proposed dock. One isolated and small patch of eelgrass was observed approximately 5 feet to the south of the centerline of the proposed float. This position is approximate; the patch of eelgrass was observed in the periphery of the video recording. The seafloor under the proposed float is generally fine sediment, a mix of silt and sand at the seaward end transitioning to a band of gravel and small cobble approximately half the distance of the float length. This material is appropriate for attachment of algae and during the growing season, algae would like be dense. Landward of the proposed float, the sea floor is composed of gravel and sand with drifting marine vegetation. Locations of the eelgrass meadows relative to the proposed dock, and location of observed boulders are illustrated on Figure 3.

A field of boulders and rock outcrops are present beyond the seaward end of the proposed float. Surf grass (*Phyllospadix* spp.) is attached to the boulders as well as a variety of marine algae including the encusting pink coralline algae, *Lithothamnion* spp.

Abalone Survey

The boulder habitat seaward of the proposed float is moderate to good value habitat for pinto abalone. A variety of attached marine vegetation is growing on the boulders including surf grass, red and brown algae and the pink encrusting coralline algae, *Lithothamnion*. (Photos 1 and 2). Kelp varieties include *Pterygophora californica. Costaria costata,* and *Laminaria* spp. however, bull kelp (*Nereocystis luetkeana*) was not observed. Observations recorded along the belt transect are listed below in Table 2. No pinto abalone were observed during this survey.

Table 2. Diver observation recorded along the rocky habitat beyond end on dock; moderate to good habitat for pinto abalone.

Station (feet)	Substrate	Species	Feature
0	Sand and silt	Bare sand	Buoy at end of proposed float
15	Boulder	Surf grass (*Phyllospadix* spp.) coralline algae (*Lithothamnion* spp.) *Mazzaella* spp. *Chondracanthus exasperatus* *Plocamium cartilagineum* *Odanthalia* spp. *Pterygophora californica* White and yellow sponge Jingle shell (*Pododesmus macrochisma*) Kelp crab (*Pugettia productus*)	
35	Boulder		
55	Sand and silt	Periphyton Patchy eelgrass (*Zostera marina*) approx. 60 shoots/sq meter Dungeness crab (*Metacarcinus magister*)	
65	Sand and silt		
130	Boulder	Surf grass (*Phyllospadix* spp.) coralline algae (*Lithothamnion* spp.) *Laminaria* spp. *Mazzaella* spp. *Costaria costata* *Pterygophora californica* White and yellow sponge Jingle shell (*Pododesmus macrochisma*) Frosted nudibranch (*Dirona albolineata*)	
175	Boulder		

The rocky habitat on the west side of the exposed rock is excellent habitat for pinto abalone. The pink encrusting coralline algae *Lithothamnion* was abundant over large areas of the rock surface and several species associated with abalone were present however, no pinto abalone were observed along during this survey. Observations recorded along the second belt transect are listed below in Table 3.

Table 3. Diver observations recorded along the outside of rock in center of cove; excellent habitat for pinto abalone.

Station (feet)	Substrate	Species	Feature
0 ft -1.5 ft MLLW	Rocky reef	Surf grass (*Phyllospadix* spp.) coralline algae (*Lithothamnion* spp.)	SW edge of rock

110 -8.5 ft MLLW	Rocky reef	*Bossiella* spp *Serraticardia macmillanii* *Egregia menziesii* *Laminaria* spp. *Mazzaella* spp. *Costaria costata* *Pterygophora californica* *Pisaster ochraceus* (large and healthy) Jingle shell (*Pododesmus macrochisma*) Frosted nudibranch (*Dirona albolineata*) Limpets (*Tectura* spp.) Chiton (*Mopalia* spp., *Katharina* spp.) Whelks (*Nucella* spp.) Top snail (*Calliostoma* spp) Green urchin (*Strongylocentrotus droebachiensis*) Broadbase tunicate (*Cnemidocarpa finmarkiensis*) Red rock crab (*Cancer productus*) Rock scallop (*Crassadoma gigantean*)	About half way toward the north end of rock

The rock habitat on the east side of the exposed rock is moderate to poor habitat for pinto abalone. The pink encrusting coralline algae *Lithothamnion* was absent and few species associated with abalone were present. Deposition of fine sediment was noticeable on the rock surfaces. No pinto abalone were observed along during this survey. Observations recorded along the second belt transect are listed below in Table 4.

Table 4. Diver observations recorded along the Inside of rock in center of cove; moderate to poor habitat for pinto abalone

Station (feet)	**Substrate**	**Species**	**Feature**
0 ft -1.5 ft MLLW	Rocky reef	*Ulva* *Odonthalia* Rock scallop (*Crassadoma gigantean*) Northern kelp crab (*Pegettia productus*) Kelp greenling (*Mexagrammos decagrammus*)	SW edge of rock; less wave action and more silt has settled on rock surface.
100 ft -8.5 ft MLLW	Rocky reef		

Conclusions

The eelgrass beds that are present in the project area are patchy and the dock will be installed at least 25 feet from the perimeter of the bed margins. The dock and boats moored to the dock will not impact the existing eelgrass beds.

Directly seaward from the end of the proposed dock is a field of large boulders or, rock outcrops (Figure 2). Surf grass is growing on many of these boulders and the elevation at the top of these boulders may be near -3 feet MLLW. We recommend that these boulders are marked with a semi-permanent marker and that a safe course is clearly set into the chart plotter of each boat using the dock and that the boats enter the dock area at a slow speed. Following a designated clear navigation channel will avoid damage to vessels and damage to marine vegetation including the existing eelgrass beds.

Bull kelp (*Nereocystis leutkeana*) forests have been mapped by the Friends of the San Juans and the distribution is illustrated on Figure 4. Bull kelp appears to be absent from the boulders near the proposed dock in the Friends of the San Juans maps and was not observed in the video or dive surveys. A clear navigation channel where boats may travel to avoid impacts to the existing bull kelp forest is illustrated on Figure 4. Keeping boat traffic restricted to this navigation channel and at a slow speed will avoid and minimize impacts to:

1. Eelgrass beds
2. Kelp and large marine plants
3. Pocket beaches
4. Marine reserve

The seafloor under the proposed dock is not suitable habitat for pinto abalone. The seafloor is mixed silt, sand and gravel. The boulder field seaward of the dock is moderate to good quality pinto abalone habitat with flora and fauna that is associated with the presence of abalone however no abalone were observed during a dive survey. This habitat will be protected by the establishing and following a clear navigation channel and operating vessels at a safe and slow speed.

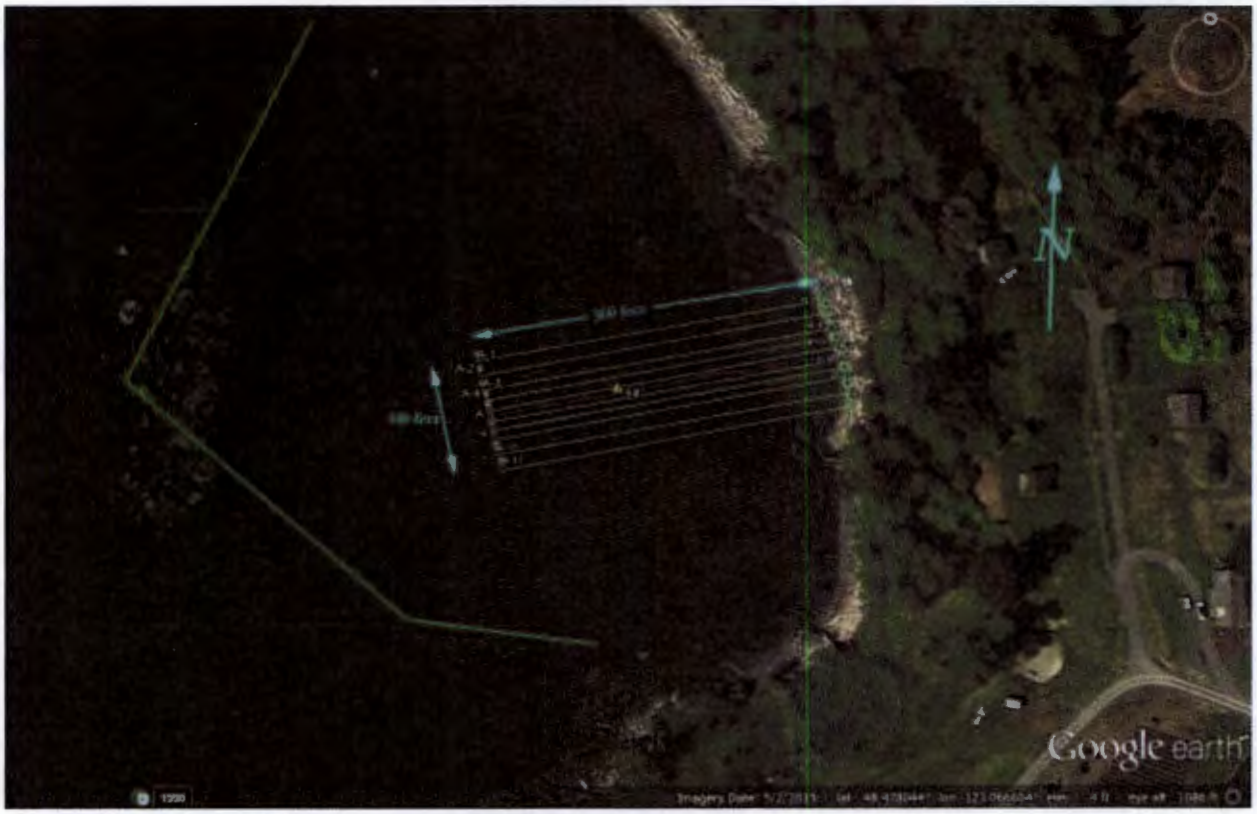


Figure 1. Transects selected for the video survey.

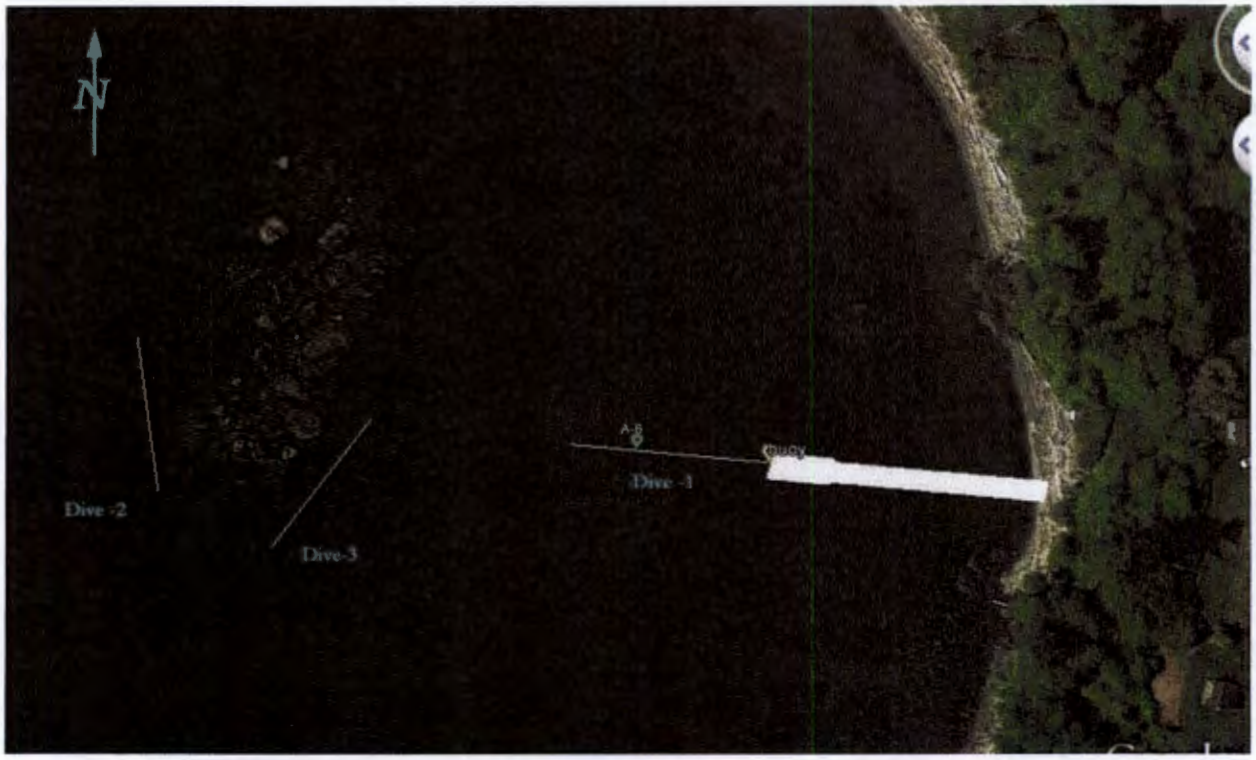


Figure 2. Transects selected for presence/absence of pinto abalone and assessment of habitat quality

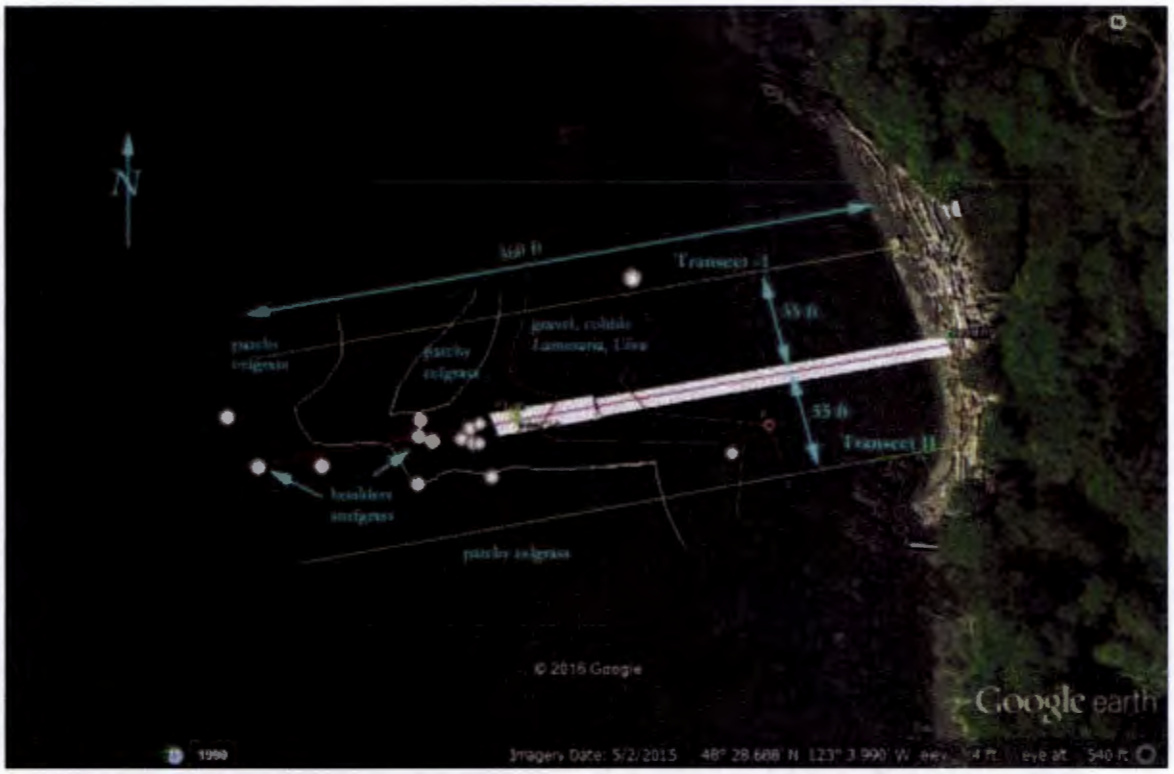


Figure 4. Locations of eelgrass bed margins, boulder habitat, and band of marine algae.

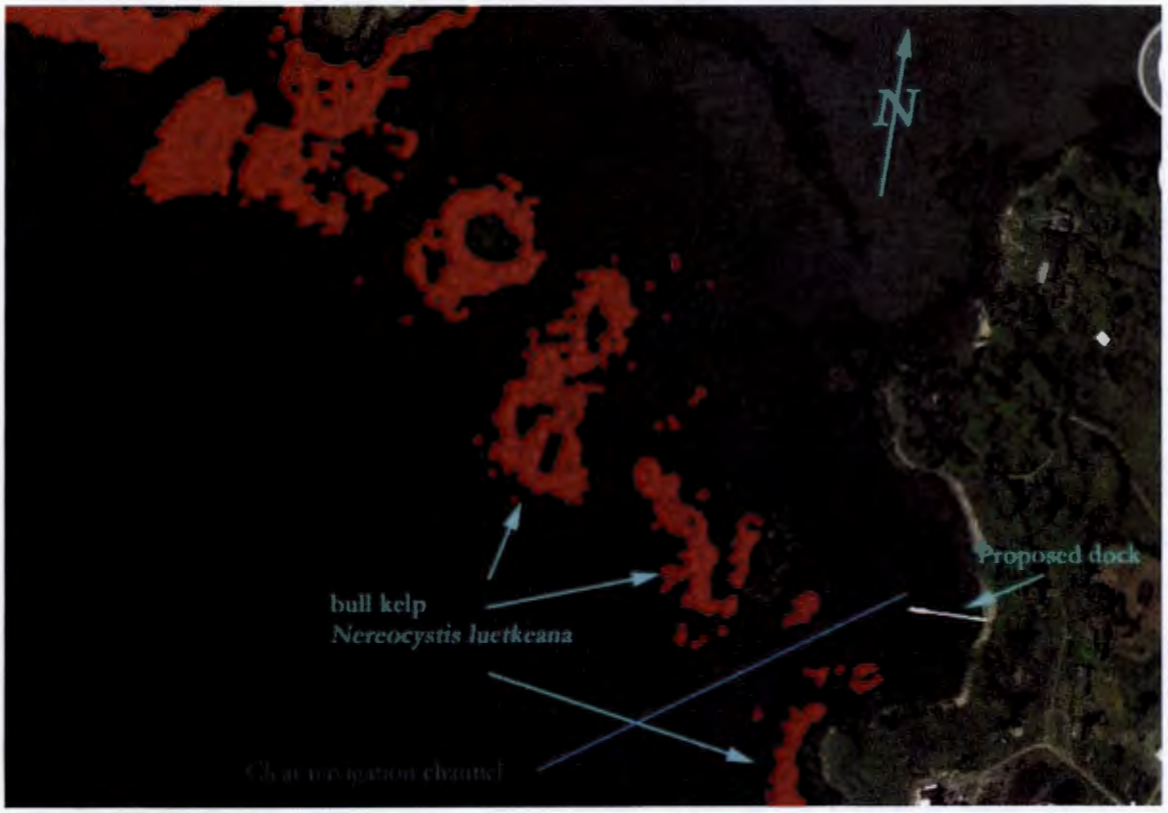


Figure 4. Bull kelp distribution mapped by The Friends of the San Juans. Location of the proposed dock and a clear navigation channel is also illustrated.

Photo 1. Typical mix of surf grass and algae attached to boulders located seaward of the proposed float.

Photo 2. The pink encrusting coralline algae *Lithothamnion* spp. is associated with abalone habitat.

Appendix D

Orca Dreams LLC
Eelgrass Survey
August 24, 2017

Orca Dreams LLC
Macroalgae and Eelgrass Survey
August 24, 2017

Introduction

This survey of marine vegetation in the proximity of a proposed joint-use dock on San Juan Island (Figure 1) was conducted on August 24, 2017 and followed the Washington State Department of Fish and Wildlife guidelines dated June 16, 2008. The purpose of the survey was to accurately assess the community of marine vegetation along five transect that were set within 25 feet of the centerline of the proposed dock. In addition, the marine vegetation within a 25-foot radius around a proposed private navigation buoy was also assessed.

This assessment was conducted by Chris Fairbanks, Fairbanks Environmental Services, Inc. with assistance from Research Support Services, Inc. Mr. Fairbanks has a master's degree in marine and estuarine sciences and has conducted similar studies throughout the Salish Sea since 1992.

Native eelgrass (*Zostera marina*) is present to the south and to the north of the proposed dock. To the south, the margin of the eelgrass bed is 26 feet from the proposed center point of the waterward end of the proposed dock. From the center point toward the north, the margin of a sparse bed of eelgrass is 47 feet. To avoid impacts to the eelgrass beds, a diver will mark the margins of the beds and will set a semi-permanent marker for the placement of the dock so that the edge of the dock will be 25 feet, or more, from the margins of the eelgrass bed. The south eelgrass bed has a higher density with an average of 39.6 shoots per square meter compared to the north eelgrass bed which was relatively sparse with 18.5 shoots per square meter.

The seafloor is primarily silt and sand under the proposed float. The sediment transitions to gravel landward from the landward end of the float. Landward of the float, the sediment transitions to a mix of sand and gravel and the beach is composed of sand and gravel.

A dense band of algae composed primarily of the green alga *Ulva fenestrata*, was present throughout the study area. This band was unattached to the substrate and drifting within the embayment

Methods

Proposed Joint-use Dock

Five transects were set relative to the centerline of the proposed joint-use dock (Figures 2 – 3). The transects started 25 feet waterward of the waterward end of the proposed float and extended landward to the Ordinary High Water Mark (OHWM) (Figure 4) determined by the edge of terrestrial vegetation at the toe of the bank. Each transect is illustrated on Figures 2-4 and described as:

T-1: 25 feet north of, and parallel the north edge proposed float.
T-2: 10 feet north of, and parallel the north edge proposed float.
T-3: Centerline of the proposed dock.
T-4: 10 feet south of, and parallel the south edge proposed float.
T-5: 25 feet south of, and parallel the south edge proposed float.

The center point of the waterward end of the proposed float was located with a survey-grade GPS receiver and the centerline transect was set. The remaining transects were set relative to the centerline transect.

Two divers worked together to set the transects and record observations along each transect. Observations were recorded at 15-foot intervals along each transect; observations included:

> Water depth, substrate, vegetation, percent cover of macroalgae, number of eelgrass shoots within ¼ square meter and anecdotal observations.

Eelgrass Density

The density of the two eelgrass beds, south of the proposed dock and north of the proposed dock, was estimated by completing 30 random counts of the number of eelgrass shoots within a ¼ square meter quadrate. Each diver selected a sampling plot where eelgrass was present within the bed. After each count, the diver swam the distance of 'five kicks' and set the quadrat down where eelgrass was present. This method is intended to provide a relative density; rather than an estimate of the number of shoots within bed and intended to conservatively estimate the density of eelgrass shoots.

Private Navigation Buoy

The proposed buoy was located with a survey-grade GPS receiver and marked with a weighted marker. Two divers worked together to record observation at a radius of 10 feet and a radius of 25 feet from the proposed location of a buoy anchor. One diver held a tape measure at 4 cardinal and 4 ordinal directions around the anchor (north, northeast, east, southeast etc.), and the second diver recorded observations.

Results

The location of the proposed float, ramp and fixed pier are void of eelgrass. A relative dense bed of the native eelgrass, *Z. marina*, is present to the south of the proposed dock with the closest patch of three shoots 26 feet to the south of the center point of the waterward end of the proposed float. The average count of eelgrass shoots in the south bed was 9.9 shoots per ¼ square meter (39.6 shoots per square meter). Toward the north, the margin of a sparse eelgrass bed is 47 feet from the center point of the waterward end of the proposed float. The average count of eelgrass shoots in the north bed was 4.6 shoots per ¼ square meter (18.5 shoots per square meter) Observations at each station along the transects are listed in Tables 1 - 7.

The seafloor of the study area has a dense cover of drifting macroalgae composed primarily of the green alga *Ulva fenestrata*. Other species of marine vegetation are mixed in this dense mat including *Gracilaria*, *Fucus* and loose shoots of eelgrass. Boulders or bedrock outcroppings are located waterward of the proposed float. Surf grass (*Phyllospadi scouleri*), *Laminaria*, and *Ulva* are growing attached to these boulders. The substrate under the float is sand which, becomes mixed with gravel toward the land. The beach is composed of sand and gravel.

The seafloor at the location of the anchor for the proposed private navigation buoy is bare sand. Surrounding the anchor location are boulders with attached algae and surf grass. Eelgrass is

growing in the sand between the boulders at a sparse density; 25.3 shoots per square meter along the 10-foot radius and 20.0 shoots per square meter along the 25-foot radius.

During the setup of the transects on the beach, three additional pile stubs were located near the waters edge at +1.0 feet MLLW. These piles were cut at the 'mudline' and were not easily seen. These locations are illustrated on Figure 3 with coordinates listed below:

Pile	Latitude	Longitude
A	48.47814°N	123.06589°
B	48.47817°N	123.06590°
C	48.47816°N	123.06594°

Discussion

Placement of a float, ramp and fixed pier will not shade the beds of native eelgrass Z. marina that are located to the north and south of the proposed location. The margin of the south bed is at the 25-foot buffer boundary of proposed dock and to avoid and minimize impact to the eelgrass beds a diver will mark the margins of the bed and will locate the seaward end of the float to provide a 25-foot buffer from the eelgrass margins prior to construction of the dock. After construction is completed, the markers will be removed.

A bathymetric survey was completed by San Juan Surveying, LLC and is illustrated in Figure 5 with the alignment of the proposed dock. The proposed float will be at the depth of -7 feet MLLW at the waterward end and at -5 feet at the landward end. At extreme low tide events, the landward end of the float will rest on stops to prevent contact with the sea floor and to prevent impacts to marine flora and fauna within the footprint of the float.

The anchor for a private navigation buoy will be a manta ray earth anchor embedded into the seafloor where an area with bare sand was observed. The buoy tether will be an industrial-strength elastic material with a series of mid-line floats to ensure that the tether does not scour the seafloor (Figure 6). The purpose of the buoy is to mark boulders near the float. Impacts to marine vegetation near to the buoy anchor and tether will be minimal.

This survey is the fourth eelgrass survey to be conducted in the study area over a period of 3.5 years. The results of each survey have been very consistent; the margin of the south eelgrass bed has been mapped at approximately 25 feet from the proposed dock and the north bed is sparse and the margin is at a greater distance from the dock. The band of algae drifting in the shallow water has also been consistent with seasonal variation of the density of the band. The dates and methods of each survey are listed below.

Date	Contractor	Method	Results
March 8, 2014	Wells Construction	WDFW preliminary	Sparse eelgrass bed toward the south
August 20, 2014	Wells Construction	WDFW preliminary	Sparse patch of eelgrass also observed to the north
February 9, 2016	Fairbanks Environmental	Boat-towed video	Margins of both north and south bed delineated
August 24, 2017	Fairbanks Environmental	WDFW advanced	Relative density of both eelgrass beds documented.

Conclusion

The proposed float, ramp and fixed pier will be located in an area that is void of eelgrass and significant community of attached macroalgae. Prior to construction a diver will locate the centerpoint of the waterward end of the float to ensure that the edge of the float is placed at least 25 feet from the margins of both the north and south eelgrass bed. The margins of the eelgrass bed will be marked so that construction team will avoid operating construction vessels near the eelgrass beds. Placement and construction of the proposed dock and private navigation buoy can be completed in such a manner as to avoid and minimize impacts to the eelgrass and macroalgae community.

Table 1. Observations along Transect T-1.

Station (feet)	Depth (feet)	Substrate	Vegetation	Cover (%)	*Zm* count	Comments
0	-7.3	Sand	*Ulva, Gracilaria*	80	8	Much of the algae is drift; not attached to the substrate
15	-6.8	Sand	*Ulva*	70	1	
25	-6.8	Sand, gravel	*Ulva*	50		
40	-6.3	Sand, gravel	*Ulva*	80		
55	-5.2	Sand, gravel	*Ulva*	90		
70	-5.2	Gravel, silt	*Ulva*	100		
85	-4.2	Gravel, silt	*Ulva*	100		
100	-4.2	Gravel, silt	*Ulva*	100		
115	-3.2	Gravel, silt	*Ulva*	100		
130	-3.2	Gravel, silt	*Ulva*	100		
145	-3.2	Gravel, silt	*Ulva*	100		
160	-2.2	Gravel, silt	*Ulva*	100		
175	-2.1	Gravel, sand	*Ulva*	100		
190	-1.1	Gravel, sand	*Ulva*	100		
205	-0.1	Gravel, sand	*Ulva*	50		Edge of water
220	+	Gravel, sand		0		
235	+	Gravel, sand		0		
250	+	Gravel, sand		0		
265	+	Gravel, sand		0		
280	+	Gravel, sand		0		Driftwood
295	+	Gravel, sand		0		Ordinary high water

Table 2. Observations along Transect T-2

Station (feet)	Depth (feet)	Substrate	Vegetation	Cover (%)	*Zm* count	Comments
0	-7.1	Sand	*Ulva*	90		Drift algae
15	-6.6	Sand, gravel	*Ulva*	100		
25	-6.6	Sand, gravel	*Ulva, Gracilaria*	80		

40	-6.1	Sand	*Ulva*	100		
55	-5.1	Sand	*Ulva*	100		
70	-5.1	Gravel	*Ulva*	80		
85	-5.1	Gravel	*Ulva*	100		
100	-4.0	Gravel	*Ulva*	100		
115	-4.0	Gravel	*Ulva*	100		
130	-3.0	Gravel	*Ulva*	100		
145	-2.0	Gravel	*Ulva*	100		
160	-2.0	Gravel	*Ulva*	100		
175	-2.0	Gravel, sand	*Ulva*	80		
190	-1.0	Gravel, sand	*Ulva*	70		
205	0.1	Gravel, sand	*Ulva*	50		
220	0	Gravel, sand		50		Edge of water
235	+	Gravel, sand				
250	+	Gravel, sand				
265	+	Gravel, sand				
280	+	Gravel, sand				
295	+	Gravel, sand				Ordinary high water

Table 3. Observations along Transect T-3; Centerline of the proposed float, ramp and fixed pier.

Station (feet)	Depth (feet)	Substrate	Vegetation	Cover (%)	*Zm* count	Comments
0	-7.0	Gravel, sand	*Ulva, Laminaria*			
15	-7.0	boulder	*Ulva, Laminaria*			Surf grass (*Phyllospadix scouleri*)
25	-7.0	Sand	*Ulva*			end of float
40	-6.0	Sand	*Ulva*			drift algae
55	-5.0	Gravel, silt	*Ulva*			
70	-5.1	Gravel, silt	*Ulva*			
85	-5.1	Gravel, silt	*Ulva*			
100	-4.1	Gravel, silt	*Ulva*			
115	-4.1	Gravel, silt	*Ulva*			
130	-3.1	Gravel, silt	*Ulva*			
145	-3.2	Gravel, silt	*Ulva*			
160	-2.2	Gravel, silt	*Ulva*			
175	-1.2	Gravel, sand	*Ulva*			
190	-0.2	Sand, gravel	*Ulva*			Edge of water at 200
205	0.8	Sand, gravel	*Ulva*			beach rack
220	+	Gravel, sand				
235	+	Gravel, sand				
250	+	Gravel, sand				

265	+	Gravel, sand				Driftwood
275	+	Gravel, sand				Ordinary high water

Table 4. Observations along Transect T-4

Station (feet)	Depth (feet)	Substrate	Vegetation	Cover (%)	*Zm* count	Comments
0	-7.3	Sand	*Laminaria, Ulva*	90		Boulder with surf grass
15	-6.3	Sand	*Ulva*	50		
25	-6.2	Sand	*Ulva*	40		
40	-5.2	Sand	*Ulva*	60		
55	-5.2	Sand	*Ulva*	100		
70	-5.1	Sand	*Ulva*	100		
85	-4.1	Gravel, silt	*Ulva*	100		
100	-3.1	Gravel, silt	*Ulva*	100		
115	-3.0	Gravel, silt	*Ulva*	100		
130	-2.0	Gravel, silt	*Ulva*	100		kelp crab
145	-2.0	Silt, gravel	*Ulva*	100		
160	-0.9	Gravel, sand	*Ulva*	100		mixed with fucus & etc.
175	0.1	Gravel, sand	*Ulva*	50		
190	1.1	Gravel, sand	*Ulva*	100		
205	2.2	Gravel, sand	*Ulva*	30		
220	0	Gravel, sand	*Ulva*	30		Edge of water
235	+	Gravel, sand				
250	+					
265	+					
280	+					
295	+					Ordinary high water

Table 5. Observations along Transect T-5

Station (feet)	Depth (feet)	Substrate	Vegetation	Cover (%)	*Zm* count	Comments
0	-3.7	Boulder	Surf grass	50		Surf grass (*Phyllospadix scouleri*)
15	-4.7	Boulder	*Ulva, Laminaria*	80		Surf grass (*Phyllospadix scouleri*)
25	-5.6	Sand	*Ulva, Gracilaria*	70	6	Eelgrass (*Zostera marina*)
40	-5.6	Sand	*Ulva*	70		
55	-4.6	Silt, gravel	*Ulva*	100		
70	-4.5	Silt, gravel	*Ulva*	100	15	Eelgrass (*Zostera marina*)
85	-3.5	Silt, gravel	*Ulva*	100	4	Eelgrass (*Zostera marina*)
100	-2.4	Silt, gravel	*Ulva*	80		
115	-2.4	Silt, gravel	*Ulva*	100		

130	-1.4	Gravel, silt	*Ulva*	100		
145	-1.3	Gravel, silt	*Ulva*	100		
160	-1.3	Gravel, silt	*Ulva*	100		
175	-0.2	Gravel, sand	*Ulva*	100		
190	0.8	Gravel, sand	*Ulva*	100		
205	1.8	Gravel, sand	*Ulva*	100		
220	0	Gravel				Edge of water
235	+	Gravel				
250	+	Gravel				
265	+	Gravel, sand				
280	+	Gravel, sand				Ordinary high water

Table 6. Observations at the center and on a 10-foot radius from the proposed buoy anchor.

10-ft radius					
Station	**Substrate**	**Vegetation**	**Cover**	***Zm* count**	**Comments**
Center	Sand, silt				bare sand, depth = -13 feet MLLW
North	Sand, silt	*Ulva, Z marina*	50	8	
NE	Sand, silt	*Ulva, Z marina*	100	7, 8	
East	Sand, silt	*Ulva, Z marina*	90	8, 5	
SE	Sand	*Ulva, Z marina*	90	3	
South	Sand	*Ulva, Z marina*	100	3	
SW	Sand, silt	*Ulva, Z marina*	80	7, 4	
West	Sand, silt	*Ulva, Z marina*	90	5, 10	
NW	Sand, silt	*Ulva, Z marina*	80	8	

Table 7. . Observations on a 25-foot radius from the proposed buoy anchor.

25-ft radius					
Station	**Substrate**	**Vegetation**	**Cover**	***Zm* count**	**Comments**
North	Sand, silt	*Gracilaria*	50		
NE	Boulder	*Ulva, Phyllospadix*	70		*Mazzaella*
East	Sand, silt	*Ulva, Z marina*	100	1, 1	
SE	Sand	*Ulva, Z marina*	90	3, 3	
South	Sand	*Ulva, Z marina*	100	7	
SW	Sand, silt	*Ulva, Z marina*	70	12, 8	*Gracilaria*
West	Sand, silt	*Ulva, Gracilaria*	100		
NW	Sand, silt	*Ulva,*	100		

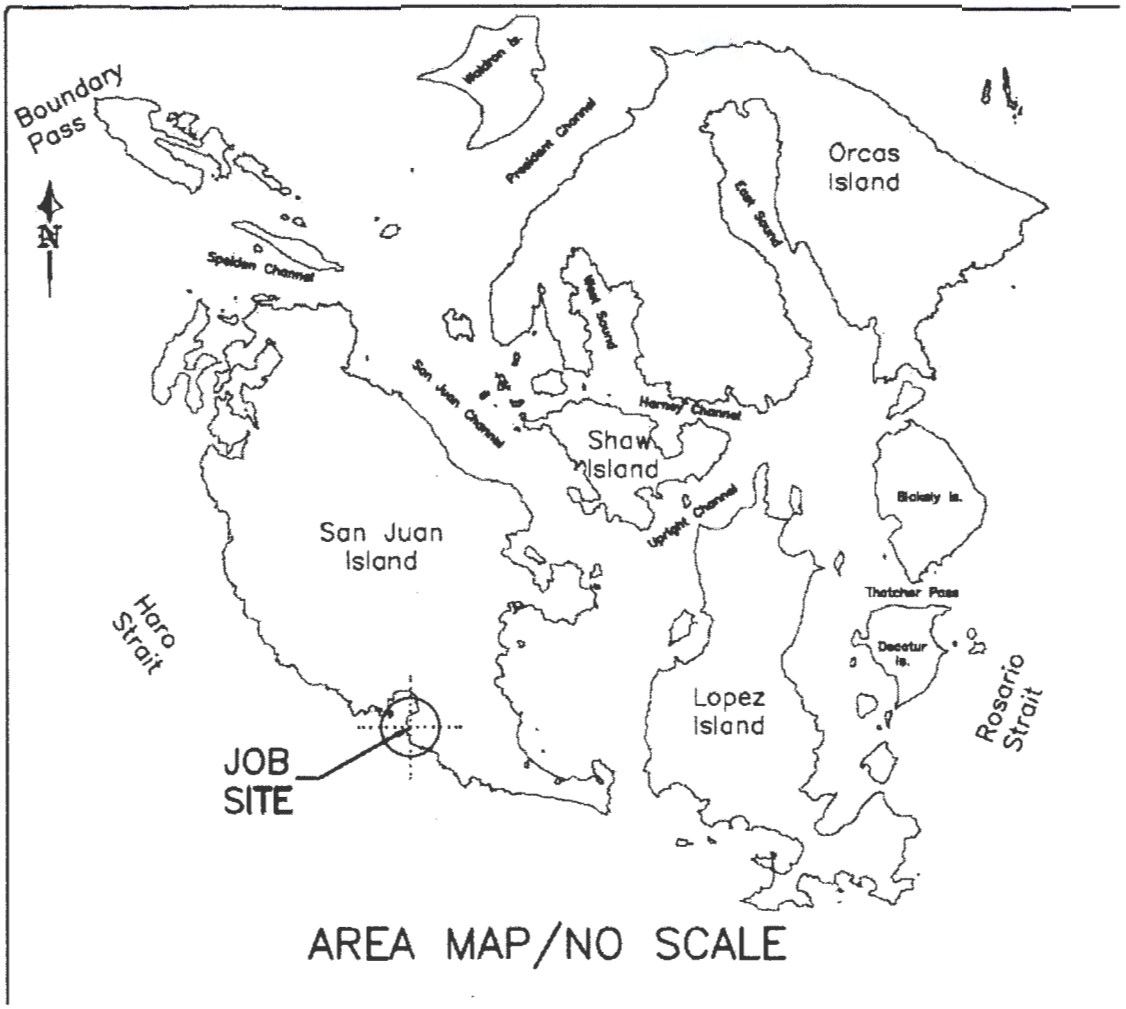


Figure 1. Vicinity map.

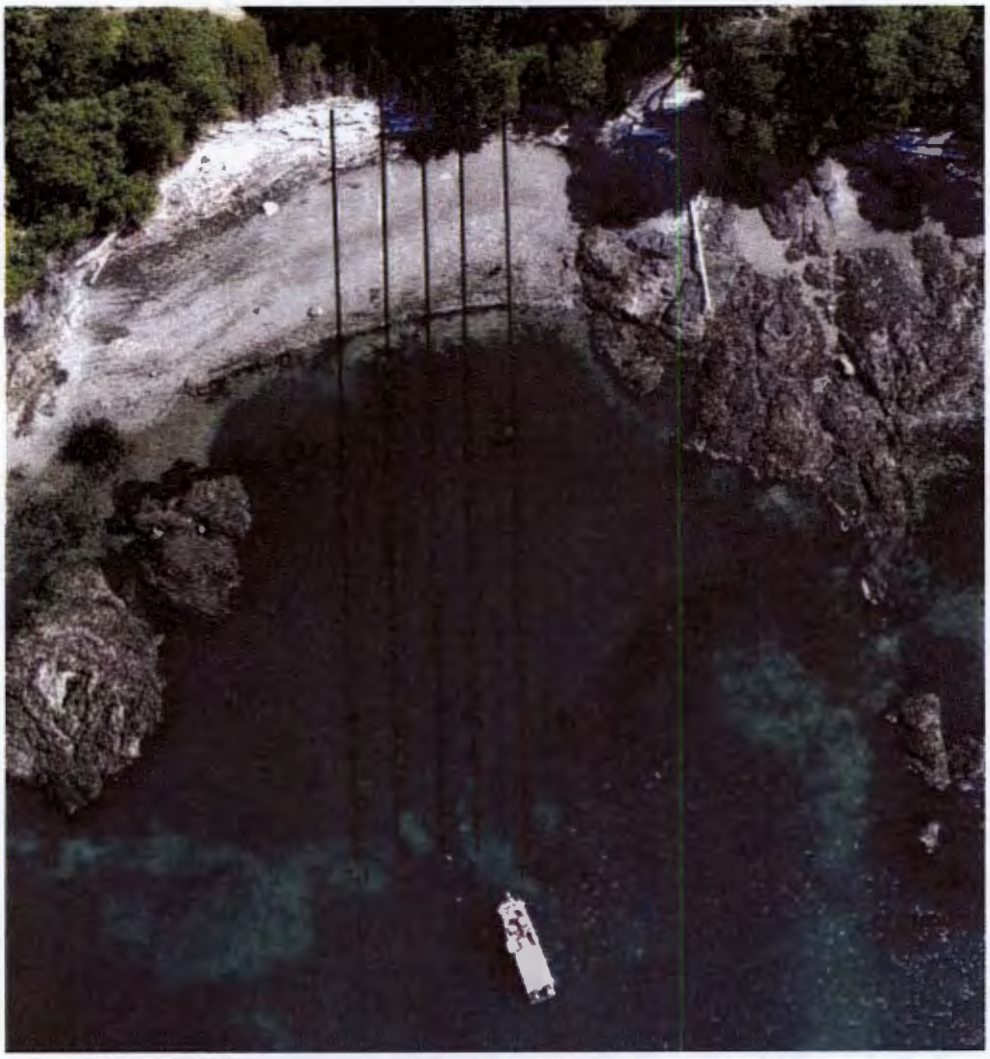


Figure 2. Study site with approximate location of dive transects. Tide = approximately +1 foot MLLW.

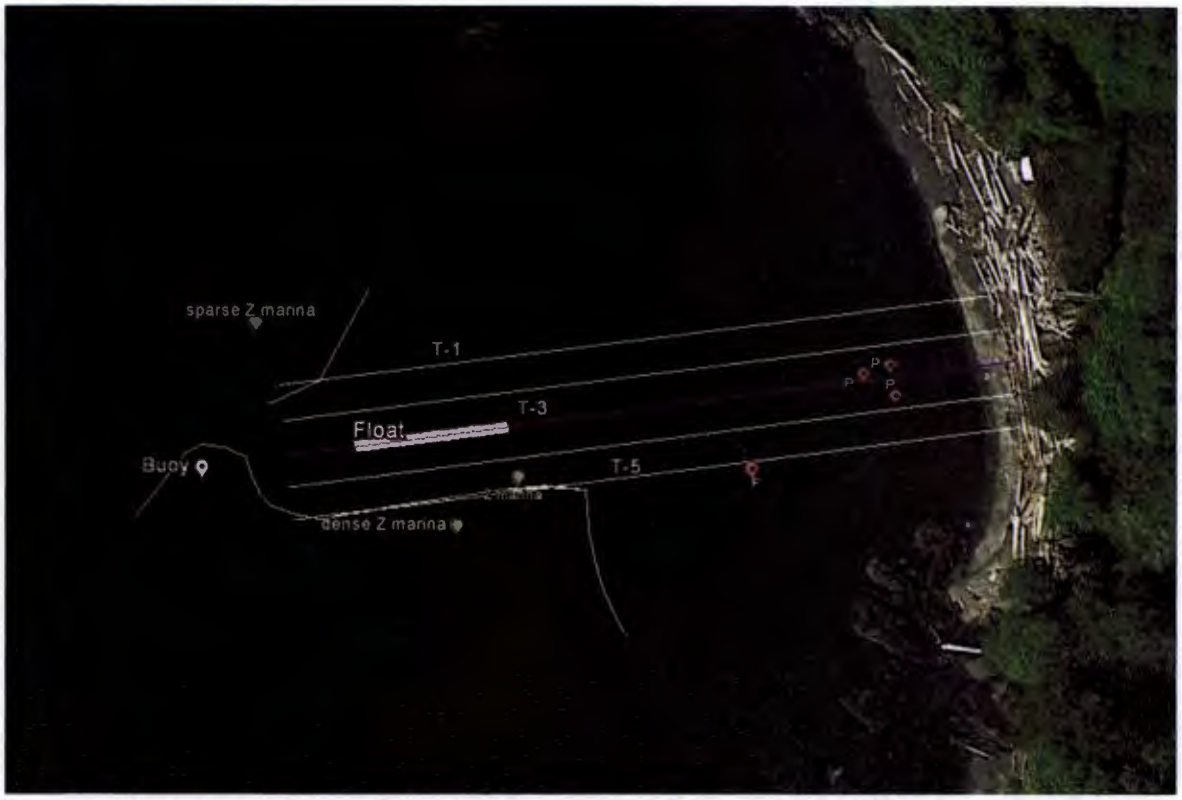


Figure 3. Study transects overlaid relative to proposed dock and location of eelgrass beds. 'P' represents location of existing piling and piling stubs.

Figure 4. Gravel and sand beach with transect lines laid out over the upper intertidal zone. Tide = approximately +2 foot MLLW.

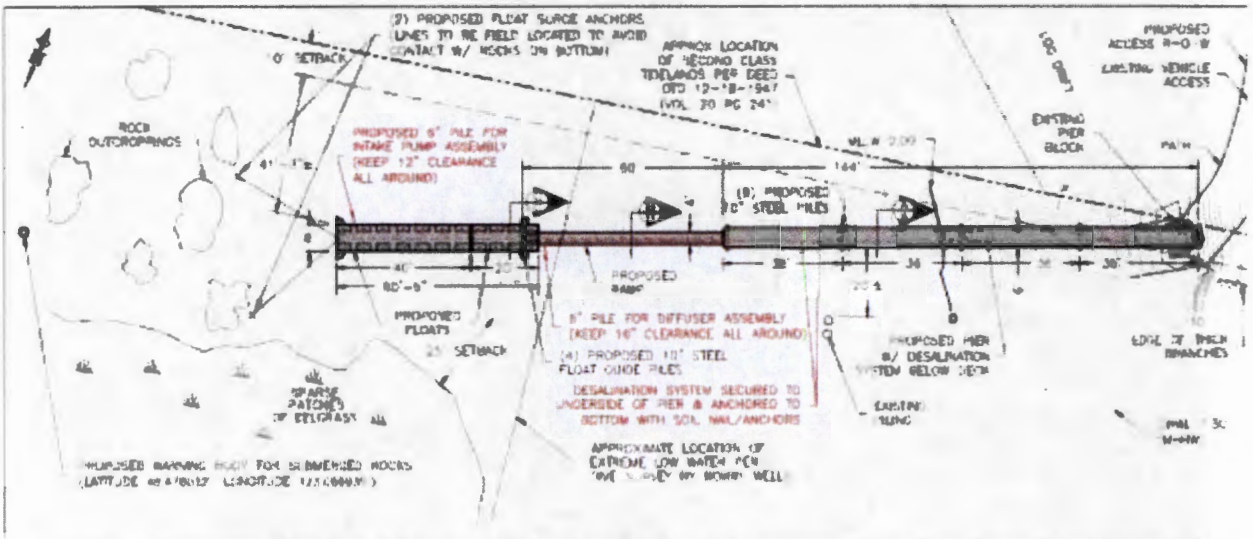


Figure 5. Proposed dock and buoy with bathymetric data surveyed by San Juan Surveying LLC.

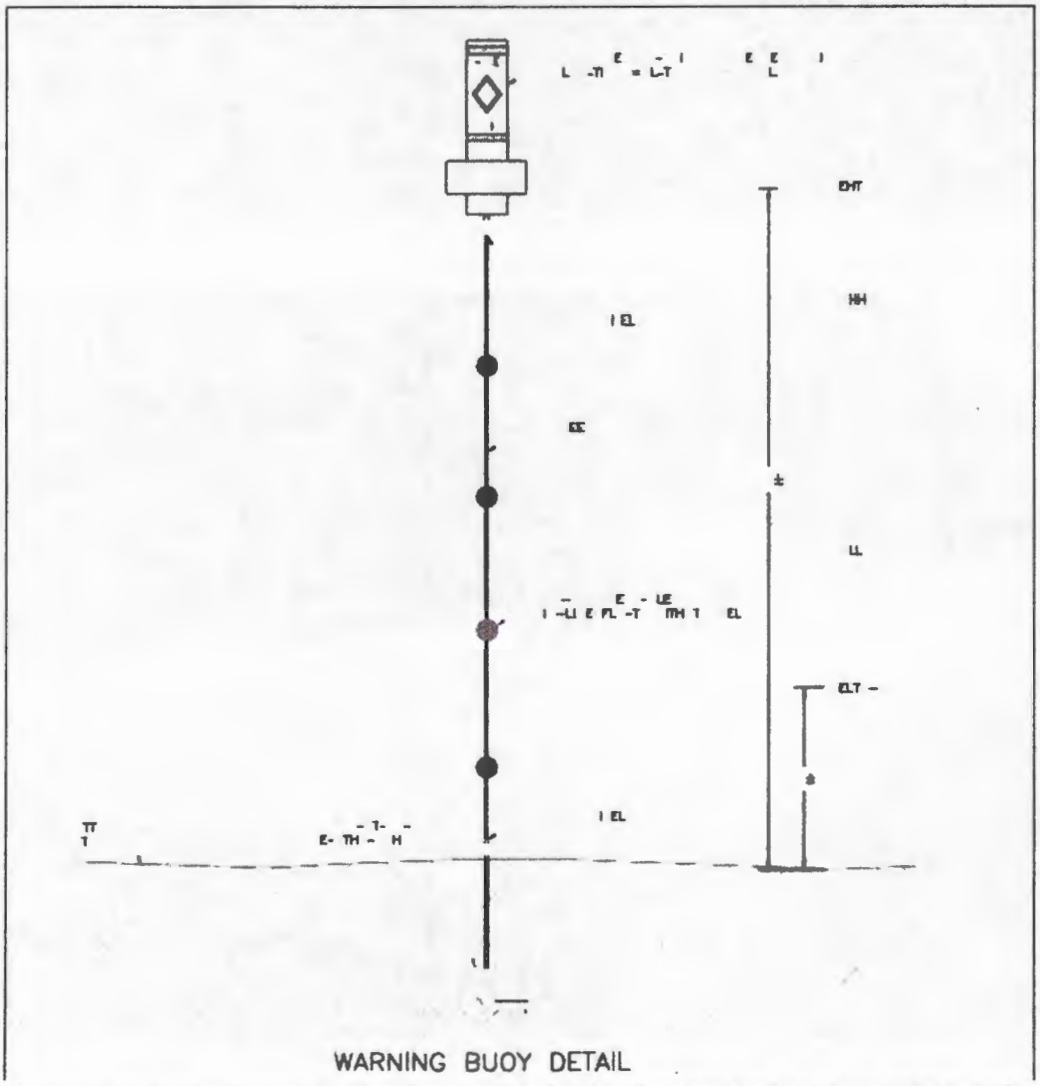


Figure 6. Proposed private navigation buoy with detail of embedded anchor, elastic tether and mid-line floats.

Appendix E

Orca Dreams Spill Prevention Containment and Control Plan

ORCA DREAMS SPILL PREVENTION, CONTAINMENT AND CONTROL PLAN

A. LOCATION

The Orca Dreams subdivision dock is located at 1601 False Bay Road on the southwest side of San Juan Island within the Strait of Juan de Fuca.

The dock is located south of the False Bay Marine Preserve which supports a variety of invertebrate species that are studied by students and researchers at the University of Washington's Friday Harbor Laboratory, primary owner of the bay. Fishing within the preserve is regulated by the Washington State Department of Fish and Wildlife. Harbor seals make use of the nearshore habitats along the outer reaches of the preserve and orca whales are found in offshore areas in the Strait of Juan de Fuca. (Figure 1)

B. INTRODUCTION

Staff at the University of Washington Labs has expressed concern that boats moored at the proposed dock might spill gas and other pollutants which would contaminate the preserve. This Spill Prevention, Containment and Control Plan has been prepared to set in place measures to avoid and eliminate any pollutants that may be generated by activities on or around the Orca Dreams dock from entering into the False Bay Preserve and the Strait of Juan de Fuca. This Spill Prevention, Containment and Control Plan describes the measures to prevent spills and to prevent, control and minimize the effects of the release of petroleum products and polluting materials during and after construction. While it is highly unlikely that spills or pollution will occur at this site due to the small scale of use, the applicants pledge all efforts will be made to prevent spills or release of any amount of petroleum products or other polluting materials into the environment.

C. CONSTRUCTION SPILL PREVENTION, CONTAINMENT AND CONTROL PLAN

Orca Dreams LLC has contracted with Waterfront Construction for the design and construction the proposed dock.

The pier, ramp and float will be constructed off-site in the Waterfront Construction yard in Seattle. Assembly of the dock components (pier, ramp and float) will occur from the waterside off a barge. There is a 300 gallon fuel tank on the barge which complies with the 2016 Coast Guard standards for fuel tanks. The tank will be filled in Seattle and will hold enough fuel to travel from Seattle to the Orca Dreams dock site, construct the dock and travel back to Seattle without having to do any refueling.

Preventative maintenance of the barge and equipment will be done in Seattle prior to heading to the project site. The construction crew will conduct daily inspections of

the barge and equipment to ensure all equipment is running properly to eliminate the potential for spills and leaks. All barges and vessels are equipped with a spill response plan and materials in the slight chance a spill or leak could occur.

Waterfront Construction employees Best Management Practices (BMPs) during construction to prevent spills and pollution. Their BMPs are also attached as Appendix G.

D. BMPS FOR BOATERS

Boaters using the Orca Dreams dock will be required to follow the Best Management Practices (BMPs) provided below. These BMPs will be included in the joint-use dock agreement to assure compliance and enforcement.

I. WASTE OIL AND OIL SPILLS

- Engines shall be tuned annually to assure operation at peak efficiency.
- No oil changes or boat repair shall be conducted at the dock. These maintenance activities shall be conducted offsite at an approved maintenance facility.

II. FUELING

- No fueling may be conducted at the dock but rather at an existing off-site fuel station (e.g., the Port of Friday Harbor).
- Boaters should not top off tanks. The fuel, when it heats, expands in the tank and could escape out vents.
- Each boat must include a fuel/air separator in the vent line of the fuel tank.
- Each boat moored at the dock shall keep an oil absorbent pad on board in case a fuel leak occurs. Oil absorbent pads can be used many times before they require disposal. Wring out allowing the oil to drip into a container. Dispose of hazardous waste. If this is not possible, thoroughly wring out the pads, wrap in newspaper and then double wrap in plastic bags to dispose as solid waste.

III. BILGE WATER FOR BOATS WITH INBOARD MOTORS

- At the beginning of each boating season check the bilge pump and make sure both the automatic and manual operation work. Test the warning alarm system.
- The discharge of contaminated bilge is illegal.
- Keep bilge area as dry as possible.
- Bilge pumps may not be operated at the site or near False Bay.
- Do not add detergent or bilge cleaners to bilge water before pumping overboard.

- Prevent bilge contamination by fixing small leaks that allow oil or fuel to drip into bilge immediately. Keep an aluminum pan, plastic tray or absorbent pad in the bilge to contain spills.
- Inspect lines and hoses annually for deterioration, secure and prevent from chafing.
- If oil seeps into bilge, insert oil absorbent pad to capture it before pumping out the bilge. Immediately turn off bilge pump to prevent contaminants from getting into the water. Squeeze out pads into an oil receptacle and reuse.

IV. SEWAGE

- Discharge of sewage into the water is illegal and prohibited.
- Sewage in holding tanks must be discharged at an appropriate marine pump out facility (i.e., Port of Friday Harbor, Roche Harbor.)
- Use shoreside restrooms when possible.
- If the boat has a Marine Sanitation Device (MSD), use chemical additives that do not contain formaldehyde, formalin, phenol derivatives, ammonia compounds, alcohol bases or chlorine bleach.
- Make sure to pick up pet waste. Never dump pet waste over board and never abandon pet waste on the dock or adjacent uplands.

V. BOAT CLEANING AND MAINTENANCE TO BE DONE OFF-SITE

- Before starting the boating season, each boat shall be tuned up by replacing spark plugs and checking for oil and fuel leaks and the clamps for rust or corrosion. Replace any old, stiff or cracking hoses that may fail.
- Check the bilge area for oily residue and clean thoroughly.
- All Engines and fuel tanks must comply with current Coast Guard standards and shall be inspected annually.
- All fuel and oil leaks shall be repaired immediately.
- Engines shall be kept clean and tuned to prevent leaks.

VI. RECYCLE

- Recycle antifreeze and transmission fluids at a marina or at a County approved hazardous waste collection event.
- Throwing garbage into the water is prohibited.
- Keep litter bags/garbage cans onboard and discard the full ones at a marina of your home.
- Take precautions to prevent trash from being blown overboard. Remove all coolers from debris before empty melted ice water overboard.
- All recyclables shall be brought back to shore and recycled.
- Dispose of monofilament fishing line at recycling bins.

VII. SPILL REQUIREMENTS

RCW 90.56.340: *"It shall be the obligation of any person owning or having control over oil entering the waters of the state in violation of RCW 90.56.320 to immediately collect and remove the same."*

- If you notice any leak or spill of any amount, stop it at the source. Once this is done make sure that additional material is not leaking into the environment. For example, if fuel has spilled into both the vessel's bilge and the water, make sure the bilge pump doesn't turn on, releasing more material.
- Report the incident to both the U.S. Coast Guard and the Washington State Department of Ecology immediately after the situation has stabilized.
- Complete the Spill Report Form (Attached below)

VIII. TAKE CARE OF THE WATERWAY

- The dock shall be accessed from the south side only.
- Boaters shall minimize wake near the shore, wildlife and other boaters.
- Carry charts and know how to read them to prevent running aground.
- Proceed slowly in shallow areas and avoid contact with underwater seagrasses.

EMERGENCY TELEPHONE NUMBERS

1-800-OILS-911	24-hour for spill reporting
1-800-258-5990	24-hour oil and hazardous material spill reporting
1-800-424-8802	U.S. Coast Guard Response Center
378-4151 via Sheriff	Islands Oil Spill Association

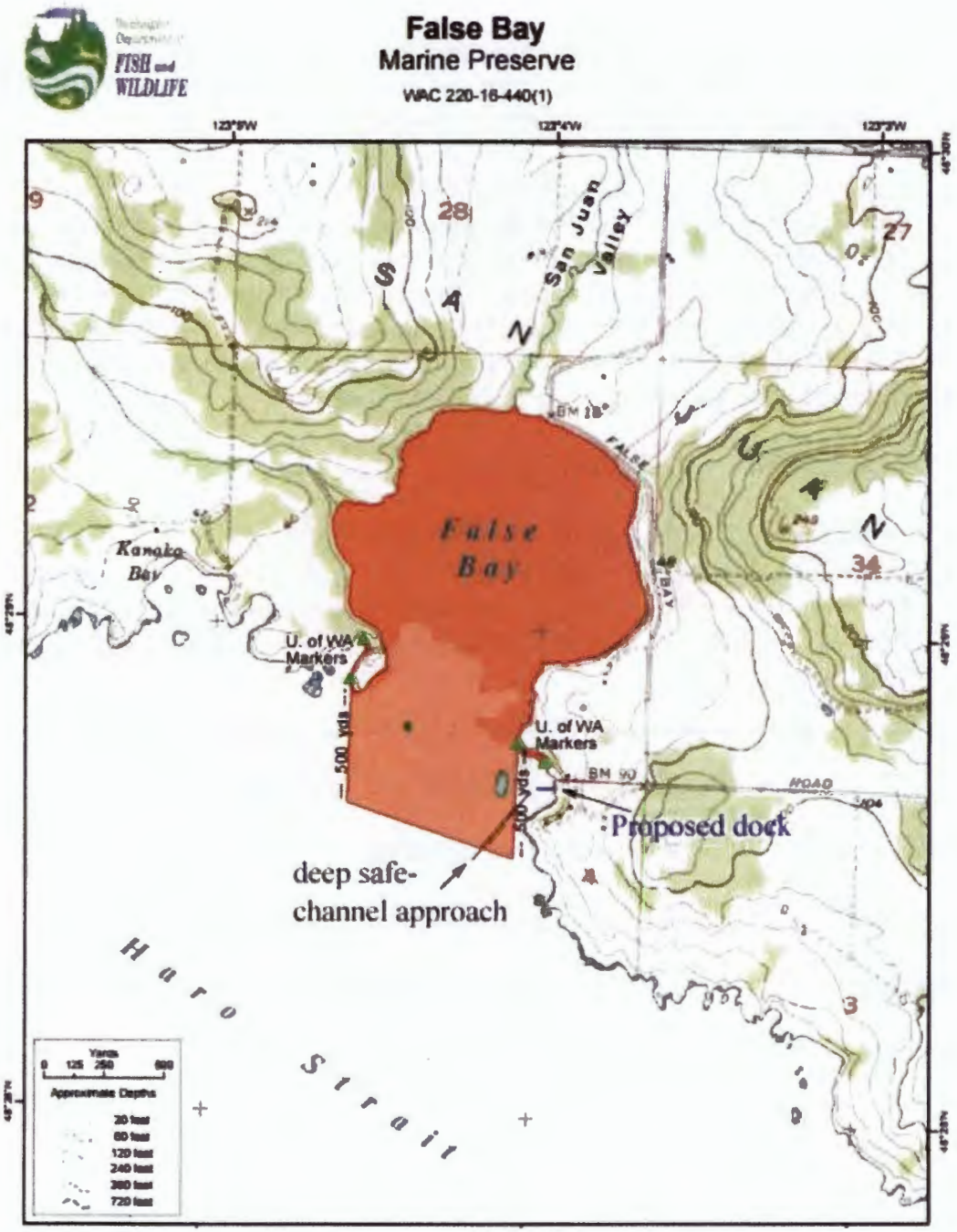


Figure 1. Location of proposed dock and deep safe-channel approach to dock relative to False Bay Marine Preserve

SPILL REPORT FORM
[insert project # / name]

Date: _____ **Time of Spill Occurrence:** _____ **Weather Conditions:** _____

Name/Title of first observer: _____

Regulatory Agencies Notified- Time/Date of Notification:

_____

_____

_____

_____

Location of Spill (Attach photocopy of site plan, as appropriate):

County: _____ **Parcel No.:** _____

Town: _____ **Milepost/Station No.:** _____

Material Spilled: _____

Quantity Spilled:

10 gallons or less: _____ **Between 10 and 1,000 gallons:** _____

Over 1,000 gallons: _____

Circumstances causing spill:

_____

_____

If spill is into water, is a sheen present? _____

Size of area affected by spill:

_____

_____

_____

Estimate depth of spilled material on water or soil:

Has spill left the construction work area? _____

Is spill under control? Y / N
If not, is there a potential for the spill to leave the construction work area?

Has spill cleanup begun? If so, what methods are being or will be used?

Signature of Contractor Representative/Date

Signature of *Transpac Marinas* Environmental Safety Officer / Date

Appendix F

EPA
Best Management Practices
for
Pile Removal & Disposal
revised
March 1,2007

Best Management Practices
For Pile Removal & Disposal

March 1, 2007

The purpose of the following Best Management Practices (BMPs) is to control turbidity and sediments re-entering the water column during pile removal, and prescribe debris capture and disposal of removed piles and debris.

BMP 1. Pile removal

A. Vibratory extraction is the preferred method of pile removal.

1) Crane operator shall be trained to remove pile slowly. This will minimize turbidity in the water column as well as sediment disturbance.

2) Operator to "Wake up" pile to break up bond with sediment.
   - Vibrate to break the skin friction bond between pile and soil.
   - Bond breaking avoids pulling out a large block of soil – possibly breaking off the pile in the process.
   - Usually there is little or no sediment attached to the skin of the pile during withdrawal. In some cases material may be attached to the pile tip, in line with the pile.

3) A major creosote release to the environment may occur if equipment (bucket, steel cable, vibratory hammer) pinches the creosoted piling below the water line. Therefore, the extraction equipment must be kept out of the water.

4) Piling must not be broken off intentionally by twisting, bending or other deformation. This practice has the potential for releasing creosote to the water column.

5) Work surface on barge deck or pier shall include a containment basin for pile and any sediment removed during pulling.

6) Basin may be constructed of durable plastic sheeting with sidewalls supported by hay bales or support structure to contain all sediment. Water run off can return to the waterway.

7) Work surface shall be cleaned by disposing of sediment or other residues along with cut-off piling as described in BMP 2C below.

8) Containment basin shall be removed and disposed in accordance with BMP 2C below or in another manner complying with applicable federal and state regulations.

9) Upon removal from substrate the pile shall be moved expeditiously from the water into the containment basin. The pile shall not be shaken, hosed-off, stripped or scraped off, left hanging to drip or any other action intended to clean or remove adhering material from the pile.

B. Cutting will be necessary if the pile has broken off at or near the existing substrate so that it cannot be removed without excavation, or below the water line. Pile cutoff is an acceptable alternative if vibratory extraction or pulling is not feasible. Every attempt should be made, however, to completely remove the piling in its entirety before cutting. If a pile is broken or breaks above the mudline during vibratory extraction, one of the methods listed below should be used to cut the pile. Prior to commencement of the work the project engineer or contractor should assess the condition of the pilings. Contractor or project engineers need to create a log outlining the location and number of pilings that need to be cut and have this log available to the agencies upon request.

1) A chain should be used, if practical, to attempt to entirely remove the broken pile.

2) If the entire pile cannot be removed, the pile should be cut at or below the mudline by using a pneumatic underwater chainsaw. Project-specific requirements for cutoff should be set by the project engineer considering the mudline elevation and the presence of contaminants in the sediment. Generally, piling should be cut off at the mudline if sediments are contaminated and the mudline is subtidal, to minimize disturbance of the sediment. Piling should be cut off at least 1 foot below the mudline in intertidal areas where the work can be accomplished in the dry. Piling should be cut off at least 1 foot below the mudline in subtidal areas where the sediments are not contaminated. Repeated attempts to remove pile with a clamshell bucket (i.e., "grubbing") should not occur in contaminated sediments, or below the water line.

3) Piles shall be cut off at lowest practical tide condition and at slack water. This is intended to reduce turbidity due to reduced flow and short water column through which pile must be withdrawn.

4) If the piling is broken off below mudline greater than 1 foot, the piling may remain, provided it is located in deep subtidal waters. In intertidal and shallow subtidal areas, seasonal raising and lowering of the beach could expose the pilings above the mudline and leach out PAHs or other contaminants. In this case, the piling should be cut off at least two feet below the mudline if it is accidentally broken off during removal.

5) Depending on future use, the removal contractor should provide the location of the broken pile using GPS. This will be necessary as part of debris characterization should future dredging be a possibility in the area of piling removal.

BMP 2. Disposal of piling, sediment and construction residue

A. Pulled pile shall be placed in a containment basin to capture any adhering sediment. This should be done immediately after the pile is initially removed from the water.

1) Utilize basin set up on the barge deck or adjacent pier

2) Basin may be made of hay bales and durable plastic sheeting.

B. Piling shall be cut into 4' lengths with standard chainsaw.

C. Cut-up piling, sediments, construction residue and plastic sheeting from the containment basin shall be packed into a container. For disposal, ship to Rabanco/Seattle, Weyco facility at Longview Washington, or to another facility complying with federal and state regulations.

BMP 3. Pile replacement

A. Pile material

1) EPA prefers concrete piles for large structural replacements. Pilings made up of painted steel, unpainted steel, steel coated with epoxy-petroleum compound or plastic are also acceptable. Should untreated wood be used for fender piles then rub strips are recommended on the face of the wood.

2) ACZA treated timber piles may be used that comply with the Amendment to the Best Management Practices for the Use of Treated Wood in Aquatic Environments; USA Version – Revised April 17, 2002. Western Wood Preservers Institute. Rub strips are recommended if ACZA treated wood is to be used for fender piles. Coordination with WDFW is also recommended regarding metal leachability into the aquatic environment. When using ACZA, it is recommended that it be demonstrated that copper and arsenic levels in surrounding sediments be within the state SQS.

B. Vibratory hammer shall be used to drive piles. Work may be done from floating or land based construction equipment.

BMP 4. Debris capture in water

A. Floating surface boom shall be installed to capture floating surface debris. Debris is to be collected and disposed of along with cut-off piling as described in BMP 2C above.

BMP 5. Resuspension/Turbidity

A. Crane operator shall be trained to remove pile from sediment slowly.

B. Work shall be done in low water and low current.

C. Removed piles shall be placed in a containment facility.

D. Sediments spilled on work surfaces shall be contained and disposed of with the pile debris at permitted upland disposal site.

Appendix G

Waterfront Construction, Inc.
Best Management Practices
and
Spill Control and Countermeasure Plan

WATERFRONT CONSTRUCTION, INC.
BEST MANAGEMENT PRACTICES
GENERAL CLEANUP

Objective:

Maintain a clean pier and upland work area to provide an environment that reduces the potential for pollutants to enter groundwater or adjacent surface waters and reduce the risk of injury to workers.

BMP:

The upland work area and pier is to be cleaned on a regular basis in order to minimize the loss of accumulated debris to adjacent waters.

- Remove and properly dispose of all refuse, including but not limited to: paper, cans, bottles, wood, steel, and other fabrication and construction materials.
- Procedures and practices should be established to ensure that adequate clean-up occurs.
- Debris that accumulates along the facilities shoreline should be periodically cleaned-up and removed.
- All waste shall be managed within the guidelines of federal, state, and local regulations.

NOTE: Methods used for general cleanup range from broom sweeping and hand pick-up to the use of mechanized equipment.

WATERFRONT CONSTRUCTION, INC.
BEST MANAGEMENT PRACTICES
SPILL CONTROL AND COUNTERMEASURE PLAN (SCC PLAN)

Objective:
In the event of a hazardous or non-hazardous spill emergency, an on-site SCC plan will greatly enhance the ability for adequate response, containment, and clean-up of the spill.

BMP:

- The SCC plan should be implemented and adhered to by all members of Waterfront Construction, Inc., sub-contractors, and customers working on site.
- Items for the work areas that need to be addressed are spill reporting, spill clean-up, portable tanks, material storage areas, employee training, reporting and record keeping, and many others.
- An adequate supply of spill cleanup and containment materials should be placed on all vessels carrying potential hazardous spill material.
- Cleanup materials designed to absorb petroleum products and plastic bags used to transport used absorbent pads.

EMERGENCY SPILL PROCEDURES

- Report spill location, type, size and approximate time to the following agencies, in the order listed:

Agency	*Phone Number*
US Coast Guard Spill Response Branch	206-220-7000 #7221 or 1-800-982-8813 #7221
Foss Environmental Services	1-800-337-7455
Waterfront Construction, Inc.	206-548-9800
Emergency Pager	206-534-8500
WA ST Dept of Ecology	425-649-7000

WATERFRONT CONSTRUCTION, INC.
BEST MANAGEMENT PRACTICES
"NO DUMPING"

Objective:

To educate employees, subcontractors and vessel operators about illegal dumping in Waterfront Construction Seattle Yard or onsite work areas.

BMP:

What is Dumping? For the purpose of this BMP, it means: No discarding of pollutants into the surface waters, storm drains, sinks and toilets, or on the grounds.

Pollutants consist of: paints, solvents, adhesives, oils, detergents, general trash and debris, etc.

"NO DUMPING" INTO:

- **Surface Waters**: Committed to preserving state waters and the local environment. All persons are asked to take part in the commitment to preserve the environment by not dumping.
- **Storm Drains**: Storm drains usually lead to the surface waters. These drains are a potential source of pollution. Be aware of the storm drains and do not allow "Dumping."
- **Sinks & Toilets**: Sinks and toilets usually discharge to the local sewage treatment plant. "Dumping" pollutants into the treatment plant is illegal. It slows the water treatment process and can cause sewage spills, which pollute the state waters. Also many illegally "dumped" pollutants do not get treated and end up in the ocean. Do not "Dump" into sinks and toilets.
- **Facility Grounds**: "Dumping" of pollutants on the grounds is unacceptable. All spills must be cleaned-up immediately. If the pollutants are not cleaned-up, wind and rain will eventually transport the pollutants to state waters. Liquids will soak into the soil, which will also eventually reach surface waters. Do your part to put litter in trashcans and report and/or clean-up all spills.
-

Be Aware, regulatory agencies will fine individuals and companies for illegal dumping.

WATERFRONT CONSTRUCTION, INC.
BEST MANAGEMENT PRACTICES
OIL CONTAINMENT BOOMS

Background:
Oil containment booms may be positioned around vessels when determined necessary, while vessel is berthed at the Waterfront Construction Seattle yard or on a construction at a job site. The booms are designed to contain spills that might occur during the vessel's stay at the yard or at a job site. When booms are placed around vessels, it is easier to determine where a spill originated (i.e., from outside the boom or inside). Booms may also be kept on shore to deploy as ancillary containment if required in case a spill should occur.

Objective:
Ensure accidental spills that reach state waters are contained.

BMP:
Yard foreman or construction crew chief may position oil containment booms around vessels that present a possibility for improper discharges while berthed at the facility.

- Reserve booming should be on site ready to deploy in case a spill requires additional containment.
- Procedures should be developed for deploying additional oil containment booms around and for clean up.
- Procedures for clean-up inside the boomed area should follow Spill Control and Countermeasure Plan.
- The employees responsible for deploying booms should be aware of outfall locations. These outfalls are potential locations where booms will need to be placed if a spill occurs near a storm drain.

WATERFRONT CONSTRUCTION, INC.
BEST MANAGEMENT PRACTICES
TEMPORARY AND PERMANENT LIQUID STORAGE AREAS

Objective:
Provide an area on vessels and in Waterfront Construction Seattle Yard where hazardous liquids can be stored that will help ensure spillage from paint, solvent, and oil containers does not soak into the underlying soils or enter nearby surface waters.

BMP:
Dangerous materials such as fuels, paints, solvents, etc. should be stored in a place that can contain the material in the event of a spill. The contained area should be surrounded by a curb, dyke, berm or some other type of secondary containment to provide sufficient volume to help contain possible spills.

- Storage of reactive, ignitable, or flammable materials will comply with all local and state fire codes.

NOTE: The following BMPs are designed to complement, not conflict with fire code requirements.

- Temporary containment will be used to contain small quantities of fuel, paint, thinner, solvents, etc. used for construction equipment, work vessel or construction project.
- Larger quantities of reserve fuel will be stored in the appropriate storage tank on board the vessel.

WATERFRONT CONSTRUCTION, INC.
BEST MANAGEMENT PRACTICES
BILGE AND BALLAST WATERS

Objective:

Prevent discharge of oily bilge water to surface waters and provide an acceptable method for handling.

BMP:

- Oily bilge water should not be discharged to surface waters.
- The wastewater must be disposed of properly (i.e., water treatment plant, oil/water separator, etc.) depending on local, state, and federal regulations.

NOTE: Depending on the presence of oils, solvents, detergents, etc., direct discharge to sanitary sewer systems or to temporary holding tanks for off-site treatment (treatment and discharge requirements are site-specific) may be the most feasible method for disposal when approved by the local sanitation district.

WATERFRONT CONSTRUCTION, INC.
BEST MANAGEMENT PRACTICES
HAZARDOUS MATERIALS AND WASTE TRANSPORTATION WITHIN THE YARD

Background:
Waterfront Construction, Inc. transports hazardous materials and waste throughout their facility.

Objective:
To minimize the likelihood of spills occurring during transportation and offer practices to control spills if they occur.

BMP:

- Materials should not be transported unless they are properly prepared for transportation. This may include properly secured lids, plugged bungs, proper labeling, and others.
- Material and waste can be secured to transportation pallets by using cellophane wrap, nylon strap/rope, or some other method that minimizes the potential that the load spills during transportation.
- Materials transported on pallets should be compatible with one another.
- Secondary containment pallets are useful when transporting hazardous materials and wastes.
- Material and waste pallets should be kept to manageable load size while being transported.
- Hazardous wastes transported must be labeled in accordance with local, state, and federal labeling requirements.
- Transportation personnel should be aware of the risks associated with spilling hazardous materials and waste. They should also be very aware of spill notification procedures.

WATERFRONT CONSTRUCTION, INC.

BEST MANAGEMENT PRACTICES

THE DO'S AND DON'TS OF HAZARDOUS WASTE DISPOSAL

Waste Oils: Hydraulic oil, gear oil, engine oil, lubricating grease, and other lubricating liquids

Don't: It is illegal to pour oil onto the ground, into the sewer system, or into storm drains. Used oils shall not be used as dust suppressants, burned, or disposed of as general refuge. Do not mix degreasers, solvents, anti-freeze, or brake fluid with oil to be recycled.

Do: Recycle used oils with an authorized recycler. Put the waste oil into a clean, sealed, labeled and approved container. Have a licensed transporter take the waste to the recycling facility.

Used Antifreeze: Antifreeze is also a very toxic chemical which needs special disposal procedures.

Don't: Do not pour antifreeze fluid into sewer, storm drains, or onto the ground (soils).

Do: Recycle antifreeze if the option is viable. Dispose of antifreeze within the guidelines of these BMP's.

Used Batteries: There are a variety of batteries used in the shipyard.

Don't: Do not dispose of batteries into general refuge dumpsters or let them stack-up in storage.

Do: Collect and recycle all used batteries.

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Petroleum Waste: Petroleum waste products consist of gasoline, diesel, kerosene, and cosmoline.

Don't: Do not discharge to storm drains, sewer system, or grounds.

Do: Petroleum waste must be recycled or otherwise disposed of through a licensed transporter.

Degreaser Waste: Degreasers consist of solvents, mineral spirits, paint thinners, etc.

Don't: Don't discharge to sanitary sewer, storm drains, or soils.

Do: Recycle to the greatest extent possible all degreasers and where possible switch from organic based solvents to inorganic, aqueous substitute detergents.

Appendix H

Request for an
Incidental Harassment Authorization

Under the
Marine Mammal Protection Act

Orca Dreams LLC
Joint-use dock
San Juan Island, WA

Request for an Incidental Harassment Authorization

Under the Marine Mammal Protection Act

Orca Dreams LLC Joint-use Dock Reverse Osmosis Desalination System

San Juan Island, WA

Revised
October 10, 2017

Submitted to:
Permits and Conservation Division
Office of Protected Resources
1315 East-West Highway
F/PR1 Room 13805
Silver Springs, MD 20910

Prepared by:
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Fairbanks Environmental Services, Inc.
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Orca Dreams LLC
Request for an Incidental Harassment Authorization

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1.0 Description of Activity

1.1 Introduction

Orca Dreams, LLC intends to construct a joint-use dock along the southwest shore of San Juan Island adjacent to Haro Strait. The dock will be constructed on the property identified as Tax Parcel Number (TPN) 340411003 and the dock is intended to serve three property parcels: TPN 353344008, TPN 3404110034, and TPN 340411005, and five existing residences. This Project will consist of a fixed pier, ramp and floating dock all in a straight alignment in a west-southwest direction. As many as eight broken creosote-treated piles will be removed and twelve 10-inch steel piles will be set with a vibratory hammer or set in a drilled hole where bedrock is encountered; an impact-hammer will not be used. All deck surfaces will have light-permeable grating with greater than 50 percent functional grating. The float will be held in position with four steel guide piles and two auger or duckbill anchors with elastic cords extending to the float. The dock will be in use during the summer months from May through October; the float and ramp section will be removed from the site from November through April.

Orca Dreams, LLC also intends to construct a Reverse Osmosis (RO) desalination system that will be located on the upland of the Orca Dreams LLC property to serve the three property parcels listed above. As part of this system, a seawater intake will be secured to a 6-inch galvanized steel piling placed at the depth of -7 feet relative to Mean Lower Low Water (MLLW) and a brine diffuser will be secured to a 6-inch galvanized steel piling placed at the depth of -4 feet MLLW. The intake and diffuser will be placed approximately 60 feet apart. The two 6-inch steel piles will be driven with a vibratory pile driver. If bedrock is encountered, the pilings will be set in drilled holes. Once the piles are installed the contractor will install the intake pump and diffuser assemblies on the pilings and install the seawater supply pipe, saltwater return pipe and electrical power conduit either onto a proposed fixed pier (as described above) or, secured onto the seafloor to MLLW. Landward of MLLW, the conduit and pipes will be buried in a trench at the depth of 2 feet below the surface of the beach.

These two independent actions will be constructed within the same footprint and may be completed concurrently, or may be completed separately:

This request is for an Incidental Harassment Authorization for Level B incidental behavioral harassment of marine mammals for the period of construction. Specifically, when underwater sound pressure level will be elevated above ambient levels and to within the behavior effects levels of 120 dB_{RMS} when a vibratory pile driver will be in use or when bedrock is being drilled. The vibratory pile driver will also be used to remove existing wood piles during a period of one day. Each steel pile will require approximately two hours of vibratory pile driving for a total of approximately 24 hours over a period of six days. The vibratory pile driver will be in operation for a few hours each day over a maximum of six days. Drilling will require a maximum of 12 days.

1.2 Project Location and Setting

The Project is located on southwest shore of San Juan Island, Washington in the NW ¼ of the NW ¼ Section 4 T34N; R03W. This shoreline is adjacent to Haro Strait, an active passage for commercial and recreation vessels. (Figure 1). Land use in the area is rural residential with single family homes.

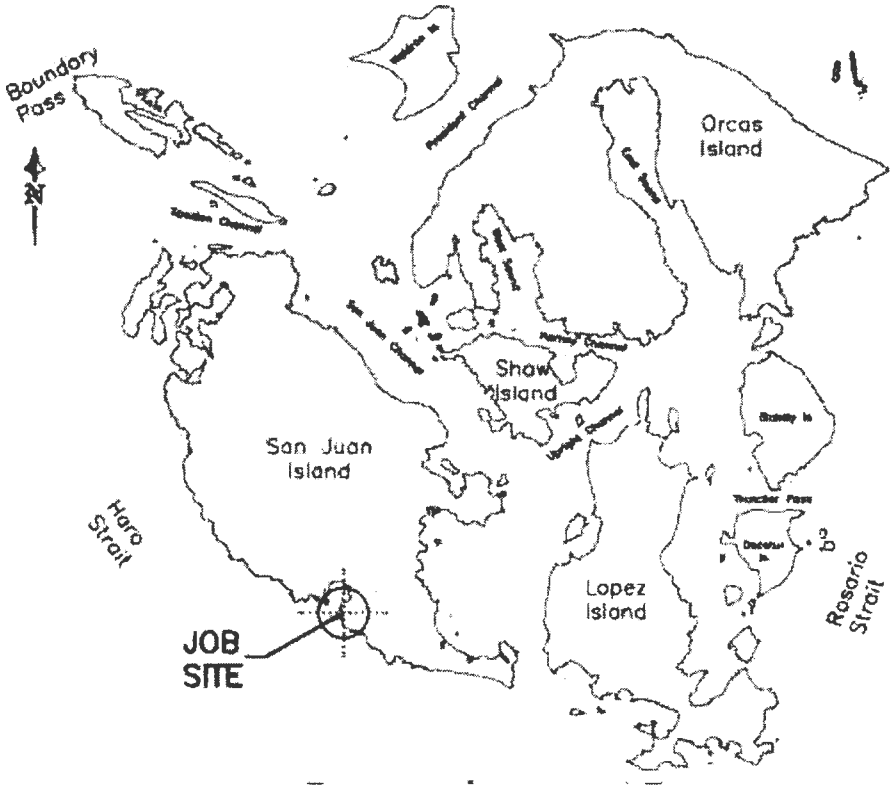

Figure 1. Vicinity map of proposed Orca Dreams, LLC joint-use dock.

1.3 Project Purpose

The purpose of the joint-use dock is to provide safe moorage for four vessels for the residents of the five existing single-family homes who will use private vessels for recreational boating in the local waters.

The purpose of constructing the RO desalination system is to provide sufficient potable water for the five existing residences plus one future residence located at the project site.

2.0 Description of Specified Activity

The Project will construct a new joint-use moorage structure consisting of a fixed pier, ramp and float. Components of the joint-use dock are listed below in Table 1 along with dimensions and construction material. The RO desalination system will require two 6-inch galvanized steel piling that will be placed within the dock project footprint.

Table 1. Components of proposed joint-use dock, materials, dimensions and footprint area and area of two 6-inch steel piling.

Component	Material	Dimension	Area (sq ft)
Fixed pier	Aluminum	6-foot wide x 144 ft long	864
Ramp	Aluminum	4-foot wide x 60 feet long	240
Float	ACZA treated wood Plastic grated deck Plastic encapsulated foam floats	8-foot wide x 60 feet long	480
Piling	8 Galvanized steel 4 Galvanized or epoxy coated steel	10-inch diameter	6.5
Piling (RO desalination system)	2 Galvanized steel	6-inch diameter	0.4
		Less ramp/float overlap	-19
		Total foot print	**1,571.9**

2.1 Site Preparation

As many as eight creosote-treated piles will be removed from the project site, or cut below the mud line if the pile cannot be pulled in their entirety. A vibratory hammer may be used to loosen the piles as they are being pulled. Remnants of an existing pier structure at the top of the beach may be incorporated into the new facility or may be removed, placed on the construction barge and transported to contractor's yard for upland disposal.

2.2 Construction

On-site construction will consist of driving or drilling the pier piles near shore and driving the float guide-piles. A total of twelve 10-inch steel piles will be driven with a vibratory hammer or, where bed rock is encountered, the piling will be set in drilled holes; an impact hammer will not be used. Once piles are installed the barge mounted construction crane will be used to hoist the pier sections to set them in place. The pier sections will be bolted to the piles. Once the pier construction is complete, the moorage float will be set in the water, bolted together and positioned in place. The float will be secured using anchors and guide-piles set in place using the barge mounted construction crane. After the float sections are secured, the ramp section will be set in place. The shoreward end of the ramp will be bolted to the pier and the water-ward end set on the moorage float. Plan view and cross sections of the proposed project are shown in the project drawing packet attached as Appendix A (Sheets 4-8 of 11).

The RO desalination system will be constructed on the upland of the Orca Dreams LLC property. As part of this system, a seawater intake will be secured to a 6-inch galvanized steel piling placed at the depth of -7 feet relative to Mean Lower Low Water (MLLW) and a brine diffuser will be secured to a 6-inch galvanized steel piling placed at the depth of -4 feet MLLW. The intake and diffuser will be placed approximately 60 feet apart. The two 6-inch steel piles will be

driven with a vibratory pile driver. If bedrock is encountered, the pilings will be set in drilled holes. Once the piles are installed the contractor will install the intake pump and diffuser assemblies on the pilings and install the seawater supply pipe, saltwater return pipe and electrical power conduit either onto a proposed fixed pier (see below) or, secured onto the seafloor to MLLW. Landward of MLLW, the conduit and pipes will be buried in a trench at the depth of 2 feet below the surface of the beach.

2.3 Pile Driving Equipment

The piling will be driven with an APE model 50 vibratory hammer with a drive force of 53 tons and maximum frequency of 1,700 vibrations per minute. A rubber cushion will be placed between the vibratory pile driver and the pile to reduce the generation of both airborne and underwater sound.

Underwater Sound

Pile driving can generate underwater Sound Pressure Levels (SPL) that may cause severe damage and mortality to fish (Longmuir and Lively 2001). The intensity of SPL produced by pile driving is dependent on several factors including:

- Type and size of pile
- Type and size of pile driving equipment
- Firmness of substrate
- Depth of water

Vibratory hammers produce less intense sound pressure levels with rapid repetition over a period of several seconds to several minutes whereas as both the hydraulic and drop-hammer impact pile driving produces a very short intense sound pressure levels. Marine mammals may display avoidance response to the SPL associated with vibratory pile driving, communication between individuals and groups may be masked and echolocation efficiency may be reduced (Griffin and Bain 2006). SPL produced by hydraulic and drop-hammer impact pile driving may cause permanent harm to marine mammals, birds and fish that are in the project area

2.4 Zone of Influence

The project will place twelve 10-inch steel pile and two 6-inch steel pile into intertidal and subtidal areas. Washington State Department of Transportation guidance (WSDOT 2015) for establishing the Zone of Influence (ZOI) for driving 12-inch steel piles with a vibratory hammer will be used, the smallest sized pile addressed by WSDOT. Underwater noise produced by driving a 12-inch steel pile with a vibratory hammer is estimated to be 155dB_{RMS} measured 33 feet from the piling (CalTrans 2007). Project noise will not reach the threshold for harm of 179dB_{RMS} for whales and 181dB_{RMS} for pinnipeds (NMFS 2016). Using the practical spreading loss model[1] (NMFS 2012), underwater noise will fall below the behavioral effects threshold of 120dB_{RMS} for marine mammals at a distance of 1.34 miles. Therefore, the ZOI of behavior

[1] Transmission Loss = $15\log(R_2/R_1)$
Solving for distance to specified level of noise: $R2 = R1 * 10^{((dB_{at\ R1} - dB_{threshold})/15)}$

threshold for marine mammals will be 1.34 miles where underwater sound transmission is not obscured by land (Figure 2). Piling driving and removal activities will not occur if killer whales or humpback whales are within the ZOI.

Figure 2. 1.34-mile zone of influence associated with attenuations of underwater noise to the disturbance threshold of 120dB$_{RMS}$ produced by driving steel piling with a vibratory hammer.

If bedrock is encountered, the piling will be placed in holes bored into rock; underwater noise produced by drilling is significantly less than vibratory pile driving. Alaska LNG (2015) reported that underwater noise generated from drilling 10-inch diameter holes did not exceed the 120 dB at the sound source. Nedwell and Brooker (2008) reported underwater noise of 162 dB at 1 meter from drilling a 46-inch hole into bedrock. Using the data from the Nedwell and Brooker report as a conservative estimate, the distance to attenuation to the behavior threshold for whales is 0.39 miles. Table 2 lists the SPL produced by each action, method of placement of the piling with the distance to attenuation, and the ZOI to be monitored for presence of marine mammals.

Table 2. Sound Pressure levels and Zone of Influence for placement of 6-inch piling and 10-inch piling with a vibratory pile driver and drilling.

Action	Method	Sound Pressure Level	Distance to attenuation to Disturbance Threshold	Zone of Influence to be Monitored
Placement of twelve 10-inch steel piling	Vibratory pile driver	155 dB$_{RMS}$ [1]	1.34 miles	1.34 miles
	Drilling 12-inch diameter hole	162 dB$_{RMS}$ [2]	0.39 miles	0.40 miles

Placement of two 6-inch steel piling	Vibratory pile driver	155 dB_{RMS} [1]	1.34 miles	1.34 miles
	Drilling 8-inch diameter hole	120 dB_{RMS} [3]	0 miles	0.40 miles

1. Underwater noise produced by driving a 12-inch steel pile with a vibratory driver is 155dB_{RMS} measured 33 feet (10 meters) from the piling (CalTrans 2007).
2. Underwater noise produced by drilling a 46-inch hole estimated to be 162 dB at 1 meter from source (Nedwell and Brooker 2008)
3. Underwater noise produced by drilling a 10-inch hole estimated at the source (Alaska LNG 2015)

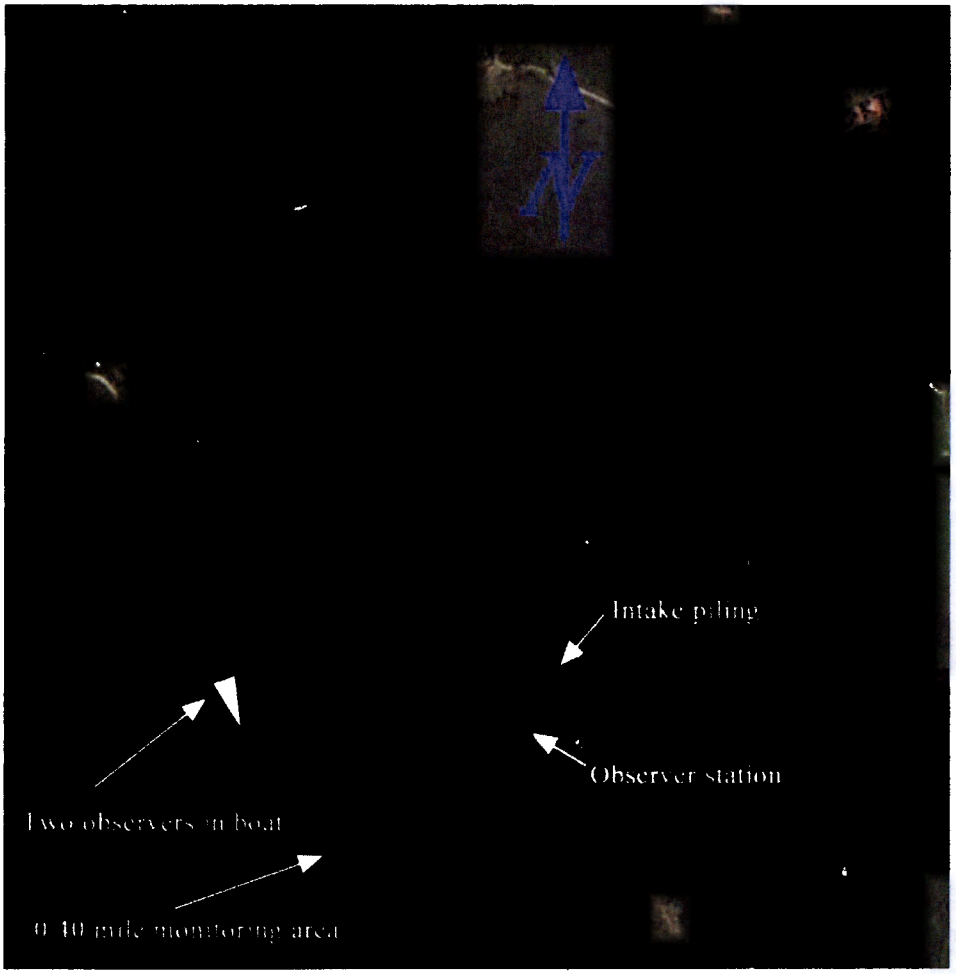

Figure 3. 0.40 mile Zone of Influence to be monitored when drilling operations are conducted.

2.5 Airborne Noise

As many as eight creosote-treated wood piles will be pulled with a vibratory hammer as needed and twelve 10-inch and two 6-inch steel piles will be driven with a vibratory hammer. Airborne noise generated by these actions may reach the disturbance threshold of 90dB_{RMS} (unweighted) for harbor seals within 139 feet of the activity and will not likely reach the disturbance threshold of 100dB_{RMS} (unweighted) for other pinnipeds at 50 feet from the action. WSDOT (2010) measured airborne noise generated by driving an 18-inch steel piling with a vibratory driver to be 88.6 dB L_{eq}/RMS at 39 feet. This measurement was standardized to an L_{max} noise of 93.8 dB at 50 feet. Transmission loss through air over water (TL=20LogR) will reduce airborne noise to 90

dB at 89 feet beyond the 50-foot distance where the L_{max} noise was estimated. Airborne noise generated from a vibratory driver setting an 18-inch pile will attenuate to the disturbance threshold of $90dB_{rms}$ for harbor seals within 139 feet from the source. Airborne noise generated from placement of 6-inch piles and 10-inch steel piles will likely be less.

The closest documented harbor seal haulout is approximately 3,000 feet (0.57 mi) from the project site although harbor seals may occasionally haulout on the beach or on an exposed rock approximately 200 feet from the project site. The closest documented sea lion haulout is approximately 12 miles west of the project site.

2.6 Background Noise

The Strait of Juan de Fuca and Haro Strait are heavily used by commercial and recreational vessels. The number of commercial ships, passenger ships, tugs and barges, and commercial fishing vessels that travel through the eastern section of the Strait of Juan de Fuca has been estimated by Glosten Associates Inc. (2014) and Northern Economics, Inc. (2014) as noted in Table 2 below.

Table 3. Average Annual Commercial Vessel Traffic in the eastern portion of the Strait of Juan de Fuca.

Vessel	Average Annual	Units
Commercial Ships[1]	4,193	Traffic days[2]
Tribal fishers crab and shrimp	2,780	Trips
Tribal fishers salmon	302	Trips
Total:	**7,275**	

1. Commercial ships include cargo, tankers, tugs, tug and barge, passenger and fishing vessels.
2. Traffic day is defined as vessels in the study area for a 24-hour period. Generally a single vessel moves through the study area and therefore multiple vessels will be contribute to a single 'vessel traffic day'. Therefore, a 'traffic day' will be the sum of several trips.

Commercial whale watching boat traffic has substantially increased in recent years to a fleet of approximately 72 boats. Typically, during the summer season, an average of 22 boats follow a pod of killer whales during the daylight hours along the west side of San Juan Island. Underwater noise generated by these boats have a significant effect on the duration of vocalization of killer whales (Foote et al. 2004).

The number of private vessels, whale watching tours, day-charter vessels and smaller boats such as skiffs, kayaks and canoes cannot be estimated because there is no requirement to report activities of private boats. The west side of San Juan Island is very popular for viewing, sailing, recreational fishing, and diving and the number of private boats in the study area during the summer season is significant. Underwater noise generated from vessels may likely reduce the distance which the noise generated from the vibratory pile driving will attenuated to be equivalent to the background noise level.

The average ambient underwater noise levels on the west side of San Juan Island was reported by Veirs and Veirs (2005, as cited in WSDOT 2012) to be 118dB$_{RMS}$ during the summer months of July and August and 116dB$_{RMS}$ during the non-summer months of October through April. Applying the practical spreading loss model, underwater noise will attenuate to background level approximately 1.8 miles through open water during July and August and 2.5 miles during October through April.

3.0 Dates and Duration of Activities

3.1 Construction Dates

The project will be constructed within the allowable work window for in-water work between September 1, 2016 and February 15 2017. The exact dates when the construction crew will be on site is to be determined.

3.2 Duration

Removal of the eight existing wood piles will be completed in one day prior to placement of the steel piles. Each steel pile may require approximately two hours of to set the pile to the correct depth with a vibratory hammer. The construction barge will need to be repositioned prior to setting the next pile. Consequently, the duration of pile driving will be approximately 24 hours over a period of four to five days for the twelve 10-inch steel piles for the dock. The RO desalination system piling will be installed in one day. The vibratory hammer may be in operation for a few hours each day over a maximum of six days.

Setting the piling by drilling is a slower process and may require four hours to install each piling; a total of 48 hours for the twelve 10-inch piling plus 6 hours for the two 6-inch steel piling. This work will be completed over a maximum of twelve days.

4.0 Species of Marine Mammals

The presence of twelve species of marine mammals have been documented near the project site. Estimated occurrence timing and the frequency listed below in Table 3 is determined through a variety of sources such as the sighting archive of Orcanetwork.org.

Table 4. Marine mammals that may be present near the project site.

Species	ESA Status	MMPA Status	Occurrence Timing	Occurrence Frequency
Harbor seal	Not listed	Non-depleted	Year-round	Common
Northern elephant seal	Not listed	Non-depleted	Year-round	Rare
California sea lion	Not listed	Non-depleted	August – April	Common
Steller sea lion	Delisted	Depleted	August – April	Occasional
Killer whale, southern resident	Endangered	Depleted	November -May June-October	Occasional Frequent

Killer whale, Bigg's	Not listed	Non-depleted	Year-round	Occasional
Gray whale	Delisted	Depleted	January – May	Occasional
Humpback whale	Endangered	Depleted	June - December	Occasional
Minke whale	Not listed	Non-depleted	June - December	Occasional
Harbor porpoise	Not listed	Non-depleted	Year-round	Occasional
Dall' porpoise	Not listed	Non-depleted	Year-round	Occasional
Pacific white-sided dolphin	Not listed	Non-depleted	Year-round	Occasional

4.1 Affected Species Status and Description

A brief description of each of the species, population status and current understanding of the local stock is included below. These descriptions are summarized from the stock assessment reports (SARs) available at: http://www.nmfs.noaa.gov/pr/sars/species.htm.

Harbor Seal (Phoca vitulina richardii)

Populations of harbor seals occur from Baja California, Mexico north along the west coast of the United States and Canada into the Bering Sea and the Pribilof Islands. Harbor seals do not make extensive pelagic migrations and have a strong fidelity for specific haulout sites. Within the Salish Sea, three stocks of harbor seals are recognized:

1. Southern Puget Sound, south of the Tacoma Narrows Bridge
2. Hood Canal
3. Washington Northern Inland Waters which include the San Juan Islands.

The population of the Northern Inland Waters stock estimated in 1999 was 11,036. Between 1983 and 1996, the annual rate of increase of this stock was 6% and the population is considered stable. Harbor seals are protected under the MMPA but are not considered depleted and are not listed under ESA. The Potential Biological Removal (PBR) cannot be determined because of the lack of historic and current population data.

Northern Elephant Seal (*Mirounga angustirostris*)

The northern elephant seal was hunted nearly to extinction and the current population is from a few tens or hundreds of individuals. Northern elephant seals breed and give birth at their natal rookeries in California and Baja California, Mexico. The California stock is considered separate from the Mexico breeding stock and the population of the California stock, estimated in 2005, is 179,000. Male elephant seals feed as far north and west as the Aleutian Islands and a few of these have been observed hauled out on Race Rocks in the Salish Sea. Observations of individual northern elephant seals near the San Juan Islands is considered rare. Northern elephant seals are protected under the MMPA but are not considered depleted and are not listed under ESA. The PBR for the California stock is estimated at 4,382.

California Sea Lion (*Zalophus californianus*)

Male California sea lions of the Pacific temperate geographic population arrive in the Salish Sea in the fall and stay through late spring. Females remain at the breeding colonies in southern

California and the Coronado Islands in Mexico. This population is considered distinct from the four other populations which breed along the Pacific coast of Baja California and in the Gulf of California. Individuals of the Pacific temperate population range along the coastal waters of Baja California, California, Oregon, Washington and British Columbia. The population was estimated in 2008 at 296,750 with an increasing trend with exceptions of strong El Niño year when pup production sharply decreases. An estimated 3,000 to 5,000 male California sea lions may winter in the Salish Sea. California sea lions are protected under the MMPA but are not considered depleted and are not listed under ESA. The PBR for the Pacific temperate population of California sea lion is 9,200.

Steller Sea Lion (*Eumetopias jubatus*)

Steller sea lions range from northern Japan across the north Pacific coastline to California. Two distinct breeding populations have been classified as the western stock and the eastern stock. The eastern stock breeds on rookeries in southeast Alaska, British Columbia, Oregon and California, no breeding rookeries have been identified in Washington State. The population was estimated at 41,638 (Muto et al. 2017); the eastern stock has an increasing trend. The population in Washington State including counts from haulouts located both on the Pacific coast and inland waters was estimated at 1,749. Male and female Steller sea lions move into the Salish Sea in the fall and forage through the winter. The eastern stock of Steller sea lions is protected under the MMPA and considered depleted. This stock has been 'delisted' from their threatened status under ESA. The PBR for the eastern stock of Steller sea lion is 1,645.

Southern Resident Killer Whale (*Orcinus orca*)

Killer whales can be found in most oceans of the world. In the Salish Sea, the southern resident killer whale (SRKW) stock is frequently observed and the Bigg's transient stock is infrequently observed. These two stocks differ in their behavior and diet. The southern resident killer whale lives in distinct social groups (pods) and their primary diet is salmon, particularly Chinook salmon. The complete range of the SRKW is uncertain; these whales have been observed in southeast Alaska and in Monterey Bay in winter months. During the summer, this stock is frequently seen in the San Juan Islands; The general description of frequency for each month of the year is listed below in Table 4 along with the number of sighting report between 1990 and 2013, a 23-year period. The current population is 81 whales in three pods as of the 2015 census. SRKW are protected under the MMPA and considered depleted. This stock is also listed as endangered under ESA. The PBR for SRKW has been estimated at 1 animal in 7 years.

Table 5 General description and frequency of sightings of SRKW in Haro Strait near the Project ZOI.

Month	SRKW Sightings in Haro Strait from San Juan Island	Sightings within quadrant which includes the ZOI 1990-2013[1]
June	Frequent	339
July	Frequent	368
August	Frequent	253
September	Frequent	260

October	Occasional	48
November	Occasional	5
December	Occasional	1
January	Occasional	2
February	Occasional	4
March	Occasional	8
April	Occasional	33
May	Often	161

1. http://www.westcoast.fisheries.noaa.gov/publications/protected_species/marine_mammals/killer_whales/occurrencemap.pdf

Bigg's Transient Killer Whale

West coast transient killer whale, also known as Bigg's killer whale are observed in the Salish Sea and is genetically distinct from the SRKW. These whales travel in small groups of three or four related individuals and specialize in hunting mammals. Bigg's killer whales range throughout the north Pacific Ocean and the population is composed of approximately 243 individuals from several 'clans'. The Bigg's killer whale are protected under the MMPA but are not considered depleted and are not listed under ESA. The PBR for Bigg's killer whale is 2.4 animals per year.

Gray Whale (Eschrichtius robustus)

North Pacific gray whales are divided into two distinct genetic stocks, Western North Pacific and Eastern North Pacific (ENP). The ENP gray whales spend the winter near two primary calving lagoons in Baja California, Mexico. In the spring the whales migrate north along the coast toward the Bering and Chukchi seas. Many of the whales have a high degree of fidelity to feeding areas along the migration routes and may remain at these sights through the summer. In the fall the whales return Baja California. Gray whales are occasionally observed in the Salish Sea as early as January and as late as August. The population of ENP gray whale was estimated to be 19,126 in 2012 with an increasing trend of 3.2 percent; the population may be near its carrying capacity. ENP gray whale are protected under the MMPA but are not considered depleted and are not listed under ESA. The PBR for the ENP population is 559 animals.

Humpback Whale (Megaptera novaengliae)

Humpback whales occur throughout the North Pacific Ocean and are categorized by their distinct winter breeding areas. The humpback whales which feed in northern Washington and southern British Columbia are included in the California/Oregon/Washington stock which breed along Central America and mainland Mexico. The population of this stock was estimated at 1,918 in 2009 with an increasing trend of approximately 7.5 percent per year. Sightings in the Salish Sea were uncommon until 2003. In 2004, 30 sightings of humpback whales were reported in the Salish Sea and eleven individuals have been identified from photographs (Falcone et al. 2005). From January through December 2015 a total of 323 sightings were reported through Orcanet.org. Many of these sightings are of a number of individual whales and many are repeated sightings of the same individuals. Two of the reported sightings May 2015 are within or near the Project action area. Humpback whale sightings are most common in May through

August however, humpback whales have been reported throughout the year. Humpback whales are protected under the MMPA and are considered depleted. Currently these whales are listed as endangered under ESA although a status review is in progress. The PBR for humpback whales is estimated at 11 whales per year.

Minke Whale (Balaenoptera acutorostrata scammoni)

Minke whales are occasional observed in the Salish Sea from late spring through fall. These small baleen whales are part of the California/Oregon/Washington stock which is a subset of the Eastern North Pacific population. Minke whales are generally solitary and feed independently although they may occur as a small group at feeding areas in the Salish Sea. The population size of the California/Oregon/Washington stock was estimated at 636 (Caretta et al 2016). Minke whales are protected under the MMPA but are not considered depleted and they are not listed under ESA. The PBR is 2 whales per year.

Harbor Porpoise (Phocoena phocoena vomerina)

Harbor Porpoise occur throughout the North Pacific Ocean from Point Barrow, Alaska to Point Conception, California. The Washington inland waters stock which occur in the San Juan Islands are year-round residents and are genetically distinct from the coastal stocks. The population size of the Washington inland waters stock was estimated at 8,103 (Jefferson 2016). Harbor porpoise are protected under the MMPA but are not considered depleted and they are not listed under ESA.

Dall's Porpoise (Phocoenoides dalli dalli)

Dall's porpoise is found in temperate waters of the North Pacific Ocean from Baja California north to the Aleutian Islands and east to Japan. For the purposes of MMPA stock assessment reports, the eastern North Pacific population is split into two groups: The California/Oregon/ Washington stock and the Alaskan stock. Dall's porpoise is occasionally observed in the Salish Sea. The population estimate for the California/Oregon/Washington stock was estimated at 25,750 using data collected in 2008 and 2014. This number excludes porpoise in the Salish Sea. Dall's porpoise is protected under the MMPA but are not considered depleted and they are not listed under ESA. The PBR is 172 animals per year calculated from the estimate of the population occurring off the coast.

Pacific White-Sided Dolphin (*Lagenorhynchus obliquidens*)

Similar to the Dall's porpoise, the Pacific White-Sided Dolphin occur in temperate waters of the North Pacific Ocean from Baja California north to the Aleutian Islands and east to Japan. For the purposes of MMPA stock assessment reports, the eastern North Pacific population is split into two groups: The California/Oregon/Washington stock and the Alaskan stock. These dolphins are occasionally observed in the Salish Sea however the size of this segment of the population has not been estimated. The population estimate for the California/Oregon/ Washington stock was estimated at 26,8140 using data collected in 2008 and 2014. Pacific White-Sided Dolphin are protected under the MMPA but are not considered depleted and they

are not listed under ESA. The PBR is 191 animals per year calculated from the estimate of the population occurring off the coast.

5.0 Type of Incidental Taking Authorization Requested

Orca Dreams LLC requests an Incidental Harassment Authorization from September 1, 2018 through February 15, 2019 for Level B incidental take (behavioral harassment) of the marine mammals described within this application during construction of a joint-use dock. Specifically, the requested authorization is for incidental harassment of any marine mammal that might enter the 120 dB_{RMS} zone of influence during active vibratory hammer activity. The scheduled pile-driving activities discussed in this application will occur between September 1, 2018 and February 15, 2019.

6.1 Take Estimate for Marine Mammals

Small numbers of marine mammals listed above in Table 3 may occur within the ZOI. With the exception of harbor seals, all of the marine mammals that enter the Project ZOI, will be exposed to pile driving noise only briefly as they are transiting the area. Harbor seals are expected to forage and possibly haulout in ZOI and could be exposed to elevated underwater sound pressure multiple times during construction of the dock. Acoustical harassment may occur on multiple individuals or may occur with one individual during multiple events.

The ZOI is where the underwater sound pressure is greater than the disturbance threshold of 120d_{BRMS} level which is estimated to be within 1.34 miles of the proposed project (Figure 2). The number of marine mammals that may occur in this zone on any day is provided below in Table 5 with the number of days that the vibratory pile hammer will be operated to either remove existing piles or drive new piles. The estimated Level B incidental take by acoustical harassment is the product of the number of animals that may occur on any given day and the number of days of construction when a vibratory pile driver will be in operation.

The method for estimating the number of animals that may be present in the ZOI follows the methods recommneded by NOAA.

The general formulas is:

IHA Request =
ZOI area (sq km) * **D**ays required of pile driving/removal activity * **E**stimated **D**ensity

1. The semicircular ZOI illustrated in Figure 4 has an area of **5.69** square kilometers
2. The maximum number of days of pile driving and or drilling where underwater noise is generated is **12**.
3. Population estimated density is estimated from US Navy density database (2015) and Jefferson (2016).

For example, the estimated population density of harbor seals is 3.1799 animals per sq km.

5.69 * 12 * 3.1799 = 217.128 => IHA request = 217

The potential for occurrence of killer whales within the ZOI will differ from month to month when construction activities will occur (Table 4).

- September – High potential
- October - Moderate potential
- November through February – Low potential

Southern resident killer whales generally travel as a group and multiple individuals will be observed together. To avoid and minimize harassment of killer whales, observers will be stationed both onshore and in a boat traveling along the ZOI boundary to inform the contractor if whales are in the ZOI. If killer whales (both southern resident and Bigg's) or humpback whales are observed approaching or entering the ZOI then the contractor will be notified to stop pile driving or removal activities until the whales have exited the ZOI (Mitigation Measure 4).

Table 6. Estimated Level B acoustic harassment of marine mammals requested for construction of the proposed joint-use dock.

Species	Maximum Construction Days	Estimated Density[1, 2] (#/km^2)	Requested Level B Harassment	Level B Harassment as a percentage of population
Harbor seal	12	3.1799	217	1.97
Northern elephant seal	12	0.0063	0	0
California sea lion	12	0.676	46	0.02
Steller sea lion	12	0.935	64	0.15
Killer whale, southern resident	12	0.020240	1	1.2
Killer whale, Bigg's	12	0.003060	0	0
Gray whale	12	0.000136	0	0
Humpback whale	12	0.00014	0	0
Minke whale	12	0.02	1	0.16
Harbor porpoise	12	2.16	147	1.8
Dall' porpoise	12	0.55179[2]	38	0.15
Pacific white-sided dolphin	12	0.00248	0	0

1. Estimated density from US Navy marine species density database (2015).
2. Estimated density of harbor porpoise from Jefferson (2016).

6.1 Anticipated Impact of the Activity

The primary impact of construction of the joint-use dock will be elevated underwater noise during periods when a vibratory hammer is in operation to remove existing piles or to drive new ten-inch steel piles or, when drilling operations are occurring. The underwater sound levels expected are 155dB$_{RMS}$ measure 33 feet from the pile which is less than the injury threshold of 179dB$_{RMS}$ for whales and 181dB$_{RMS}$ for pinnipeds. Behavior response may include avoidance and disturbance of feeding behavior. Airborne noise may exceed the behavior threshold of 100 dB$_{RMS}$ for sea lions and 90 dB$_{RMS}$ for harbor seals within 50 feet of the pile, as measured when

driving an 18-inch steel pile (WSDOT 2015). Beyond 50 feet, the airborne noise will be less than these thresholds.

If incidental takes occur, it is expected to only result in short-term changes in behavior and potential temporary hearing threshold shift. These takes would be unlikely to have any impact on stock recruitment or survival and, therefore, would have a negligible impact on the stocks of these species.

7.0 Anticipated impacts on Subsistence Uses

No impacts on subsistence uses are anticipated; currently, there are no authorized ceremonial and/or subsistence hunts for marine mammals in Puget Sound or the San Juan Islands with the possible exception of some coastal tribes who may allow a small number of directed take for subsistence purposes. 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.

8.0 Anticipated Impacts on Habitat

Construction activities will have temporary impacts on marine mammal habitat with temporary disturbance with increases air-borne noise and underwater sound pressure levels from pile driving. To reduce the volume of noise produced by pile driving, the contractor will place a rubber pad between the vibratory pile driver and the pile (Mitigation Measure 3).

Other potential temporary increase of turbidity as piling are removed and new piling installed and potentially an effect of prey species distribution. To minimize the disturbance of sediment as existing piling are being removed, a collar will be placed around existing creosote-treated piles prior to removal. Disturbed sediment will fall into the hole made by the removed piling (Mitigation Measure 4).

9.0 Anticipated Effects of Habitat Impacts on Marine Mammals

The proposed joint-use dock will be constructed in water depth shallower than -10 feet MLLW and is not expected to result in a significant permanent loss or modification of habitat for marine mammals or their food sources. The most likely effects on marine mammal habitat for the proposed project are temporary, short duration underwater noise, prey (fish) disturbance, and water quality effects. A documented harbor seal haulout is located approximately 3,000 feet to the north of the project site although harbor seals may haulout on exposed rocks during low-tide events. 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. Mitigation measures listed below are designed to avoid and minimize anticipated effects to individual marine mammals and their habitat.

10.0 Mitigation Measures

The following conservation measures have been incorporated into the project to protect and minimize the impact to the aquatic habitat, marine mammals and other species that occupy the marine environment.

1. Timing limitations: In-water work will only be allowed from September 1 through March 1 for the protection of salmon and bull trout.
2. Pile driving/removal operations will occur between 2 hours after sunrise and 2 hours before sunset from September 1 through September 15 to protect marbled murrelet during nesting season of April 1 through September 15.
3. A rubber cushion will be placed between the vibratory pile driver and the pile to reduce the generation of both airborne and underwater noise.
4. A collar will be placed around existing creosote-treated piles prior to removal to control and minimize any increase of turbidity associated with pile removal.
5. Observers qualified in identification of marine mammals and seabirds will be on site during all pile removal, driving, and drilling operations to watch for presence or absence of killer whales, other marine mammals, and marbled murrelet within the 1.34-mile ZOI. During vibratory pile removal and driving, one land-based biologist will monitor the area from the terminal work site, and one boat with a qualified PSO shall navigate the along the boundary of the ZOI in a semicircular path (See Figure 2). A 30-minute pre-construction marine mammal monitoring period will be required before the first pile driving, pile removal, or drilling activity of the day. A 30-minute post-construction marine mammal monitoring period will be required after the last pile driving, pile removal, or drilling activity of the day. If the construction personnel take a break between subsequent pile driving, pile removal, or drilling activities for more than 30 minutes, then additional pre-construction marine mammal monitoring will be required before the next start-up of pile driving, pile removal, or drilling activities. If marine mammals are discovered near or within the ZOI, observers will advise operators of their presence in order to abide by the shutdown procedure listed below. All presence/absence of marine mammals will be recorded and reported (See Marine Mammal Monitoring plan attached as Appendix B for more specifications).
    a. One observer will be stationed at the top of the bluff at the promontory just south of the project site (Figures 3 and 4). Two additional observers will be stationed in a boat and will be cruising in Haro Strait along the boundary of the ZOI.
    b. Observers will communicate with the contractor with both cellular telephones and VHF radios. Communication checks will occur daily.
    c. Pile driving/removal will <u>not</u> occur if killer whales, humpback whales, minke whales, or gray whales are within the 1.34-mile zone of influence.

    Shutdown Procedures:
    a. If a killer whale or large whale is observed approaching or within the ZOI, all pile driving, pile removal, and drilling activities will stop.
    b. If a marine mammal approaches the project site within 10 meters, all project operations will cease. This includes pile removal, pile-driving, drilling operations, movement of the barge to the pile location, positioning of the pile on the substrate via a crane (i.e., stabbing the pile), and placement of sound attenuation devices

around the piles. Once the animal has left the 10 meter area, monitoring would take place from 15 minutes prior to initiating construction activities until the action is complete.

c. If a delay, power down, or shutdown occurs due to southern resident killer whale/s approaching or entering the ZOI ,activities will not resume until the SRKW (1) is observed to have left the Level B harassment zone or (2) has not been seen or otherwise detected within the Level B harassment zone 30 minutes.

6. The contractor will have a prepared Stormwater Pollution Prevention Plan (SWPPP) as required by Washington State Department of Ecology. Element 9 of this plan would address specific actions to prevent petroleum products from being discharged into surface waters. The contractor will also have oil-absorbent materials on site to be used in the event of a petroleum product spill and measures to avoid petroleum products or other deleterious materials from enter surface waters will be taken.
7. Eelgrass and macroalgae will not be adversely impacted due to any project activities:
   a. The construction barge will not be allowed to ground in the Project area.
   b. Prop wash will not be directed in the eelgrass bed that is mapped to the south of the dock alignment
   c. Barge anchors and cables will not be placed in the eelgrass bed and will be set 25 feet away from the bed that is mapped to the south of the dock alignment.
8. All construction materials will be removed from the work site and natural material will be returned to their original position at the end of construction.

Figure 4. Observer stations; One observer will be stationed at the top of the bluff at the promontory just south of the project site and two observers will be stationed in a boat cruising along the boundary of the ZOI.

11.0 Arctic Subsistence Plan of Cooperation

This section is not applicable. The proposed activities will take place in Washington State, specifically the San Juan Islands/Georgia Basin. No activities will take place in or near a traditional Arctic subsistence hunting area.

12.0 Monitoring and Reporting

The marine mammal observer contractor will provide NMFS with a draft monitoring report within 60 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 marine mammals are observed, the following information will be documented (See appendix B for more specifications):

- Species of observed marine mammals;
- Number of observed marine mammal individuals;
- Behavior of observed marine mammals;
- Location within the ZOI; and
- Animals' reaction (if any) to pile driving activities.

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.

In addition, contact with the Orca Network and/or Center for Whale Research will be made and maintained daily to determine the location of the nearest marine mammal sightings and pile driving, pile removal, or drilling will not commence if SRKW are told to be near or within the project area. Also, all SRKW sightings will be 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. Marine mammal occurrence information collected by the Orca Network also includes detection by the following hydrophone systems:

1. The SeaSound Remote Sensing Network, a system of interconnected hydrophones installed in the marine environment of Haro Strait (west side of San Juan Island) to study killer whale communication, underwater noise, bottomfish ecology, and local climatic conditions
2. A hydrophone at the Port Townsend Marine Science Center that measures average underwater sound levels and automatically detects unusual sounds.

13.0 Suggested Means of Coordination

The marine mammal observers will coordinate with local marine mammal sighting networks (Orca Network, the Center for Whale Research, and/or the Whale Museum Whale Hotline) to gather information on the location of the Southern Resident killer whales (and other whales) prior to initiating piling removal and pile driving operations. Marine mammal monitoring will be conducted to collect information on presence of marine mammals within the zone of influence for this project.

Contact with the Orca Network and/or Center for Whale Research will be made and maintained

daily to determine the location of the nearest marine mammal sightings. Pile driving, pile removal, or drilling will not commence if SRKW are reported to be near or within the project area. Also, all SRKW sightings will be 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. Marine mammal occurrence information collected by the Orca Network also includes detection by the following hydrophone systems:

1. The SeaSound Remote Sensing Network, a system of interconnected hydrophones installed in the marine environment of Haro Strait (west side of San Juan Island) to study killer whale communication, underwater noise, bottomfish ecology, and local climatic conditions, and
2. A hydrophone at the Port Townsend Marine Science Center that measures average underwater sound levels and automatically detects unusual sounds.

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