BIOLOGICAL EVALUATION
CUSTOM PLYWOOD EMERGENCY ACTION PROJECT

Former Custom Plywood Mill

Anacortes, Washington

Prepared for:

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ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
ACOC	Anacortes Chamber of Commerce
AMEC	AMEC Geomatrix, Inc.
BE	biological evaluation
bgs	below ground surface
BMP	best management practice
BP	British Petroleum
BTEX	benzene, toluene, ethylbenzene, xylenes
CFR	Code of Federal Regulations
cm	centimeters
COPC	chemicals of potential concern
Corps	U.S. Army Corps of Engineers
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSL	Cleanup Screening Level
dB	decibels
dBA	decibels, A-weighted scale
dB_{peak}	instantaneous peak sound pressure level
dB_{rms}	decibels – root mean squared average
DPS	distinct population segment
Ecology	Washington State Department of Ecology
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FS	feasibility study
GBH	GBH Investments, LLC
kHz	kilohertz
µm	micrometer
MCL	maximum contaminant level
µg/L	micrograms per liter
µm	micrometer
mg/kg	milligrams per kilogram
MHHW	mean higher high water
Mill	Former Custom Plywood Mill
MLLW	mean lower low water
mph	miles per hour
MSL	mean sea level
MTCA	Model Toxics Control Act
NMFS	National Marine Fisheries Service
NOAA-Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NWP	Nationwide Permit

ABBREVIATIONS AND ACRONYMS

(Continued)

PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCDD/PCDF	polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
PCE	primary constituent element
PHS	Priority Habitat and Species
pptr	parts per trillion
RI	remedial investigation
RMS	root mean square
SMS	Sediment Management Standards
SPL	sound pressure level
SQS	Sediment Quality Standards
SVOC	semivolatile organic compound
TEQ	Toxic Equivalency
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TVS	total volatile solids
USFWS	U.S. Fish and Wildlife Service
WDF	Washington Department of Fisheries
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WSDOT	Washington State Department of Transportation

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1.0 INTRODUCTION

Section 7 of the Endangered Species Act (ESA) requires that actions of federal agencies should be “not likely to jeopardize the continued existence of any (listed) species or result in the destruction or adverse modification of habitat of such species.” Issuance of permits by federal agencies falls under this requirement.

The proponent for the former Custom Plywood Emergency Action project, GBH Investments, LLC (GBH), received a permit from the U.S. Army Corps of Engineers (Corps) (Appendix A) to conduct an emergency action at the former Custom Plywood Mill. The Corps issued a Nationwide Permit (NWP) 38 on February 23, 2010, to allow construction. One of the permit conditions stipulated that a biological evaluation (BE) be produced within 30 days of project authorization.

The project site is located on Fidalgo Bay in Anacortes, Washington (Figures 1 and 2; Appendix C, Photo 1). Because the action was permitted by a federal agency (the Corps), it must comply with Section 7 of the ESA. Under ESA Section 7(c), the Corps is required to produce a BE of the potential influence of its action (issuing the permit) on listed species or their critical habitat. To help the Corps evaluate the potential effects of the proposed project on listed species, AMEC Geomatrix, Inc. (AMEC), has prepared this BE on behalf of GBH.

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2.0 PROJECT DESCRIPTION

The project site is located on the western shore of Fidalgo Bay in Anacortes, Skagit County, Washington, at Township 35 North, Range 2 East, and Section 18 (Figures 1 and 2; Appendix C). The mouth of the Skagit River is located about 13.5 miles southeast of the site via the Swinomish Channel.

The emergency action was undertaken in response to concerns expressed by the Washington State Department of Ecology (Ecology) that contamination related to the Former Custom Plywood Mill (the Mill) may be migrating into adjacent Fidalgo Bay during conditions of extremely high tides combined with storm events that cause erosion of shoreline soils. In response to Ecology's concerns, AMEC prepared an emergency action plan and applied for a Corps permit to proceed with the emergency action.

2.1 SITE HISTORY AND EXISTING CONDITIONS

The property was originally developed as a saw and planing mill operated by Fidalgo Mill Company from around 1900 until it burned down sometime after 1925 and prior to 1937. Bill Morrison acquired the property in 1913 and owned it until it was purchased around 1937 by the Anacortes Plywood Company. The newly incorporated plywood company failed early on, but was able to reorganize as the Anacortes Veneer Company on April 4, 1939. The Anacortes Veneer Company operated on the property until it was sold to Publisher's Forest Products in 1969 (Figure 3). In 1984, Anacortes Plywood assumed control of the plant. Brent Homes assumed title out of bankruptcy proceedings in January 1991. Custom Plywood became the operating entity sometime prior to 1991 and continued to use the facility until 1992. Most of the wooden structures in the main plant area, many of which were built in the 1940s, were consumed in a fire that occurred on November 28, 1992. The main historical features of the former Mill plant are visible on an aerial photograph taken in 1966 (Figure 3) (AMEC, 2009).

Primarily because of environmental concerns, the former Mill has remained mostly undeveloped since 1992 (Figure 2), when the majority of the buildings were destroyed by fire.

2.2 PROJECT DETAILS

Evidence of storm damage at two locations on the former Mill property contributed to Ecology's concerns.

Zone 1 is on the shoreline at the north end of the property. This location experienced erosional damage resulting in undermining of the steep face of the soils that form the shoreline.

Zone 2 is a low-lying area that was inundated with water during the recent high-tide storm surges (Figure 4).

The emergency action was implemented on February 25, 2010, and work was completed in approximately 10 hours. It is estimated that the emergency action will be in place for a period of 18 to 24 months.

Construction details for the emergency action are described below.

2.2.1 Zone 1

Erosion in Zone 1 was mitigated by laying a geotextile fabric (16 ounce per square yard, non-woven, black geotextile) on the upland and extended over the slope break and down the slope to elevation of approximately +7 feet mean lower low water (MLLW). The geotextile was anchored by large pieces of concrete that were already present on the site and that were screened for visible contamination due to petroleum hydrocarbons. Geotextile staples were used to more firmly secure the geotextile. No concrete with visible contamination was used. The geotextile measured approximately 20 feet wide by 115 feet long. A cross section through Zone 1 is depicted at the top of Figure 5. Appendix C provides photographs of the project site and construction activities.

Large concrete rubble was removed from the beach, and the beach face was smoothed to allow for better contact with the geotextile fabric. The geotextile fabric was rolled out by hand and was then covered by placing concrete rubble on top of it to keep it in place (Appendix C, Photo 6).

A dump truck and excavator were used to haul and place on-site concrete rubble along the beach in Zone 1 (Appendix C). No work was done in the water, and the erosion control measure in Zone 1 does not extend below the mean higher high water (MHHW) mark (Figure 5).

2.2.2 Zone 2

Inundation of the low-lying areas west of Zone 2 was mitigated by constructing a berm with a core of concrete ecology blocks and topped with geomembrane (polyvinyl chloride plastic sheeting). The geomembrane (30 mil thickness) was anchored in place by concrete pieces from the site. This berm, about 2 feet high, was constructed parallel to the shoreline and will prevent the low-lying areas from being overtopped. The bottom portion of Figure 5 is a cross-sectional depiction of the berm. The berm extends north-south across the lower elevation area from approximately the 9-foot contour on the north to the 9-foot contour on the south (Figure 4) (Appendix C).

The erosion control measure in Zone 2 does not extend to or below the MHHW mark (Figure 5), and no in-water work was done.

As with construction in Zone 1, a dump truck and two excavators were used to haul and place ecology blocks (Appendix C). It is estimated that the excavators operated for a total of about 4 hours during implementation of the emergency action and that the dump truck operated for about 1.5 hours. The entire emergency action was completed within 10 hours.

2.3 CONSERVATION MEASURES

The approved in-water work windows for species within Tidal Reference Area 9 (Blaine) are provided below:

- Salmon – July 2 to March 2;
- Bull trout – July 16 to February 15;
- Pacific herring – April 15 to January 31;
- Sand lance – March 2 to October 14; and
- Surf smelt – year-round (surf smelt may spawn in this area year-round).

Based on this information, the approved in-water work window for Fidalgo Bay would be from July 16 to October 14, thus the emergency action occurred outside of the approved work window for this area. To the extent possible, conservation measures were adopted to minimize potential impacts to listed fish species and forage fish species occurring in the project area. The major conservation measures included:

- No in-water work; and
- Completing the project in one work day (10 hours).

Other conservation measures that were incorporated into the emergency action to help minimize or reduce potential impacts on listed species and their critical habitats included:

- Using construction best management practices (BMPs) that include:
  - No on-site fueling or maintenance of construction equipment;
  - Inspection of construction equipment prior to each work shift to ensure that there are no leaks or spills and that equipment is functioning properly;
  - Removal of leaking or improperly functioning equipment from the site for off-site repair;

- Placement of absorbent pads beneath equipment that uses hydraulic fluids;
- The use of vegetable-based hydraulic fluids and lubricants, when possible;
- Depositing all construction-related waste in bins or containers and preventing all construction-generated wastes from entering Puget Sound; and
- Restricting all construction activities to daylight hours only.

3.0 ACTION AREA

This section describes the action area for the emergency action. The action area is defined as all areas to be affected directly and indirectly by the federal action, and not merely the immediate area involved in the action (ESA; Code of Federal Regulations [CFR] Title 50, part 17.11). The action area includes the geographic extent of physical, biological, and chemical impacts of the project. Consequently, the action area is usually larger than the project area and sometimes larger than the project vicinity.

No in-water work was conducted as part of the emergency action. All work was conducted from shore, so that there is no in-water action area.

The action area for the project is defined by upland construction activities, with construction noise being the primary element defining the ambient (terrestrial) action area. The extent of the area affected by construction noise will be determined based on:

- Existing ambient noise levels;
- Noise levels generated by the proposed project activities; and
- The attenuation with distance of noise generated by project activities.

3.1 EXISTING AMBIENT NOISE

The former Custom Plywood Mill site is located within the city limits of Anacortes, Washington, in an urban/industrial setting. Sources of existing ambient noise (background noise) at the site include:

- Urban development;
- Traffic noise (primarily from State Route 20);
- Marina operations; and
- Oil refinery operations (Tesoro and Shell refineries are located across Fidalgo Bay on March Point).

Each of these sources is discussed below.

3.1.1 Urban Development

Background noise attributable to urban development, exclusive of traffic noise, can be estimated based on population density (number of people per square mile) (WSDOT, 2010). The population density of Anacortes, is 1,426 people/square mile (City Data, 2010). The estimated daytime noise level at this density is 50 decibels, A-weighted scale (dBA) (WSDOT, 2010).

3.1.2 Traffic Noise

Traffic noise is attributable to a combination of multiple sources produced by engines, exhaust, and tires. The loudness of vehicle noise can be affected by the condition and type of roadway, road grade, and the condition and types of vehicle tires (WSDOT, 2010). The largest road carrying the greatest volume of traffic that is located near the project site is State Route 20, a four-lane highway with a maximum speed limit of 55 miles per hour (mph) (WSDOT, 2009a). The highway is located approximately 1,000 feet southwest of the site (Figure 2).

The Annual Traffic Report published by the Washington State Department of Transportation (WSDOT, 2009b) indicates that the average daily traffic volume for State Route 20 in Anacortes is 20,000 vehicles. The typical noise level (measured at 50 feet from the source) for this volume of traffic traveling at 55 mph is 73.9 dBA (WSDOT, 2010).

3.1.3 Marina Operations

There are six marinas within Anacortes mooring a total of 2,750 vessels (ACOC, 2009). One of these marinas, Fidalgo Marina, is located about 400 feet immediately north of the project site. Two other marinas, Anacortes Marina and Cap Sante Boat Haven (Port of Anacortes), are located 2,700 feet and 6,140 feet north of the project site, respectively.

No information on background noise within the Fidalgo Marina or adjacent marinas could be found. The Port of Los Angeles recorded background noise levels ranging from 58.4 to 61.7 dBA in the Watchorn Basin Marina in Los Angeles, which has 550 boat slips (Port of Los Angeles, 2003). Background noise within the Watchorn Marina was attributed to multiple sources, including vessel operations. The Fidalgo Marina is substantially smaller than the Watchorn Marina, with only 55 slips (EBM, 2008); therefore, the noise attributed to this marina would be expected to be on the lower end of the noise range reported for the Watchorn Marina.

3.1.4 Oil Refinery Operations

Two oil refineries (Tesoro and Shell) are located on March Point approximately 1.4 miles east of the project site across Fidalgo Bay (Figure 1; Appendix C, Photo 1). No information was located reporting noise levels associated with these refineries; however, noise studies were conducted at the British Petroleum (BP) oil refinery located at Cherry Point, Washington (BP, 2003). Noise levels were monitored at four locations along the property line of the refinery from 7:00 AM to 10:00 PM from May 31, 2001, to June 7, 2001. Noise levels at the four locations ranged from 50 dBA to 64 dBA, with noise levels at two of the stations reported to be 61 dBA (BP, 2003).

3.1.5 Background Noise from Combined Sources

Noise from multiple sources at the same location results in a louder noise level than a single source alone, but because the decibel unit is on a logarithmic scale, combined sound levels cannot be determined by simple arithmetic addition (WSDOT, 2010). The rules for decibel addition (WSDOT, 2010) are shown below:

- Decibel levels differ by 0 or 1 dBA – add 3 dBA to the highest decibel level;
- Decibel levels differ by 2 to 3 dBA – add 2 dBA to the highest decibel level;
- Decibel levels differ by 4 to 9 dBA – add 1 dBA to the highest decibel level; and
- Decibel levels differ by 10 dBA or more – add 0 dBA to the highest decibel level.

The four sources of background noise at the project site and their assumed decibel levels are:

- Urban development – 50 dBA;
- Traffic – 73.9 dBA;
- Marina operations – 58.4 dBA; and
- Oil refinery operations – 61 dBA.

The two noise sources that produce the least noise, urban development and marina operations, have a summed noise level of 59.4 dBA using the rules above. This noise level taken in combination with that from oil refinery operations results in a combined noise level of about 63 dBA. Because the combined noise level from these three noise sources is 10 dBA below that produce by traffic, the background noise level at the project site is roughly estimated to be about 73.9 dBA, attributable primarily to traffic noise.

3.2 CONSTRUCTION NOISE

An excavator and dump truck were used to construct the emergency action. During operation, the excavator and dump truck produce noise levels of 81 and 76 dBA, respectively (WSDOT, 2010). The combined noise level produced by the simultaneous operation of the dump truck and excavator is 82 dBA (WSDOT, 2010).

Noise level attenuates as the distance from the noise source increases. Highway traffic produces line-source noise, which is measured as an average over time. In contrast, point-source noise, such as that produced by heavy equipment, is measured as an instantaneous peak level. The standard noise reduction for line-source noise is 3 dBA per doubling of distance from the source, compared to a noise reduction of 6 dBA for point-source noise with the doubling of distance from the noise source (WSDOT, 2010). The distance at which construction noise attenuates to traffic noise can be estimated by creating a noise attenuation table (Table 1). From Table 1, it can be seen that construction noise attenuates to background traffic noise between 400 feet and 800 feet from the project site. Therefore, it is assumed that construction noise attenuates to background traffic noise at a distance of approximately 600 feet from the project site. Therefore, the action area is defined by an arc of radius 600 feet extending into Fidalgo Bay (Figure 6).

4.0 SPECIES AND CRITICAL HABITAT

This section discusses species listed under the Endangered Species Act that may occur in the action area, including specific life-history stages that may occur in the action area. The presence of critical habitat within the action area is also addressed. The National Oceanic and Atmospheric Administration–National Marine Fisheries Service (NOAA-Fisheries) and U.S. Fish and Wildlife Service (USFWS) were consulted for lists of ESA-listed species occurring in the action area (Appendix B) (NOAA-Fisheries, 2010; USFWS, 2010). Additionally, the Washington Department of Fish and Wildlife's (WDFW) Priority Habitat and Species (PHS) Program was contacted for a list of sensitive species and habitats within the project vicinity (WDFW, 2010) (Appendix B). Table 2 shows the listed species that could potentially occur in the action area.

Although NOAA-Fisheries lists leatherback sea turtle (*Dermochelys coriacea*) and humpback whale (*Megaptera novaeangliae*) as potentially occurring in the action area, their occurrence in the action area is very unlikely. Additionally, on March 16, 2010, NOAA-Fisheries listed the Pacific eulachon (*Thaleichthys pacificus*) as threatened under the ESA. Eulachon are rare in Puget Sound (NMFS, 2008), thus the presence of eulachon in the action area is highly unlikely. Therefore, the emergency action will likely have **no effect** on the leatherback sea turtle, humpback whale, or the Pacific eulachon distinct population segment (DPS).

The USFWS has determined that several species of listed animals, other than those listed in Table 2, occur in Skagit County. These are:

- Canada lynx (*Lynx canadensis*);
- Gray wolf (*Canis lupus*);
- Grizzly bear (*Ursus arctos*); and
- Northern spotted owl (*Strix occidentalis caurina*).

It is extremely unlikely that these species occur in the action area; therefore, the emergency action would have had **no effect** on these species.

4.1 LIFE-HISTORY STAGES OF LISTED SPECIES OCCURRING IN ACTION AREA

Brief life histories of each of the listed species addressed in this BE are provided in Appendix D. This section presents information on the life-history stages of species that may occur in the action area.

4.1.1 Chinook Salmon

The project site is located adjacent to Fidalgo Bay. Fidalgo Bay's tideflats contain productive microalgae and macroalgae providing important habitat for juvenile salmonids and their prey resources (i.e., harpacticoids, copepods, and amphipods). Juvenile Chinook salmon (*Oncorhynchus tshawytscha)* are known to occur in Fidalgo Bay during spring out-migrations (WDNR, 2008). Three river basins discharge to Puget Sound within a 20-mile radius of Fidalgo Bay: the Nooksack and Samish rivers to the northeast and the Skagit River to the southeast. All three river systems host runs of Puget Sound Chinook salmon. The stock status of the Nooksack/Samish Chinook stock is unknown, while that of the lower Skagit mainstem is rated as depressed (WDFW, 2002a).

Juvenile Chinook salmon from the Skagit River system historically utilized Padilla, Samish, and Fidalgo bays as part of the former Skagit River delta. Due to alterations in the delta, this area is no longer directly accessible to outmigrant Skagit Chinook (Redman et al., 2005).

Juvenile Chinook salmon from the Nooksack populations utilize this subbasin area for feeding and growth, refuge, physiological transition, and as a migratory corridor. The area also likely provides significant rearing potential to larger non-natal juvenile Chinook from other sub-basins, perhaps primarily for the northern Puget Sound populations (Redman et al., 2005).

Beamer et al. (2006), studying the use of pocket estuaries by salmonids in northern Skagit County bays, sampled Crandall Spit and Lagoon in Fidalgo Bay during April 2004. Crandall Spit and Lagoon are located across Fidalgo Bay from the project site adjacent to March Point. Beamer et al. (2006) did not capture any juvenile Chinook salmon, but did capture year 0+ chum (*Oncorhynchus keta*) and pink (*O. gorbuscha*) salmon, estimating salmon density to be 1,250 juvenile salmon per hectare.

4.1.2 Steelhead Trout

No information was found regarding the use of Fidalgo Bay by juvenile steelhead (*O. mykiss*). The nearest river basin for which steelhead stock status is available is the Samish River. The Samish winter steelhead stock is described as healthy (WDFW, 2002a). In general, winter-run, or ocean-maturing, steelhead return as adults to the tributaries of Puget Sound from December to April (WDF et al., 1973). The inshore migration pattern of steelhead in Puget Sound is not well understood; it is generally thought that steelhead smolts move quickly offshore (Hartt and Dell, 1986). So far, data are lacking to demonstrate whether juvenile steelhead stay close to the nearshore or move offshore when moving through Puget Sound (Corps, 2007).

Beamer et al. (2006), studying the use of pocket estuaries by salmonids in northern Skagit County bays, sampled Crandall Spit and Lagoon in Fidalgo Bay during April 2004. They did not capture any juvenile steelhead.

4.1.3 Coastal/Puget Sound Bull Trout and Dolly Varden

No published information exists on the occurrence of bull trout (*Salvelinus confluentus*) or Dolly Varden (*S. malma*) in Fidalgo Bay. However the area is located in the proposed critical habitat for coastal bull trout. Bull trout are likely to utilize the low-energy, mixed gravel and cobble beaches of the bay for foraging and shelter (WDNR, 2008).

4.1.4 Rockfish

Juveniles and subadults of bocaccio (*Sebastes paucispinis*), canary rockfish (*S. pinniger*), and yelloweye rockfish (*S. ruberrimus*) may be more common than adults in shallower water, and are associated with rocky reefs, kelp canopies, and artificial structures, such as piers and oil platforms (NOAA-Fisheries, 2009a,b,c). Currently, there is little information describing the distribution of rockfish species proposed for listing under the ESA within Puget Sound. It is possible that juveniles and subadults of these species could occur in the action area. Because adults of these species are generally found in much deeper waters (80 to 1,560 feet) (NOAA-Fisheries, 2009a,b,c), it is unlikely that they would be found in the action area.

4.1.5 Killer Whale

The project site is located outside of the primary area of occurrence for southern resident killer whales (*Orcinus orca*) (Wiles, 2004). During early autumn, southern resident pods of killer whales, especially J-pod, expand their routine movements into Puget Sound to likely take advantage of chum and Chinook salmon runs (Wiles, 2004). In recent years, early autumn has become the only time of year that K- and L-pods regularly occur in the Sound. Movements into seldom-visited bodies of water may occur at this time. One noteworthy example of such use occurred in Dyes Inlet near Bremerton in 1997. On October 21, 1997, 19 members of L-pod entered the 19-square-kilometer inlet, which is surrounded by urban and residential development, during a strong run of chum salmon into Chico Creek. They remained there until November 19, when salmon abundance finally tapered off (Wiles, 2004).

During the late fall, winter, and early spring, the ranges and movements of the southern residents are poorly understood. J-Pod continues to occur intermittently in the Georgia Basin and Puget Sound throughout this time, but its location during apparent absences is unknown (Wiles, 2004). Prior to 1999, K- and L-pods followed a general pattern in which they spent progressively smaller amounts of time in inland waters during October and November and departed them entirely by December of most years (Wiles, 2004). Sightings of both groups passing through the Strait of Juan de Fuca in late fall suggested that activity shifted to the outer coasts of Vancouver Island and Washington, although it was unclear if the whales spent a substantial portion of their time in this area or were simply in transit to other locations (Wiles, 2004). Since the winter of 1999-2000, K- and L-pods have extended their use of inland waters until January or February each year. Thus, since 1999, both pods have been completely absent from the Georgia Basin and Puget Sound only from about early or mid-February to May or June (Wiles, 2004).

Information on the occurrence in and use of the action area by southern resident killer whales was not found. Although southern resident killer whales could potentially occur in the action area, the available information indicates that they have not used the area extensively in the past.

4.1.6 Steller Sea Lion

Information received from the WDFW PHS program (March 2010) does not indicate the presence of haul-out areas for the Steller sea lion (*Eumetopias jubatus)* within the action area. Steller sea lions may be observed in Puget Sound year-round, but they are most abundant during the fall and winter months. The most frequented haul-out areas in Puget Sound are located north of Admiralty Inlet. However, the species is occasionally seen on navigation buoys in Puget Sound (Jeffries et al., 2000).

No breeding rookeries have been identified in Washington waters (Jeffries et al., 2000; NMFS, 1992).

4.1.7 Marbled Murrelet

Marbled murrelets (*Brachyramphus mormoratus*) do not frequent the action area. Very little suitable habitat exists within the action area, and there are no records of observations of marbled murrelet within the action area (J. Jenkerson, Marbled Murrelet Data Manager, WDFW, e-mail with B. Stuart, AMEC, March 3, 2010, personal communication). Falxa et al. (2008) conducted effectiveness monitoring for marbled murrelets from 2004 through 2007 for the Northwest Forest Plan and did not report the occurrence of marbled murrelets in the action area.

Critical habitat for the marbled murrelet does not occur in the action area.

4.2 CRITICAL HABITAT WITHIN THE ACTION AREA

This section discusses the occurrence of critical habitat and the primary constituent elements (PCEs) of species-specific critical habitats within the action area.

4.2.1 Salmonids

The action area contains critical habitats for Puget Sound Chinook salmon and Coastal/Puget Sound bull trout. The PCEs for each of these species are listed below, although not all of the PCEs listed occur within the action area.

The critical habitat PCEs for Puget Sound Chinook salmon are:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development;

2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;

3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival;

4. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh and salt water; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation;

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

6. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Of the PCEs listed above for Puget Sound Chinook salmon, only the attributes described in PCE 5 would occur in the action area.

The PCEs for Coastal/Puget Sound bull trout are:

1. Water temperatures that support bull trout use; bull trout have been documented in streams with temperatures from 32 to 72°F (0 to 22°C) but are found more frequently in temperatures ranging from 36 to 59°F (2 to 15°C); these temperature ranges may vary depending on bull trout life-history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence; stream reaches that preclude bull trout use are specifically excluded from designation;

2. Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures.

3. Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the year and juvenile survival, including a minimal amount of fine substrate with a diameter of less than 0.25 inch (0.63 centimeter [cm]);

4. A natural hydrograph, including peak, high, low, and base flows, within historic ranges or, if regulated, currently operate under a biological opinion that addresses bull trout, or a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and minimizing departures from the natural cycle of flow levels corresponding with seasonal variation;

5. Springs, seeps, groundwater sources, and subsurface water to contribute to water quality and quantity as a cold water source;

6. Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows;

7. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish; and

8. Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival are not inhibited.

Of the PCEs listed above for Coastal/Puget Sound bull trout, only the attributes described in PCEs 6, 7, and 8 would be present in the action area.

4.2.2 Marine Mammals

Critical habitat occurs in the action area only for the southern resident killer whale. Critical habitat for Steller sea lion does not occur in the action area.

The PCEs for southern resident killer whale 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;

3. Passage conditions to allow for migration, resting, and foraging.

4. NOAA-Fisheries is gathering data to assist in evaluating sound levels (noise) as a potential PCE.

One or more of the attributes listed in each of the PCEs for southern resident killer whales occurs in the action area.

4.2.3 Marbled Murrelet

The primary constituent elements of marbled murrelet critical habitat are described as: (1) trees with potential nesting platforms, and (2) forested areas within 0.5 mile of potential nest trees with a canopy height of at least 1/2 of the site potential tree height (USFWS, 2009). Neither of these PCEs occurs in the action area.

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5.0 ENVIRONMENTAL BASELINE

This section provides a brief description of the general habitat and environmental conditions within the project and action areas. Additionally, this section provides descriptions of habitat elements, significant to the species being addressed, that could be affected by the emergency action or that would affect the use of the action area by listed species.

5.1 GENERAL

The project site is located on the east side of Fidalgo Island on the west side of Fidalgo Bay within the city limits of Anacortes, Washington (Figure 1). The former mill site is listed Ecology's Hazardous Sites List as Facility Site ID 2685. The former Custom Plywood Mill is one site of about a dozen sites within Fidalgo Bay and nearby Padilla Bay that are being investigated and cleaned up with oversight by the Puget Sound Initiative.

The elevation of the upland portion of the site is approximately 10 to 30 feet above mean sea level (MSL). The site is relatively flat or slopes slightly downward toward Fidalgo Bay. Breaks in slope between the various portions of the site are evidenced by low retaining walls or steepened vegetated slopes (AMEC, 2009).

5.2 SURFACE WATER QUALITY AND STORMWATER

This section describes existing conditions and expected effects of the emergency action related to water quality.

5.2.1 Existing Conditions

No site-specific marine water quality data are available for the project site. A search of *Washington State's Water Quality Assessment [303(d) & 305(b) Report]* (Ecology, 2009) indicates no listing for Fidalgo Bay.

There are no stormwater outfalls from the site draining into Fidalgo Bay.

5.2.2 Effects of the Action

No in-water work was conducted as part of the emergency action, and construction in Zone 1 did not extend below the MHHW. The emergency action was implemented to prevent shoreline erosion along the project site and is expected to minimize the likelihood of site-related contamination associated with nearshore soils from entering Fidalgo Bay. Thus, the proposed action is expected to have a net beneficial effect on water quality in the nearshore area adjacent to the project site.

5.3 SHORELINE, SEDIMENT, SUBSTRATE, BATHYMETRY, AND HABITAT DIVERSITY

This section describes existing conditions and expected effects of the emergency action related to habitat diversity, slopes, and shoreline conditions.

5.3.1 Existing Conditions

The site is relatively flat or slopes slightly downward toward Fidalgo Bay. Breaks in slope between the various portions of the site are evidenced by low retaining walls or steepened vegetated slopes (AMEC, 2009). The nearshore area is gently sloping to depths of 4 to 5 feet below MLLW (Figure 7).

The uplands portion of the site that was used for industrial purposes was created by placement of fill on top of former shallow tidelands that slope very gradually beyond the MLLW line shown on Figure 7. Inner portions of Fidalgo Bay beyond the Outer Harbor Line remain quite shallow (less than 12 feet below MLLW). Sanborn Maps from 1903, 1907, and 1925 indicate that the early sawmill was built on piles over the tidelands. The sequence of fill placement on top of the intertidal areas could not be ascertained from early records. Observations of the fill in test pits and borings indicate that the fill is highly heterogeneous, and a pattern of placement was not discernable. Much of the fill seen during test pits and excavations on the site consisted of wood waste, ranging from sawdust to logs. Construction debris from former structures is also present in the fill, and includes concrete, rebar, piping, brick, and pile-supported concrete foundations. The wood waste content of the fill material averages 30 to 40 percent across the site, but varies significantly. Hand augering west of the press pits (Figure 4) encountered 2 to 3 feet of saturated fine wood material overlying sand and gravel. In contrast, fill soil in some northwestern portions of the site contained little wood and consisted of poorly graded, clean sand to a depth of 6 feet below ground surface (bgs).

Much of the large debris in the upland that was left from the fire has been cleared since initial investigations in 1995; several concrete structures and concrete building foundations still remain. Smaller debris, such as brick and remnants of wooden pilings, are present on the surface of the uplands, and brick, concrete pieces, roof remnants, and rafted-in logs are still present in the intertidal area below the MHHW (Appendix B).

Accumulations of wood and wood waste from the former mill operations are visible in the intertidal areas at the north end of the site during low tides. Building debris, pilings, concrete rubble, and foundations are present on or protruding from the surface of the sediments. An underwater video survey conducted in 2007 revealed accumulations of wood and building debris in the lower intertidal and shallow subtidal zones. Test pits excavated in the intertidal area above the MLLW line showed accumulations of sediment, wood debris, sawdust deposits, and building debris of 8 feet or more. Pilings and concrete rubble in the lower intertidal zone have developed a diverse community of marine encrusting organisms (AMEC, 2010).

The shoreline at the south end of the GBH property is armored with riprap to protect the walking path. A narrow intertidal beach composed of coarse sand and gravel with scattered cobbles and riprap pieces is present along the toe of the riprap (AMEC, 2010).

The lower intertidal/shallow subtidal portions of the site are characterized by sediments consisting of silts and fine-grained sands. Sediment grain size analysis indicated that over 75 percent of the sediment samples had a fines (< 63 micrometer [µm]) composition ranging from 50 percent to 88 percent (AMEC, unpublished data).

Habitat diversity on site and along the shoreline is extremely limited. Vegetative cover is limited to grasses, invasive species such as blackberry (*Rubus* spp.), and some shrubs. There are no trees or shrubs along the shoreline.

Field studies related to the Remedial Investigation/Feasibility Study (RI/FS) were conducted at the site in July 2008 with supplemental investigations in April 2009 and August 2009 (AMEC, 2009). Soil, groundwater, and sediment samples were collected during these investigations to characterize chemical constituents in these media. The chemical characterization results for each of the media are discussed briefly below.

5.3.1.1 Soil

Soil samples were collected from approximately 57 locations plus from nine monitoring well boreholes in 2008 and 2009 during the final phases of the RI. The majority of the samples were shallow samples collected from depth intervals of 0 to 1 feet, 2 to 4 feet, and 4 to 6 feet bgs.

The primary contaminants of potential concern in soil are total petroleum hydrocarbons (TPH) derived from diesel and oil, inorganic constituents (arsenic, cadmium, copper, chromium, lead, mercury, nickel, selenium, silver, and zinc), and select semivolatile organic compounds (SVOCs) (primarily carcinogenic polycyclic aromatic hydrocarbons). Polychlorinated biphenyls (PCBs) and polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans (PCDDs/PCDFs) each exceed its respective screening level at only one location. Of the chemicals detected, TPH-Oil has the most significant relative exceedance, with concentrations up to 164,000 milligrams per kilogram (mg/kg) (or 82 times the Model Toxics Control Act [MTCA] Method A cleanup level of 2,000 mg/kg) found in the vicinity of the press pits (Figure 4). Where the concentrations of petroleum hydrocarbons are highest, some SVOCs were detected (e.g., phenanthrene, fluoranthene, pyrene). Due to analytical interference from the elevated oil concentrations, detection limits for SVOCs were often elevated and in some cases above current MTCA Method B cleanup levels. PCDDs/PCDFs were detected in soil samples at low concentrations consistent with a combustion origin (AMEC, 2010).

5.3.1.2 Groundwater

A total of 11 monitoring wells are currently located on the project site. These wells have been sampled a maximum of three times since 2008. In addition, four seeps were sampled within the intertidal zone in 2008. Groundwater, seep, and grab samples were analyzed for both total (all three monitoring events) and dissolved (July/August 2008 event only) metals.

Total Metals – Detectable concentrations of total (unfiltered) metals were found for arsenic, barium, copper, lead, nickel, selenium, and zinc. Total arsenic was detected in samples from all but three boring locations and at two of the seep locations at concentrations ranging from 1.3 to 19 micrograms per liter (µg/L). Copper was found at concentrations ranging from 5.2 to 20 µg/L at seven locations, including all four seeps. Nickel was detected at six locations, including all four seeps, at concentrations ranging from 8.7 to 24 µg/L. Lead was detected at two locations at concentrations of 7.1 and 2.4 µg/L, both below the preliminary screening level. Barium was found in all but one of the samples analyzed from the July/August 2008 monitoring event, at concentrations ranging from 32 to 420 µg/L. No screening level has been developed for barium; however, this range of concentrations falls below the Washington State and Federal Groundwater Maximum Contaminant Level (MCL) of 2,000 µg/L.

Zinc was detected during the August 2009 monitoring event in one monitoring well at a concentration of 130 µg/L, exceeding the screening level (81 µg/L). Selenium was detected at three locations during the August 2009 monitoring event at concentrations ranging from 5.9 to 8 µg/L. The screening level for selenium is 71 µg/L, almost 10 times greater than the highest concentration detected in groundwater (AMEC, 2010).

Dissolved Metals – Similar to the analytical data for total metals, arsenic, barium, copper, and nickel were found at detectable concentrations in groundwater samples. None of the seep samples was analyzed for dissolved metals; seep samples were analyzed only for total metals. Dissolved arsenic was detected in the same four wells where total arsenic was detected, and at similar concentrations. Dissolved copper and nickel were detected in two wells at concentrations ranging from 4.5 to 7.4 µg/L and 8.6 to 15 µg/L (AMEC, 2010).

The detected concentrations of dissolved copper were slightly lower than the detected concentrations of total copper, whereas detected concentrations of dissolved nickel were similar in magnitude to the detected concentrations of total nickel. Dissolved barium was detected in all samples analyzed at concentrations ranging from 54 to 170 µg/L, which is well below the MCL.

No other metal was detected at the reporting limit; however, the reporting limits for mercury (0.125 µg/L), silver (8 µg/L), and thallium (5 µg/L) were all higher than the preliminary screening levels developed for the site remedial investigation/feasibility study (RI/FS) Work Plan (AMEC, 2009). The reporting limits for arsenic (1.0 to 3 µg/L) and copper (3 µg/L) were above the screening levels as well. However, Ecology approved the use of these reporting limits in an email message dated July 10, 2008 (AMEC, 2009).

Dissolved metals were only analyzed for during the July/August 2008 groundwater monitoring event.

VOCs – All groundwater, seep, and grab samples collected in 2008 were analyzed for VOCs. Naphthalene and 1,2,4-trimethylbenzene were detected in one groundwater sample at concentrations of 20 µg/L and 0.24 µg/L, respectively. Acetone was detected in the sample at 6.2 µg/L; however, acetone is a known laboratory contaminant. Carbon disulfide was detected in 7 out of 13 samples at concentrations ranging from 0.21 to 1.3 µg/L. 4-Isopropyltoluene (known also as p-isopropyltoluene) was detected in 5 out of 13 samples at concentrations ranging from 0.78 µg/L to 8.4 µg/L (AMEC, 2010).

There is no established screening level for 1,2,4-trimethylbenzene, acetone, carbon disulfide, or 4-isopropyltoluene. The preliminary screening level for naphthalene is 4,900 µg/L, more than two orders of magnitude greater than the concentration of naphthalene detected.

SVOCs – All groundwater and seep samples were analyzed for SVOCs during all three groundwater monitoring events. Various individual polycyclic aromatic hydrocarbons (PAHs) were detected, as were several other SVOCs. Individual PAHs exceeded the established preliminary screening levels (0.018 µg/L) at five locations, at concentrations ranging from 0.018 to 0.19 µg/L. However, only the samples from three locations exceeded the preliminary screening level for carcinogenic PAHs (cPAHs) (0.018 µg/L) on a toxic equivalency (TEQ) basis with concentrations ranging from 0.04496 µg/L to 0.0552 µg/L (AMEC, 2010).

PCBs – All groundwater samples from all three groundwater monitoring events were analyzed for PCBs. PCBs were not detected in any samples (AMEC, 2010).

PCDDs/PCDFs – PCDDs/PCDFs were not analyzed for in any groundwater or seep samples due to the lack of a defined burned horizon in the corresponding soil lithological boring logs from the monitoring well installation. PCDDs/PCDFs are hydrophobic compounds, and would not be expected in groundwater, unless they are attached to the particle fractions.

Total Petroleum Hydrocarbons (TPH)/Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) – All groundwater, seep, and grab samples were analyzed for TPH and BTEX. No gasoline-range hydrocarbons were detected in the groundwater or seep samples at reporting limits ranging from 100 to 400 µg/L. Preliminary screening levels for gasoline-range hydrocarbons are the MTCA Method A cleanup level of 1,000 µg/L (no detectable benzene) or 800 µg/L (if benzene is detected) (AMEC, 2010).

Lube oil was detected in one seep sample at a concentration of 1,200 µg/L; lube oil was not detected in any other seep or groundwater sample at reporting limits ranging from 360 to 470 µg/L. Diesel-range hydrocarbons were detected in one sample during the August 2009 monitoring event at a concentration of 490 µg/L. No other diesel-range hydrocarbons were detected in any groundwater or seep samples during the three monitoring events at reporting limits ranging from 220 to 290 µg/L (AMEC, 2010).

5.3.1.3 Sediment

Microtox® testing was conducted on sediments collected from 29 stations in the nearshore area adjacent to the site (Figure 8). Eighteen of the Microtox® tests failed the Sediment Management Standards (SMS) Sediment Quality Standards (SQS) criteria.

Sixteen of the stations were subjected to additional biological testing using amphipod and sediment larval tests. All of the sediments passed the amphipod test but six sediments failed to meet the sediment larval SQS criteria and two failed to meet the Cleanup Screening Level (CSL) biological criteria (AMEC, 2010).

Archived sediment samples from the six stations with CSL exceedances of the biological criteria were analyzed for the SMS list of chemicals of potential concern (COPCs). There were no exceedances of the SMS SQS.

Bioaccumulative COPCs (PCBs and PCDDs/PCDFs) were analyzed as part of the RI at selected locations and/or composites of locations. PCBs were not detected in any of the discrete or composite samples selected for PCB analysis. PCDDs/PCDFs were also measured in selected samples and in composite samples. TEQs were calculated using the World Health Organization 2005 toxicity equivalency factors (Van den Berg et al., 2006). TEQs calculated from data collected during the RI ranged from 2.74 to 19.6 parts per trillion (pptr) using one-half of the reporting limit for nondetected values (Figure 9) (AMEC, 2010).

The initial tier of testing assessed wood content in the sediments using visual, analytical, and biological criteria. Surficial wood debris coverage was assessed in each grab using a visual point contact method. Total volatile solids (TVS) measured with a large (≈300 grams) sample size and total organic carbon (TOC) were measured and used as a surrogate for wood debris within the biologically active zone. Pore water ammonia and sulfide (from the top 10 cm) were also measured in each grab (AMEC, 2010).

Surficial wood coverage in the 29 grab samples collected ranged from 0 percent to 20 percent. All grabs had less than 25 percent coverage of surficial wood. TVS values in sediment from the 29 grabs and from 5 hand-collected sediment samples ranged from 2.14 percent to 23.5 percent. Fourteen of the samples from 13 stations exceeded the Tier 1 criterion of 9.7 percent. TOC values exceeded the Tier 1 criterion of 10 percent in three samples from two stations (AMEC, 2010).

Sediment grain-size analysis indicated that over 75 percent of the sediment samples had a fines (<63 μm) composition ranging from 50 percent to 88 percent.

5.3.2 Effects of the Action

The emergency action involved reconfiguration of approximately 115 feet of eroding shoreline in Zone 1 and construction of a berm topped with Ecology blocks along the shoreline in Zone 2 (Figure 4; Appendix B). The upper, eroding portion of the beach in Zone 1 was smoothed with an excavator to create a shallower gradient and then covered with geotextile fabric, which was in turn covered with concrete rubble from the beach. The emergency action is expected to stop or reduce future beach erosion within Zone 1. In Zone 2, a transect line was leveled and concrete blocks were placed in a line to create a berm. The emergency action is expected to stop or reduce erosion and flooding within Zone 2. The emergency action in Zone 2 did not extend below the MHHW mark.

Other than reconfiguring the beach gradient in Zone 1 and construction of a berm parallel to the shoreline in Zone 2, the action maintained the existing beach substrate, which consists of concrete rubble, brick, cobble, and other coarse debris.

The emergency action will have no effect on existing sediment, substrate, bathymetry, or habitat diversity at the site.

5.4 ACCESS AND REFUGIA

This section describes existing conditions and expected effects of the emergency action related to refugia and access.

5.4.1 Existing Conditions

No fish passage barriers exist in the action area. The action area provides forage habitat for migrating juvenile salmonids, as well as for other fish and aquatic biota.

5.4.2 Effects of the Action

The emergency action had no effect on access or refugia within the action area.

5.5 FLOW, CURRENT PATTERNS, SALTWATER–FRESHWATER MIXING

This section describes existing conditions and expected effects of the emergency action related to flow, current patterns, and saltwater–freshwater mixing.

5.5.1 Existing Conditions

There are no major freshwater streams that flow into the Fidalgo Bay/Guemes Channel area. Runoff is predominantly from non-point sources, small creeks, and outfalls. Direct seepage around the bay is likely the major freshwater contributor during periods of low precipitation (WDNR, 2008).

Fidalgo Bay experiences a semidiurnal tidal cycle, with a mean range of 1.5 meters, and with strong tidal currents and various wave regimes. Shallow depths and large tidal ranges drive water movement in the Fidalgo Bay/Guemes Channel area. The bay is open to northerly and southerly winds, but greater wave heights occur when northerly winds combine with the larger north fetch distance. The bay is well-mixed vertically with temperatures, salinity, and dissolved oxygen measurements similar to regional values (WDNR, 2008).

Extensive shoreline modifications have greatly reduced sediment input to the shorelines of the bay, resulting in sediment-starved beaches and depositional landforms. Generally, there are few remaining natural sources for shoreline sediment along the drift sectors influencing the bay (WDNR, 2008).

A rock jetty is located immediately north of the project site, separating the site from the Fidalgo Marina (Figure 2).

5.5.2 Effects of the Action

The emergency action will not affect flow, current patterns, or saltwater–freshwater mixing within the action area.

5.6 MACROALGAE

This section describes existing conditions relevant to macroalgae and expected effects of the emergency action.

5.6.1 Existing Conditions

Portions of the subtidal area adjacent to the site are covered by well-established eelgrass and algal beds. The eelgrass beds were mapped during a nearshore survey conducted in 1996 and 1997 (Ritter et al., 1997) (Figure 10) and during a 2007 underwater video habitat survey (Geomatrix, 2007) (Figure 11). Emergent and submerged aquatic vegetation were mapped in Fidalgo Bay using multispectral imagery and ground surveys during the 1996 and 1997 survey (Ritter et al., 1997). A majority of the area mapped as eelgrass during the 1996/1997 survey also had eelgrass present during the 2007 video survey (Geomatrix, 2007). Some changes in the inshore limits of the beds adjacent to the study area have occurred, and the eelgrass bed offshore of Fidalgo Marina (immediately north of the former Mill) identified during the 2007 video survey (Geomatrix, 2007) was not identified as an eelgrass bed during the 1996/1997 Skagit County survey. The full offshore extent of the eelgrass beds was not mapped during the 2007 video survey (AMEC, 2010).

Additional changes in the distribution of eelgrass and submerged aquatic vegetation are evident when comparing the distribution of eelgrass mapped in 1996/1997 with the 2007 video survey results. The 1996/1997 survey information shows submerged aquatic vegetation (either eelgrass or attached brown algae) extending farther offshore than was documented during the 2007 survey. Patchy dark areas that may represent submerged aquatic vegetation are also visible in the 2006 aerial image used in Figures 10 and 11 (AMEC, 2010).

5.6.2 Effects of the Action

The emergency action is expected to have no effect on eelgrass and macroalgal beds on or adjacent to the site.

5.7 BENTHIC FAUNA

This section describes existing conditions relevant to benthic epifauna and expected effects of the emergency action.

5.7.1 Existing Conditions

Epibenthic zooplankton—primarily crustaceans—along with terrestrial insects are important prey for juvenile salmonids in estuaries (Simenstad et al., 1988; Healey, 1991). Epibenthic prey species from the littoral zone (typically considered to range from MHHW to approximately -10 feet MLLW) are used by juvenile salmonids in the Duwamish Estuary (Meyer et al., 1981). These organisms are most abundant on mid- and lower-intertidal soft-bottom habitats but are also common on all habitats sampled.

Infauna is not considered a major source of prey for any age group of Chinook salmon. Chinook salmon do prey on certain burrowing and tube-dwelling amphipods, but these animals (e.g., *Corophium* sp.) are not typically considered part of the infauna; rather they are considered to be epifaunal because they are captured by juvenile salmonids (Cordell et al., 1997, 1998).

NOAA and Ecology (1999) conducted benthic sampling at 100 stations throughout northern Puget Sound, including Fidalgo Bay. A total of 700 benthic taxa were identified in the 100 samples collected in Central Puget Sound. Of the 509 taxa identified, 387 (76 percent) were identified to the species level. Among the 387 species identified, 183 (47 percent) were polychaete species, 111 (29 percent) were arthropods, 68 (18 percent) were molluscs, and 25 (6 percent) were miscellaneous taxa (i.e., Cnidaria, Platyhelminthes, Nemertina, Sipuncula, Phoronidae, Enteropneusta, and Ascidiacea) and echinoderms.

Six stations were sampled in Fidalgo Bay: three in the outer bay and three in the inner bay. Total abundance (number of individual per 0.1 square meters) at the six stations ranged from 339 to 1,358. This compares to a low of 24 at a station in the Snohomish River delta to a high of 7,761 organisms at a station in Padilla Bay (NOAA and Ecology, 1999). The results of the benthic community analyses for the six stations sampled in Fidalgo Bay are presented in Table 3. Fidalgo Bay was among 5 of the 100 stations sampled that demonstrated the most abundant and diverse fauna (NOAA and Ecology, 1999).

5.7.2 Effects of the Action

The emergency action is not expected to adversely affect the benthic community within the action area.

5.8 FORAGE FISH

This section describes existing conditions relevant to forage fish and expected effects of the emergency action.

5.8.1 Existing Conditions

Information provided by the WDFW PHS program (WDFW, 2010) (Appendix B) indicates a number of forage fish species may occur within the action area. Surf smelt (*Hypomesus pretiosus*) spawn on beaches adjacent to the project site. The shoreline at the south end of the GBH property is armored with riprap to protect a walking path (Tommy Thompson Trail) (Figure 2). A narrow intertidal beach composed of coarse sand and gravel with scattered cobbles and riprap pieces is present along the toe of the riprap. Surf smelt spawning was documented along this portion of the shoreline during surveys conducted in the 1980s and early 1990s (WDFW, 2005) (Figure 12).

Pacific herring (*Clupea harengus pallasi*) use the well-established eelgrass and algal beds adjacent to the site as spawning areas (WDFW, 2005) (Figure 12).

5.8.2 Effects of the Action

The emergency action did not involve any in-water work. The existing beach at the project site consists of coarse substrate containing concrete rubble, bricks, rebar, and other building debris and does not provide suitable spawning habitat for surf smelt. The emergency action is not expected to adversely affect forage fish or their habitat.

5.9 AMBIENT NOISE

This section describes existing conditions relevant to ambient noise and expected effects of the emergency action.

5.9.1 Existing Conditions

No site-specific information was found describing existing underwater or ambient (terrestrial) noise levels in the action area. Section 3.1 provides a discussion of ambient noise within the action area.

Underwater noise levels in Puget Sound are typically around 130 dB_{peak} (instantaneous peak sound pressure level) (WSDOT, 2010). Underwater baseline noise for the Hood Canal is reported to range from 115 to 135 dB_{rms} (decibels root mean square) (WSDOT, 2010). Open-ocean ambient noise levels have been reported to be between 74 and 100 dB_{peak} off the coast of central California with a sea state of 3 to 5 (WSDOT, 2010). There are numerous contributing sources to baseline noise conditions, including those produced by natural sources such as snapping shrimp, lightning strikes (260 decibels [dB]), and waves breaking on the ocean surface (WSDOT, 2010).

Underwater noise levels can range louder in areas of high human usage. Underwater noise levels at Everett Home Port are reported to be between 80 and 90 dB (sound pressure level [SPL]) (the author did not specify if these were peak or root mean square [RMS] values), while those at the Mukilteo ferry terminal have been reported to be approximately 145 dB_{peak} in the absence of ferry traffic (WSDOT, 2010).

Underwater noise levels in Puget Sound with no construction activity have been reported to range between 131 dB_{peak} and 136 dB_{peak}. With construction activity (excluding pile driving) the underwater noise levels can range between 133 dB_{peak} and 140 dB_{peak} (WSDOT, 2010). Underwater noise in the Duwamish River averaged over 20 seconds to 5 minutes varied between 110 to 130 dB (SPL) (WSDOT, 2010).

Noise levels produced by human or mechanical sources include those attributable to large tankers and naval ship engines (up to 198 dB) and 180 dB or more for depth sounders (WSDOT, 2010). Commercial sonar devices operate in a frequency range of 15 kilohertz (kHz) to 200 kHz and in an acoustical range of 150 to 215 dB (WSDOT, 2010).

The presence of six recreational marinas within the City of Anacortes, as well as two oil transfer facilities serving the two oil refineries on March Point across Fidalgo Bay from the project site, indicate that there is substantial recreational and commercial marine traffic near the site. It is expected that underwater noise levels in the action area attributable to these sources would be similar to noise levels in other areas of Puget Sound with similar levels of marine vessel traffic.

5.9.2 Effects of the Action

The emergency action required the use of an excavator and a dump truck. It is estimated that the machinery operated for approximately 4 to 5.5 hours during the 10 hours required to complete the emergency action. Considering the location of the site within an urban/industrial area adjacent to a number of roads, it is expected that the ambient noise levels generated by the machinery were not substantially above those attributable to existing background sources. State Route 20, a four-lane highway with a legal speed limit of 55 mph, runs adjacent to the south end of Fidalgo Bay and continues along the southwest-west side of the bay. March Point Road borders the eastern edge of Fidalgo Bay. It is expected that the temporary noise generated by the emergency action was not substantially above that generated by the combination of traffic, two oil refineries, marine vessel operation, and urban development. Any effects on ambient noise attributable to the emergency action were temporary and likely insubstantial.

The emergency action would not have affected existing underwater noise levels within the action area.

6.0 EFFECTS OF THE ACTION ON LISTED SPECIES AND THEIR CRITICAL HABITATS

This following section discusses temporary and permanent direct and indirect effects on listed species attributable to project activities and concludes with an effects determination. This section discusses only attributes of listed species that are relevant to the project area and likely to be affected by the project. Appendix E addresses Essential Fish Habitat (EFH), describing habitat for federally managed commercial fish species, potential project impacts, and proposed conservation measures.

6.1 PUGET SOUND CHINOOK SALMON

The following section discusses temporary and permanent direct and indirect effects on Puget Sound Chinook salmon attributable to project activities.

6.1.1 Direct Effects

No in-water work occurred as part of the emergency action; therefore, no long-term or short-term direct effects on Puget Sound Chinook salmon are anticipated.

6.1.2 Indirect Effects

No short-term or long-term indirect effects on Puget Sound Chinook salmon are anticipated as a result of the emergency action.

The emergency action covered approximately 115 feet of shoreline with a geotextile fabric overlain with concrete rubble collected from on site. The emergency action did not extend below the MHHW mark (Figure 5). It is expected that the emergency action may be in place for a period of 18 to 24 months. Although the emergency action could have long-term, indirect effects on Puget Sound Chinook salmon foraging behavior in the action area, such impacts are expected to be insignificant.

6.1.3 Effects Determination

The effects determination for the emergency action, which involved no in-water work, is that it **will not effect**, Puget Sound Chinook salmon.

6.1.4 Effects on Critical Habitat

The primary constituent elements determined essential to the conservation of Puget Sound Chinook salmon are presented in Section 4.2.1. Of the listed PCEs, only the following PCEs occur in the action area:

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

The proposed action will have **no effect** on any of the critical habitat PCEs of the Puget Sound Chinook salmon..

6.2 COASTAL/PUGET SOUND BULL TROUT AND DOLLY VARDEN

The effects of the emergency action on Coastal/Puget Sound bull trout and Dolly Varden are expected to be similar or identical to those discussed above for Puget Sound Chinook salmon. Please refer to Section 6.1 for a discussion of potential effects of the proposed action on bull trout.

6.2.1 Effects Determination

The effects determination for the emergency action is that it **will have no effect** on, Coastal/Puget Sound bull trout and will not jeopardize the continued existence of Dolly Varden.

6.2.2 Effects on Critical Habitat

The primary constituent elements determined essential to the conservation of Coastal/Puget Sound bull trout are presented in Section 4.2.1. Of the listed PCEs, only the following PCEs occur in the action area:

- Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows;
- An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish;
- Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival are not inhibited.

The proposed action will have **no effect** on any of the critical habitat PCEs for Coastal/Puget Sound bull trout..

6.3 PUGET SOUND STEELHEAD TROUT

The effects of the emergency action on Puget Sound steelhead are expected to be similar or identical to those discussed for Puget Sound Chinook salmon. Please refer to Section 6.2 for a discussion of potential effects of the action on Puget Sound steelhead that may use the action area.

6.3.1 Effects Determination

The effects determination for the emergency action is that it **will have no effect** on, Puget Sound steelhead that may occur in the action area.

6.3.2 Effects on Critical Habitat

Critical habitat has not been designated for Puget Sound steelhead.

6.4 ROCKFISH

No short-term or long-term direct or indirect effects on bocaccio, canary rockfish, or yelloweye rockfish are expected to occur as a result of the emergency action.

6.4.1 Effects Determination

The effects determination for the emergency action is that it **will not jeopardize the continued existence of** bocaccio, canary rockfish, or yelloweye rockfish that may occur in the action area.

6.5 SOUTHERN RESIDENT KILLER WHALES

The following section discusses temporary and permanent direct and indirect effects on southern resident killer whales attributable to project activities.

6.5.1 Direct Effects

No short-term or long-term direct effects on southern resident killer whales are anticipated as a result of the emergency action.

6.5.2 Indirect Effects

No short-term or long-term indirect effects on southern resident killer whales are anticipated as a result of the emergency action.

6.5.3 Effects Determination

The emergency action will have **no effect** on the southern resident killer whale distinct population segment.

6.5.4 Effects on Critical Habitat

The primary constituent elements determined essential to the conservation of southern resident killer whales are presented in Section 4.2.2. All of the listed PCEs for southern resident killer whales apply in the action area:

- Water quality to support growth and development;

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

The emergency action will have **no effect** on southern resident killer whale critical habitat.

6.6 STELLER SEA LION

The following section discusses temporary and permanent direct and indirect effects on Steller sea lion attributable to project activities.

6.6.1 Direct Effects

No long-term direct effects on Steller sea lions are anticipated from the emergency action.

Although there are no recorded haul-out areas within the action area, or within Fidalgo Bay (Jeffries et al., 2000), it is possible that Steller sea lions could occur in the action area. Therefore, construction-related noise could have had short-term, direct effects by causing Steller sea lions to avoid the area during active construction.

6.6.2 Indirect Effects

No short-term or long-term indirect effects on Steller sea lions are anticipated as a result of the emergency action.

6.6.3 Effects Determination

The emergency action **may affect, but is not likely to adversely affect**, the Steller sea lion distinct population segment because the potential for significant sound disturbance is highly unlikely.

6.6.4 Effects on Critical Habitat

Steller sea lion critical habitat does not occur in the action area.

6.7 MARBLED MURRELET

The following section discusses temporary and permanent direct and indirect effects on marbled murrelets attributable to project activities.

6.7.1 Direct Effects

No long-term, direct effects on marbled murrelets are anticipated as a result of the emergency action.

Short-term, direct effects on marbled murrelets may have resulted from construction-generated noise. The noise disturbance threshold for marbled murrelet is reported to be 70 dBA; however, this threshold will change depending upon the baseline sound level, and may not apply widely (WSDOT, 2010). Assuming a noise disturbance threshold of 70 dBA, construction-related noise may have been as high as 82 dBA, exceeding the disturbance threshold. Thus, it is possible that construction-related noise could have inhibited marbled murrelet from entering the action area to forage.

6.7.2 Indirect Effects

No short-term or long-term indirect effects on marbled murrelets are anticipated to result from the emergency action.

6.7.3 Effects Determination

The emergency action **may affect, but is not likely to adversely affect**, the marbled murrelet distinct population segment.

6.7.4 Effects on Critical Habitat

The primary constituent elements of marbled murrelet critical habitat are described as: (1) trees with potential nesting platforms, and (2) forested areas within 0.5 mile of potential nest trees with a canopy height of at least 1/2 of the site potential tree height (USFWS, 2009). Neither of these PCEs occurs in the action area, therefore, the emergency action will have **no effect** on marbled murrelet critical habitat.

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7.0 INTERRELATED/INTERDEPENDENT ACTIONS AND CUMULATIVE EFFECTS

Interdependent actions are those from actions with no independent utility apart from the proposed action. Interrelated actions include those that are part of a larger action and depend on the larger action for justification. Cumulative effects are those from state or private activities not involving activities of other federal agencies that are reasonably certain to occur within the area of the federal action subject to consultation (50 CFR 402.02 Definitions).

The emergency action was implemented to prevent shoreline erosion and site inundation during extreme tidal events coupled with storm events. This action is expected to minimize the off-site migration of site-related contamination. At some point in the future, a MTCA cleanup action will occur at the site; however, the cleanup would occur with or without the emergency action. Therefore, no interdependent or interrelated actions are expected as a result of the emergency action.

Federal actions unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Endangered Species Act. There are no other state or private activities that are reasonably certain to occur within the area as a result of the emergency action. Therefore, no cumulative effects are expected as a result of the emergency action.

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8.0 EFFECTS DETERMINATION SUMMARY

The effects determinations for each of the listed species and their critical habitats, if present in the action area, are summarized in Table 4.

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TABLES

TABLE 1

NOISE ATTENUATION FOR TRAFFIC NOISE AND CONSTRUCTION NOISE[1]
Former Custom Plywood Mill
Anacortes, Washington

Distance from Source (feet)	Traffic Noise (dBA)	Construction Noise (dBA)
50	73.9	82
100	70.9	76
200	67.9	70
400	64.9	64
800	61.9	58
1,600	58.9	52

Notes
1. Source: WSDOT, 2010.

Abbreviations
dBA = decibel, A-weighted scale: For sound pressure in air, the reference amplitude is usually 20 micropascals (µPa). Sound measured on an A-weighted scale is in reference to 20 µPa.

TABLE 2

ESA-LISTED SPECIES POTENTIALLY OCCURRING IN THE ACTION AREA

Former Custom Plywood Mill
Anacortes, Washington

Species	Listing Status (Date)	Critical Habitat
Fish		
Puget Sound Chinook Salmon (*Oncorhynchus tshawytscha*)	Threatened (03/24/99)	Designated
Coastal/Puget Sound Bull Trout (*Salvelinus confluentus*)	Threatened (06/10/98)	Designated
Dolly Varden (*Salvelinus malma*)	Proposed – Threatened (01/09/01	Not Designated
Puget Sound Steelhead Trout (*O. mykiss*)	Threatened (05/7/07)	Under Development
Bocaccio (*Sebastes paucispinis*)	Proposed – Endangered (04/22/09)	Not Designated
Canary Rockfish (*S. pinniger*)	Proposed – Threatened (04/22/09)	Not Designated
Yelloweye Rockfish (*S. ruberrimus*)	Proposed – Threatened (04/22/09)	Not Designated
Birds		
Marbled Murrelet (*Brachyramphus marmoratus*)	Threatened (10/01/92)	Designated
Marine Mammals		
Southern Resident Killer Whale (*Orcinus orca*)	Endangered (11/15/05)	Designated
Steller Sea Lion (eastern population) (*Eumetopias jubatus*)	Threatened (04/05/90)	Designated

TABLE 3

SUMMARY OF BENTHIC COMMUNITY ANALYSES DATA AT SIX STATIONS IN FIDALGO BAY[1]
Former Custom Plywood Mill
Anacortes, Washington

Station	Total Abundance[2]	Percent of Total Abundance				
		Annelida	Arthropoda	Echinoderm	Mollusc	Miscellaneous Taxa
Inner Bay						
50	623	57	13	3	26	1
51	1,358	45	3	1	50	1
52	339	49	21	3	25	1
Outer Bay						
53	748	41	24	10	22	3
54	707	39	20	1	39	1
54	633	48	8	10	32	2

Notes
1. Source: NOAA and Ecology, 1999.
2. Number of organisms per 0.1 square meter (m^2).

TABLE 4

SUMMARY OF EFFECTS DETERMINATIONS FOR LISTED AND PROPOSED SPECIES AND THEIR CRITICAL HABITATS IN THE ACTION AREA

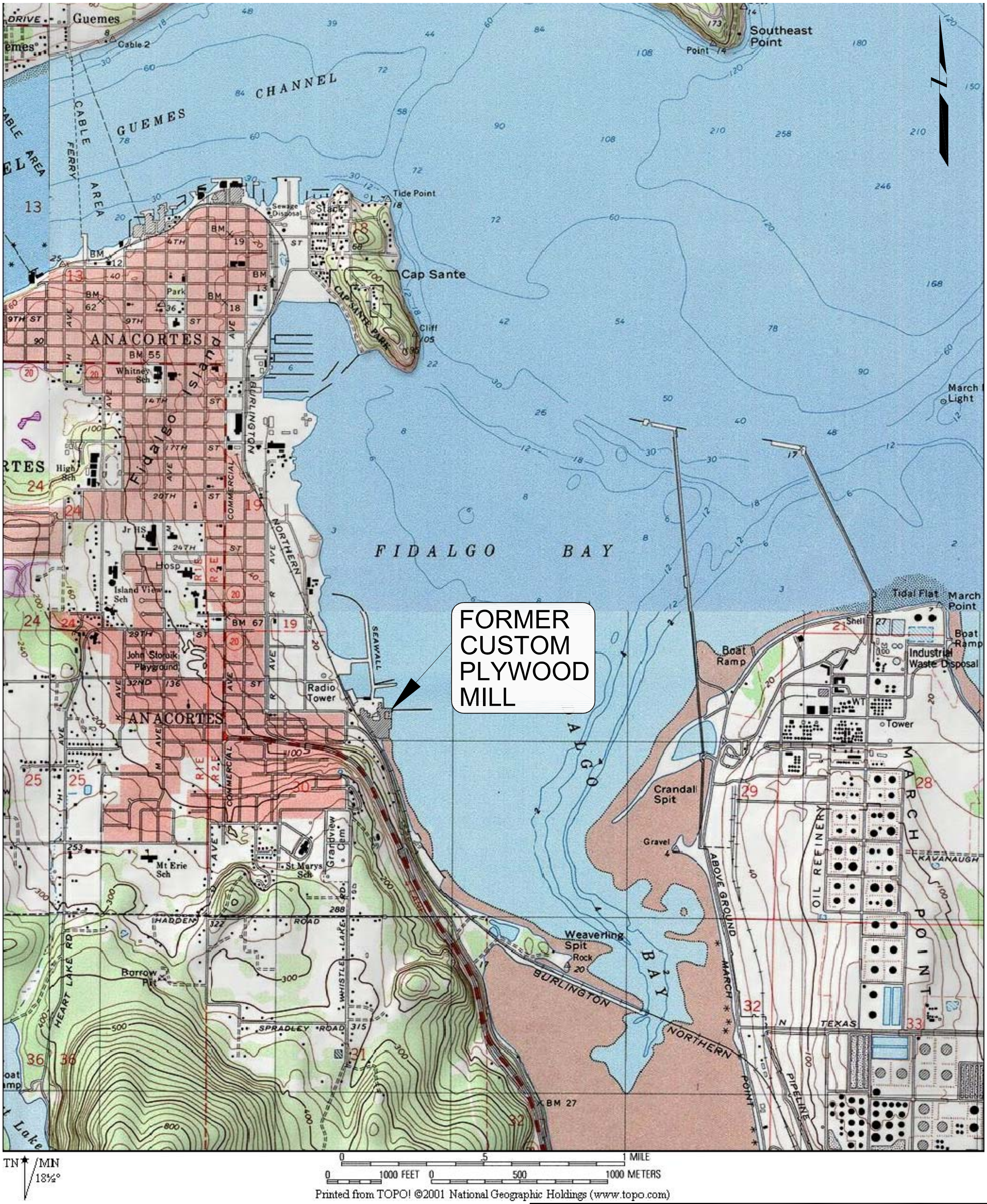
Former Custom Plywood Mill
Anacortes, Washington

Species/PCEs	NE	NLAA	LAA
Puget Sound Chinook Salmon	X		
Critical Habitat PCEs 1, 2, 3, 4, 5, & 6	X		
Coastal/Puget Sound Bull Trout	X		
Critical Habitat PCEs 1, 2, 3, 4, & 5, 6, 7, & 8	X		
Dolly Varden (proposed)[1]			
Puget Sound Steelhead Trout	X		
Rockfish (boccacio, canary, and yelloweye) (proposed)[1]			
Southern Resident Killer Whale	X		
Critical Habitat PCEs 1, 2, 3	X		
Steller Sea Lion		X	
Marbled Murrelet		X	

Notes
1. Will not jeopardize their continued existence.

Abbreviations
LAA = likely to adversely affect
NE = no effect
NLAA = not likely to adversely affect
PCE = primary constituent element

FIGURES



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VICINITY MAP
Former Custom Plywood Mill
Anacortes, Washington

By: APS	Date: 10/26/09	Project No. 10654
AMEC Geomatrix		Figure 1

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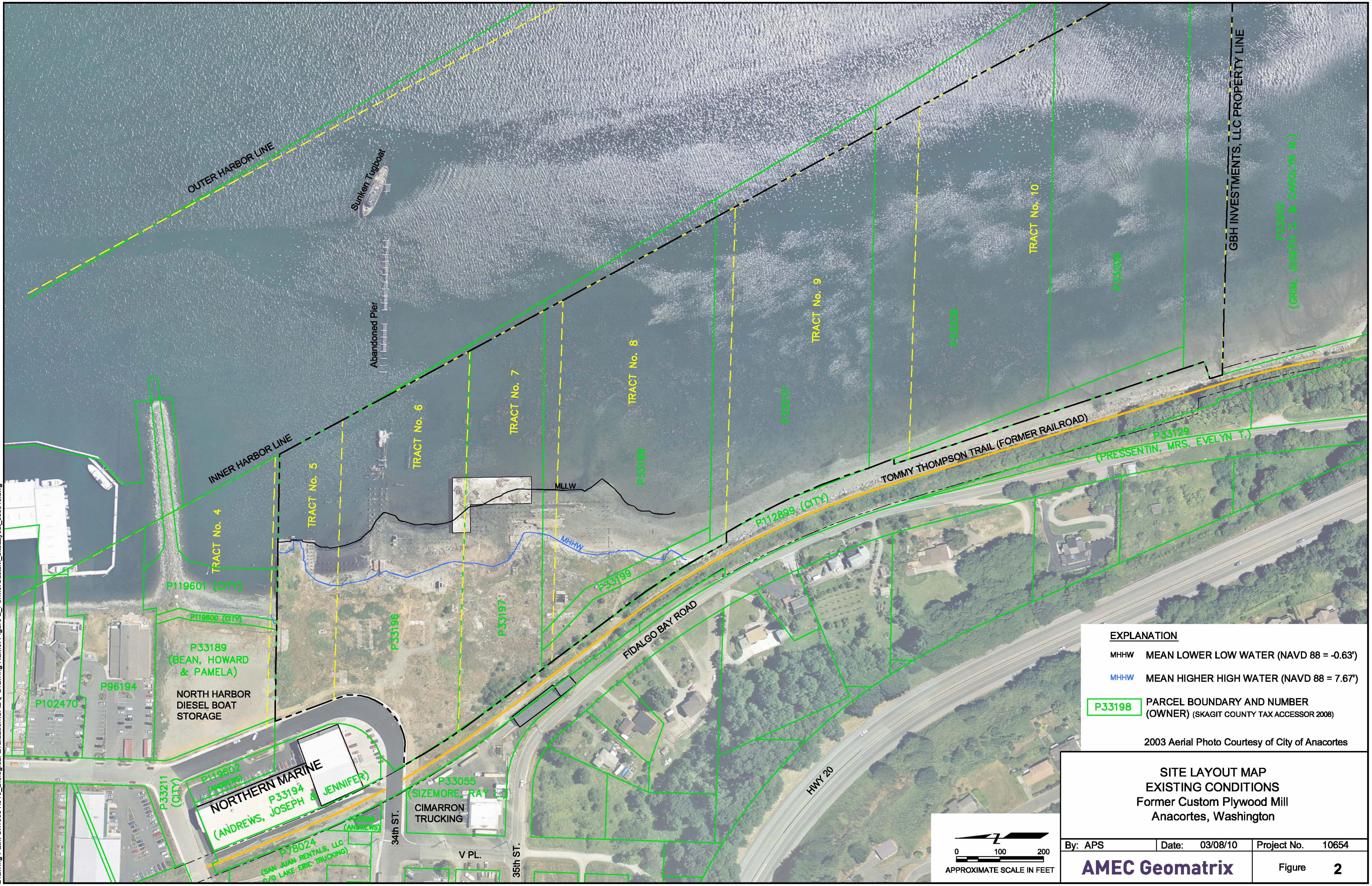

SITE LAYOUT MAP
EXISTING CONDITIONS
Former Custom Plywood Mill
Anacortes, Washington

By: APS	Date: 03/08/10	Project No. 10654
AMEC Geomatrix		Figure 2

Plot Date: 03/08/10 - 5:57pm, Plotted by: adam.stenberg
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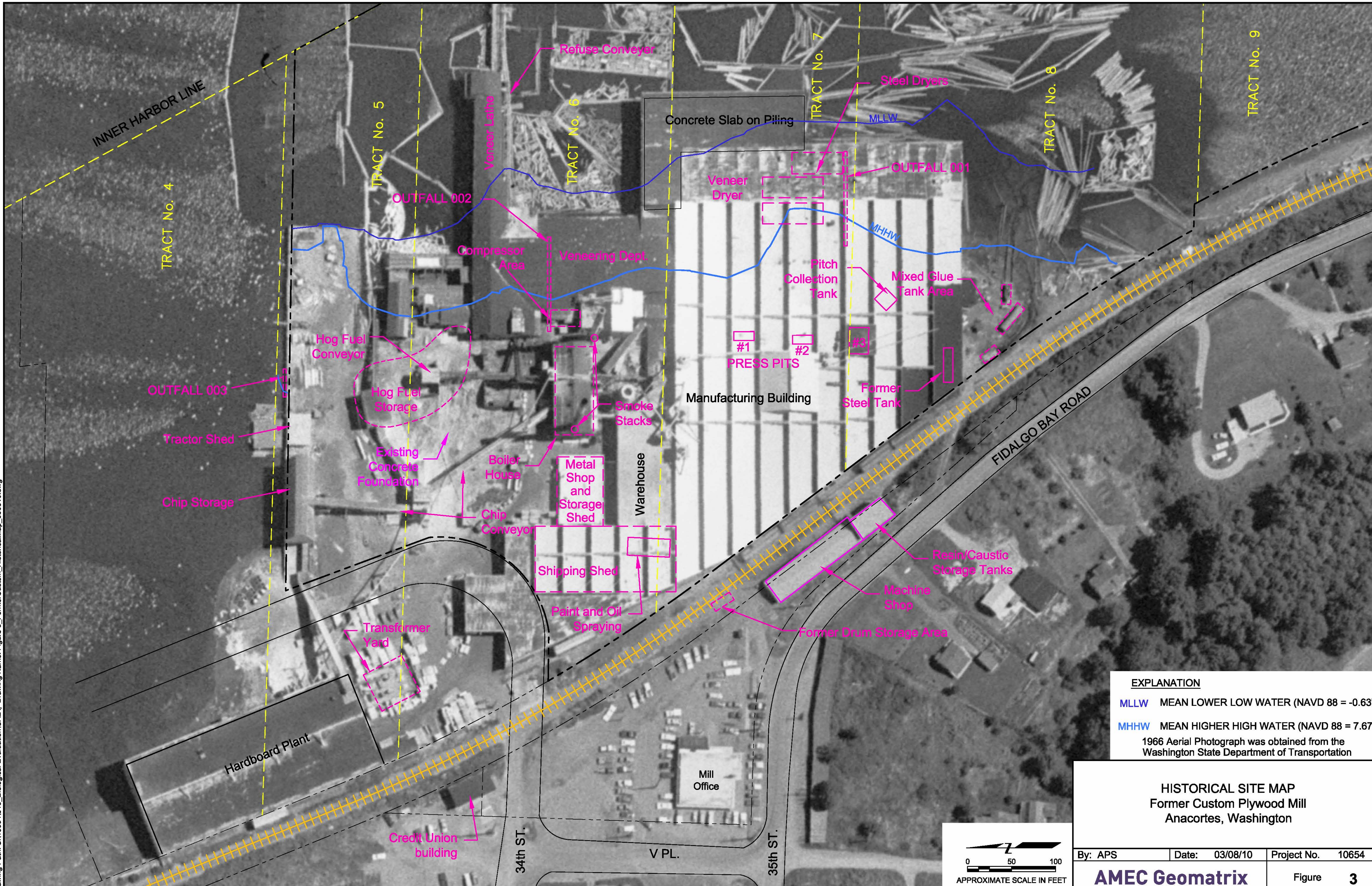

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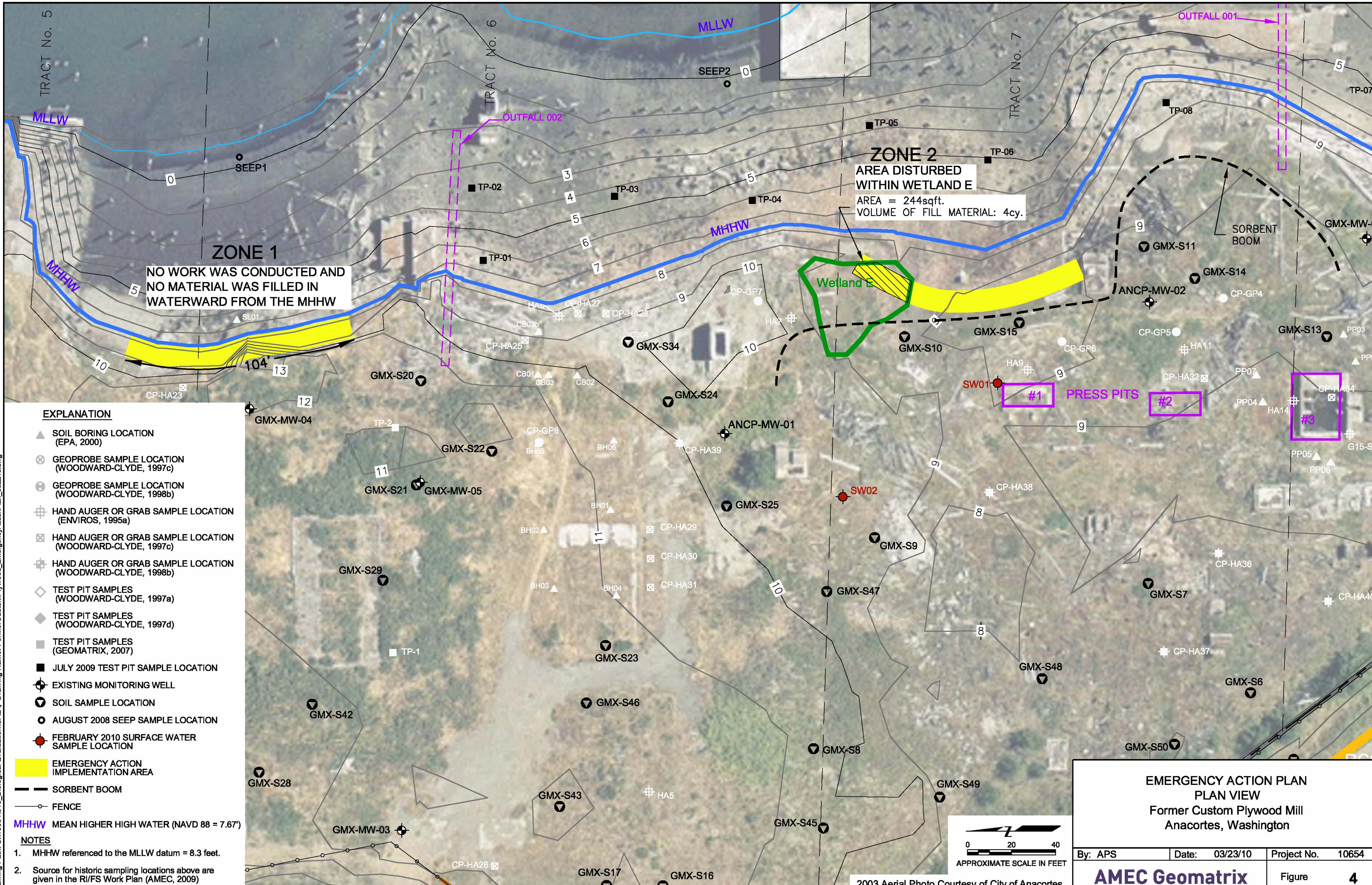
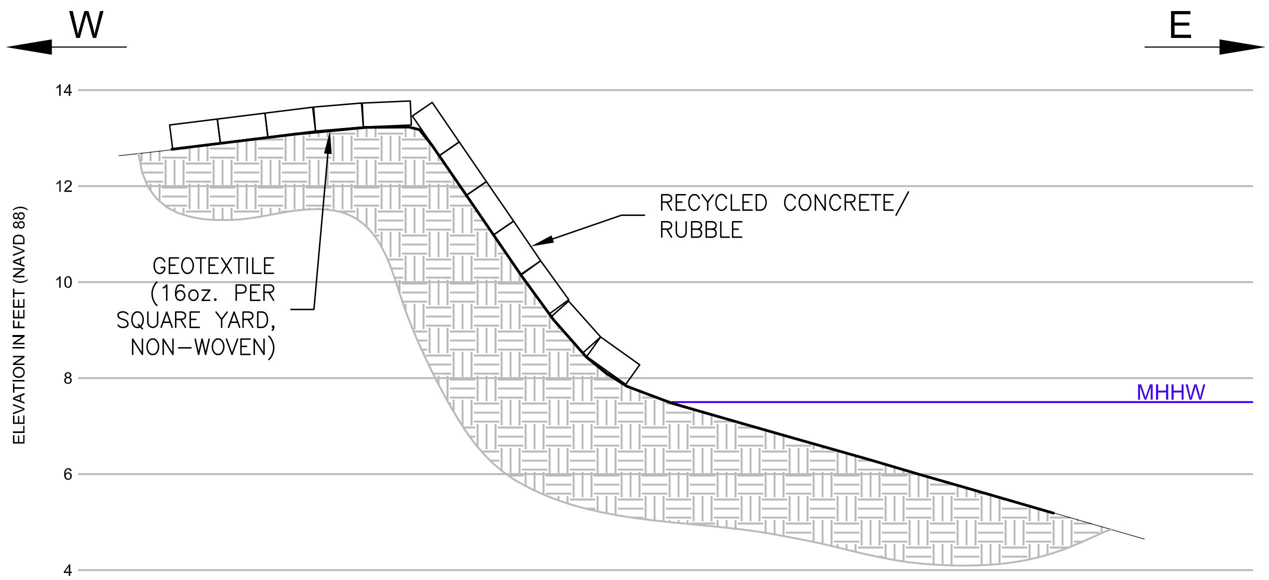


EMERGENCY ACTION PLAN
PLAN VIEW
Former Custom Plywood Mill
Anacortes, Washington

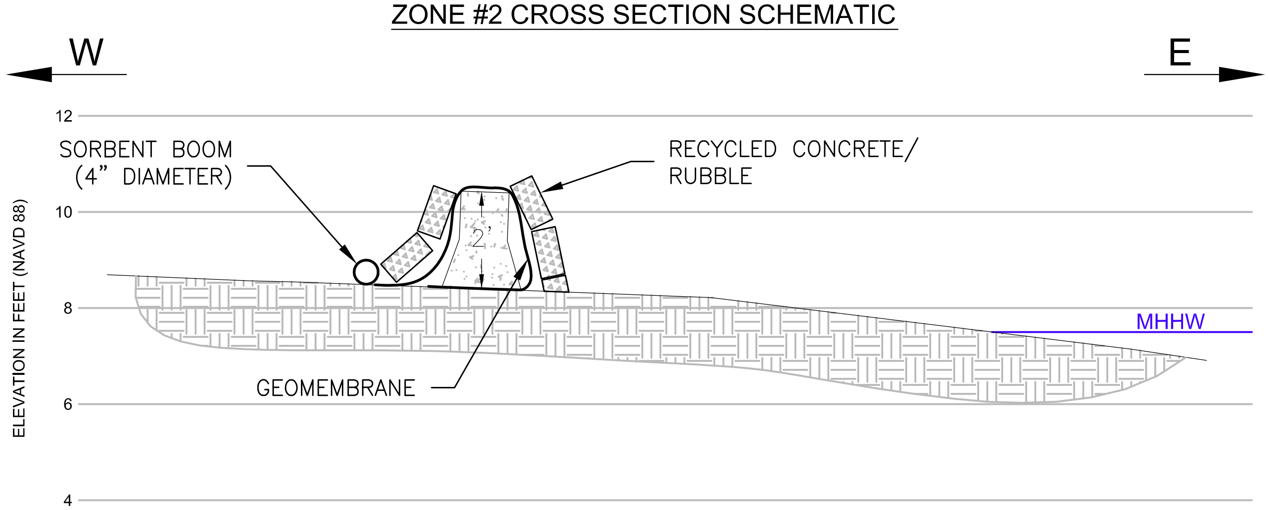
By: APS | Date: 03/23/10 | Project No. 10654

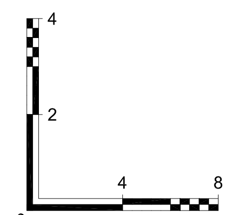
AMEC Geomatrix | Figure 4

ZONE #1 CROSS SECTION SCHEMATIC



ZONE #2 CROSS SECTION SCHEMATIC





APPROXIMATE SCALE IN FEET
VERTICAL EXAGGERATION = 2X

KEY

MHHW MEAN HIGHER HIGH WATER (NAVD 88 = 7.67')

NOTE:
MHHW referenced to the MLLW datum = 8.3 feet.

EMERGENCY ACTION PLAN
CROSS-SECTIONAL VIEW
Former Custom Plywood Mill
Anacortes, Washington

By: APS	Date: 03/22/10	Project No. 10654
AMEC Geomatrix		Figure 5

Plot Date: 03/22/10 - 9:03pm, Plotted by: adam.stenberg
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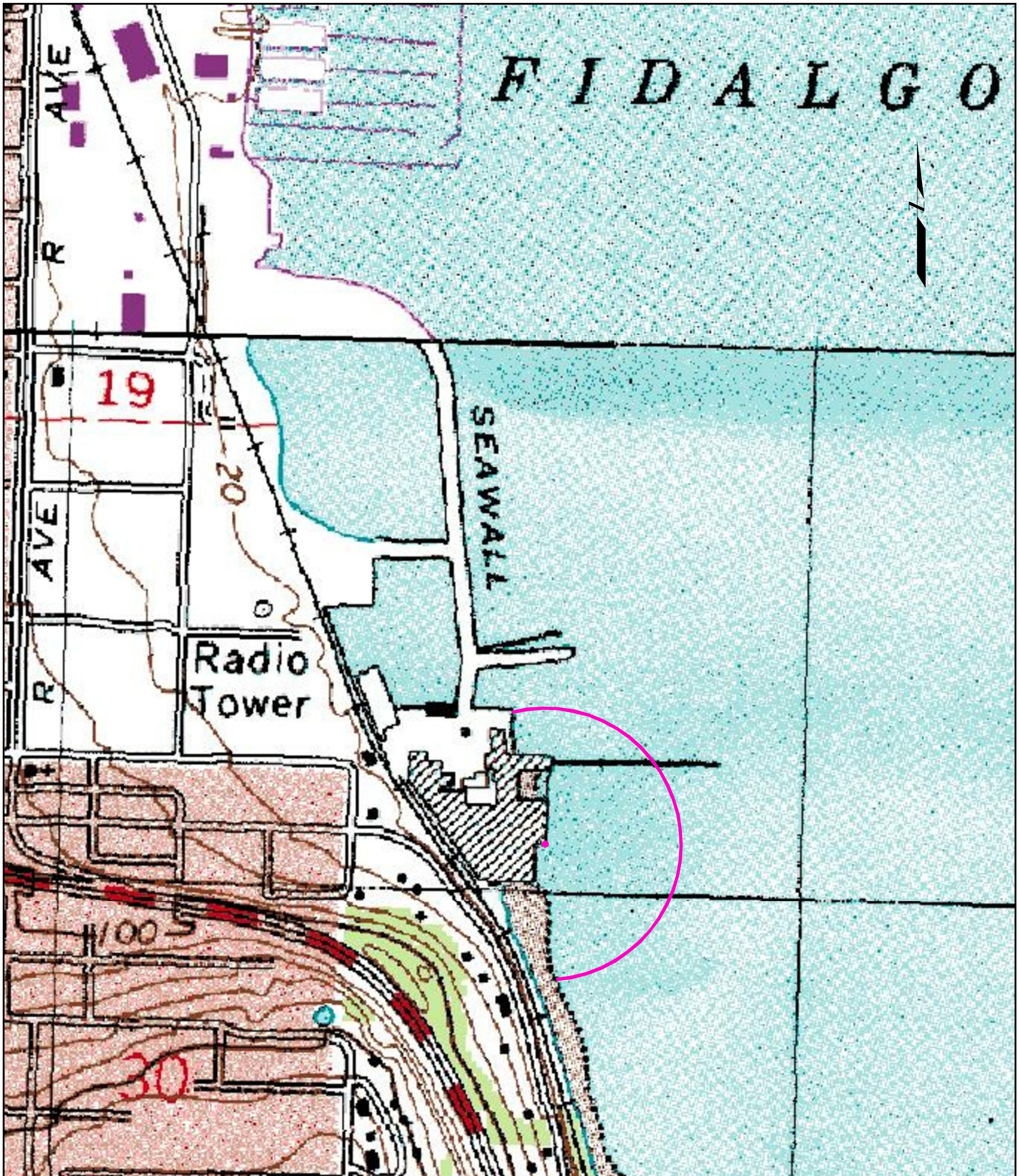

Map Courtesy of USGS

APPROXIMATE SCALE IN FEET

0 300 600 1200

ACTION AREA

Former Custom Plywood Mill
Anacortes, Washington

By: GSM	Date: 3-10-2010	Project No. 010654

AMEC Geomatrix

Figure 6

Plot Date: 03/10/10 - 8:21am, Plotted by: gary.maxwell
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Plot Date: 03/09/10 - 1:01pm, Plotted by: adam.stenberg
Drawing Path: S:\10654\016_Biological Evaluation\CAD\, Drawing Name: Figure 7_BathymetricTidelands_030910.dwg

2003 Aerial Photo Courtesy of City of Anacortes

MLLW MEAN LOWER LOW WATER (MLLW datum = 0')
MHHW MEAN HIGHER HIGH WATER (MLLW datum = 8.3')

Bathymetry Datum: MLLW
CRA Northwest, January 2006

0 125 250
APPROXIMATE SCALE IN FEET

BATHYMETRIC AND TOPOGRAPHIC MAP
Former Custom Plywood Mill
Anacortes, Washington

By: APS	Date: 03/09/10	Project No. 10654
AMEC Geomatrix		Figure 7

File path: I:\Project\Concorde Inc\10654-000 Former Custom Plywood Site\14000 FIELD DATA_PHOTOS\GPS data\proposed vs actual.mxd

Proposed Sampling Locations

Attempted (failed) grabs

Actual Sampling Locations

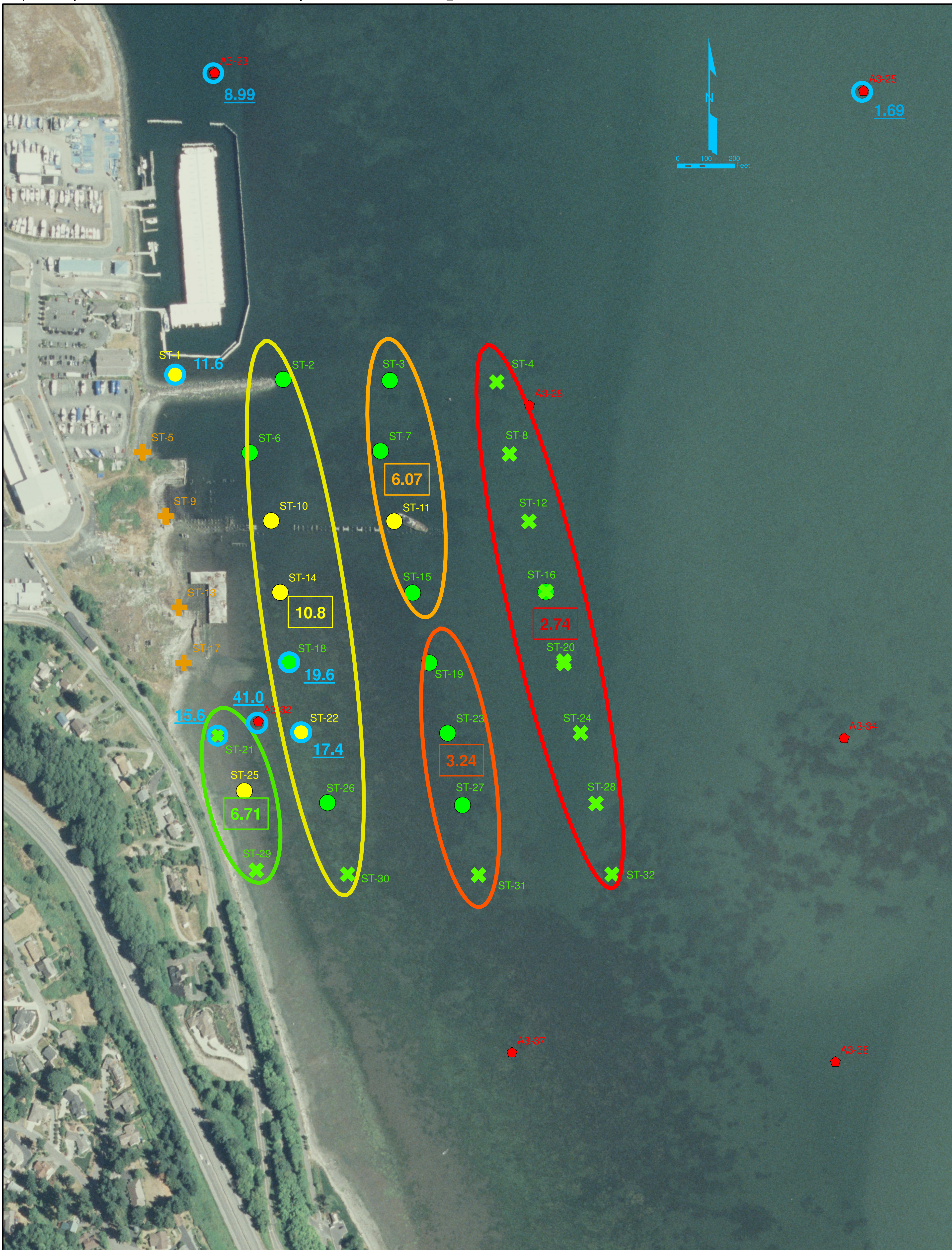
Note: Samples were collected by pneumatically operated grab sampler, except ST-5, ST-9, ST-9D, ST-13, and ST-17 were collected by hand.

Source: AMEC, 2010

PROPOSED AND ACTUAL SEDIMENT SAMPLE LOCATIONS
Former Custom Plywood Mill
Anacortes, Washington

By: RHG	Date: 3/11/2010	Project No. 10654.001
AMEC Geomatrix		Figure 8

File path: I:\Project\Concorde Inc\10654-000 Former Custom Plywood Site\14000 FIELD DATA_PHOTOS\GPS data\dioxin results.mxd



Key to Dioxin Results

6.71 Composite sample group with result in parts per trillion TEQ

Group 1
Group 2
Group 3
Group 4
Group 5

17.4 Discrete dioxin analysis with result in parts per trillion TEQ

Key to Tiered Test Results (discrete samples)

Pass Tier 1
Pass Tier 2
Fail Tier 2

Fidalgo Bay Sediment Investigation Locations (SAIC, 2008)
Beach Locations

TEQ = Toxicity equivalency quotient

Source: AMEC, 2010

SEDIMENT SAMPLE LOCATIONS AND
DIOXIN TEST RESULTS
Former Custom Plywood Mill
Anacortes, Washington

By: RHG	Date:3/11/2010	Project No. 10654.001
AMEC Geomatrix		Figure 9

File path: I:\Project\Concorde Inc\10654-000 Former Custom Plywood Site\14000 FIELD DATA_PHOTOS\GPS data\FHabitat.mxd

Vegetation Types

- Brown Algae
- Green Algae
- Eelgrass

Based on Skagit County Nearshore Survey by Ritter et al. 1997

MARINE MACROPHYTE AND ALGAL BEDS
1996/1997 SKAGIT COUNTY HABITAT SURVEY
Former Custom Plywood Mill
Anacortes, Washington

By: RHG	Date: 3/11/2010	Project No. 10654.002
AMEC Geomatrix		Figure 10

File path: I:\Project\Concorde Inc\10654-000 Former Custom Plywood Site\14000 FIELD DATA_PHOTOS\GPS data\Eelgrass and Debris.mxd

Estimated eelgrass coverage–2007

- ● High > 75%
- ● Medium 25 to 75 %
- ● Low 1 to 25 %
- ● None
- ✚ Misc. Debris
- ● Wood Debris

Based on video survey conducted July 28 and July 29, 2007 (Geomatrix, 2007).

RESULTS OF GEOMATRIX 2007
EELGRASS SURVEY
Former Custom Plywood Mill
Anacortes, Washington

By: RHG	Date: 3/11/2010	Project No. 10654.002
AMEC Geomatrix		Figure 11

File path: I:\Project\Concorde Inc\10654-000 Former Custom Plywood Site\14000 FIELD DATA_PHOTOS\GPS data\Forage Fish.mxd

Surf_Smelt

Herring_Spawning

Note:
Surf smelt and herring spawning habitat polygons from
WDFW 2005

SURF SMELT AND HERRING SPAWNING AREAS
Former Custom Plywood Mill
Anacortes, Washington

By: RHG	Date: 3/11/2010	Project No. 10654.002
AMEC Geomatrix		Figure 12

APPENDIX A

U.S. Army Corps of Engineers Nationwide Permit 38

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

February 23, 2010

Regulatory Branch

GBH Investments, LLC
Mr. Bud LeMieux
13941 Gibraltar Rd
Anacortes, Washington 98221

Reference: NWS-2010-288
GBH Investments, LLC

Dear Mr. LeMieux:

We have reviewed your application to place fill for actions associated with the Custom Plywood Model Toxics Cleanup Act project in Fidalgo Bay at Anacortes, Skagit County, Washington. Based on the information you provided to us, Nationwide Permit 38, Cleanup of Hazardous and Toxic Waste (Federal Register, March 12, 2007 Vol. 72, No. 47), authorizes your proposal as depicted on the enclosed drawings dated February 16, 2010. In order for this NWP authorization to be valid, you must ensure that the work is performed in accordance with the enclosed *Nationwide Permit 38, Terms and Conditions* and the following special conditions:

a. All work must be performed "in the dry" at suitable low tides. No equipment shall be operated in the water.

b. Within 30 days of this authorization, the permittee shall prepare and submit to the U.S. Army Corps of Engineers, Seattle District (Corps) a biological evaluation (BE) acceptable to the Corps that describes the project's likely impact Endangered Species Act listed and proposed species and designated critical habitats, and Essential Fish Habitat. The permittee shall implement all conservation measures and other required impact reduction measures resulting from the after-the-fact Endangered Species Act Section 7 consultation for this action.

The authorized work complies with the Washington State Department of Ecology's (Ecology) Water Quality Certification and the Coastal Zone Management Act requirements for this NWP. No further coordination with Ecology is required.

We have reviewed your project pursuant to the requirements of the Endangered Species Act and the Magnuson-Stevens Fishery Conservation and Management Act in regards to Essential Fish Habitat (EFH). We have determined that this project meets the requirements of NWP National General Condition 11 and will not adversely affect EFH, provided you comply with special conditions "a." and "b." given above.

Our verification of this NWP authorization is valid for 2 years from the date of this letter unless the NWP is modified, reissued, or revoked prior to that date. If the authorized work has not been completed by that date, please contact us to discuss the status of your authorization. Failure to comply with all terms and conditions of this NWP verification invalidates this authorization and could result in a violation of Section 404 of the Clean Water Act and/or Section 10 of the 1899 Rivers and Harbors Act. Also, you must obtain all State and local permits that apply to this project.

Upon completing the authorized work, you must fill out and return the enclosed *Certificate of Compliance with Department of the Army Permit* form. Thank you for your cooperation during the permit process. We are interested in your experience with our Regulatory Program and encourage you to complete a customer service survey form. This form and information about our program is available on our website at: www.nws.usace.army.mil (select “Regulatory” and then “Regulatory/Permits”).

A copy of this letter with enclosure will be furnished to Ms. Kathleen Goodman of AMEC at 600 University Street, Suite 1020, Seattle, Washington 98101-4107. If you have any questions about this letter, please contact me at (206) 764-6985 or via email at randel.j.perry@usace.army.mil.

Sincerely,

Randel Perry, Project Manager
North Puget Sound Section

Enclosures

APPENDIX B

Species List
from USFWS, NOAA-Fisheries, and WDFW PHS Program

Endangered Species Act Status of West Coast Salmon & Steelhead

(Updated July 1, 2009)

Species[1]			Current Endangered Species Act Listing Status[2]	ESA Listing Actions Under Review
Sockeye Salmon (*Oncorhynchus nerka*)	1	Snake River	*Endangered*	
	2	Ozette Lake	*Threatened*	
	3	Baker River	*Not Warranted*	
	4	Okanogan River	*Not Warranted*	
	5	Lake Wenatchee	*Not Warranted*	
	6	Quinalt Lake	*Not Warranted*	
	7	Lake Pleasant	*Not Warranted*	
Chinook Salmon (*O. tshawytscha*)	8	Sacramento River Winter-run	*Endangered*	
	9	Upper Columbia River Spring-run	*Endangered*	
	10	Snake River Spring/Summer-run	*Threatened*	
	11	Snake River Fall-run	*Threatened*	
	12	Puget Sound	*Threatened*	
	13	Lower Columbia River	*Threatened*	
	14	Upper Willamette River	*Threatened*	
	15	Central Valley Spring-run	*Threatened*	
	16	California Coastal	*Threatened*	
	17	Central Valley Fall and Late Fall-run	*Species of Concern*	
	18	Upper Klamath-Trinity Rivers	*Not Warranted*	
	19	Oregon Coast	*Not Warranted*	
	20	Washington Coast	*Not Warranted*	
	21	Middle Columbia River spring-run	*Not Warranted*	
	22	Upper Columbia River summer/fall-run	*Not Warranted*	
	23	Southern Oregon and Northern California Coast	*Not Warranted*	
	24	Deschutes River summer/fall-run	*Not Warranted*	
Coho Salmon (*O. kisutch*)	25	Central California Coast	*Endangered*	
	26	Southern Oregon/Northern California	*Threatened*	
	27	Lower Columbia River	*Threatened*	• Critical habitat
	28	Oregon Coast	*Threatened*	
	29	Southwest Washington	*Undetermined*	
	30	Puget Sound/Strait of Georgia	*Species of Concern*	
	31	Olympic Peninsula	*Not Warranted*	
Chum Salmon (*O. keta*)	32	Hood Canal Summer-run	*Threatened*	
	33	Columbia River	*Threatened*	
	34	Puget Sound/Strait of Georgia	*Not Warranted*	
	35	Pacific Coast	*Not Warranted*	
Steelhead (*O. mykiss*)	36	Southern California	*Endangered*	
	37	Upper Columbia River	*Threatened*	
	38	Central California Coast	*Threatened*	
	39	South Central California Coast	*Threatened*	
	40	Snake River Basin	*Threatened*	
	41	Lower Columbia River	*Threatened*	
	42	California Central Valley	*Threatened*	
	43	Upper Willamette River	*Threatened*	
	44	Middle Columbia River	*Threatened*	
	45	Northern California	*Threatened*	
	46	Oregon Coast	*Species of Concern*	
	47	Southwest Washington	*Not Warranted*	
	48	Olympic Peninsula	*Not Warranted*	
	49	Puget Sound	*Threatened*	• Critical habitat
	50	Klamath Mountains Province	*Not Warranted*	
Pink Salmon (*O. gorbuscha*)	51	Even-year	*Not Warranted*	
	52	Odd-year	*Not Warranted*	

1 The ESA defines a "species" to include any distinct population segment of any species of vertebrate fish or wildlife. For Pacific salmon, NOAA Fisheries Service considers an evolutionarily significant unit, or "ESU," a "species" under the ESA. For Pacific steelhead, NOAA Fisheries Service has delineated distinct population segments (DPSs) for consideration as "species" under the ESA.

Northwest Regional Office

NOAA's National Marine Fisheries Service

ESA-Listed Marine Mammals

Under the jurisdiction of NOAA Fisheries Service that may occur:

off Washington & Oregon

- Southern Resident Killer Whale (E), *Orcinus orca*; critical habitat
- Humpback Whale (E), *Megaptera novaeangliae*
- Blue Whale (E), *Balaenoptera musculus*
- Fin Whale (E), *Balaenoptera physalus*
- Sei Whale (E), *Balaenoptera borealis*
- Sperm Whale (E), *Physeter macrocephalus*
- Steller Sea Lion (T), *Eumetopias jubatus*; critical habitat

in Puget Sound

- Southern Resident Killer Whale (E), *Orcinus orca*; critical habitat
- Humpback Whale (E), *Megaptera novaeangliae*
- Steller Sea Lion (T), *Eumetopias jubatus*; critical habitat

(E) = Endangered
(T) = Threatened

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7600 Sand Point Way NE, Seattle, WA 98115-0070
206-526-6150
Email: Webmaster or Content Manager

Page last updated: May 27, 2009

ESA-Listed Marine Turtles

Under the jurisdiction of NOAA Fisheries Service that may occur off Washington & Oregon:

- Leatherback Sea Turtle (E), *Dermochelys coriacea*
- Loggerhead Sea Turtle (T), *Caretta caretta*
- Green Sea Turtle (E), *Chelonia mydas*
- Olive Ridley Sea Turtle (E), *Lepidochelys olivacea*

Sightings and strandings of these animals are very rare, and there are no breeding beaches in the Northwest Region.

(E) = Endangered
(T) = Threatened

Jan. 5, 2010: NOAA's Fisheries Service proposed to revise and expand critical habitat for the leatherback turtle under the Endangered Species Act. Additional information about this proposal can be found in the links below and at the website of the NOAA Fisheries' Office of Protected Resources.

- *News Release (PDF 73KB)*
- *Federal Register Notice (PDF 712KB)*

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Page last updated: January 5, 2010

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

Contact: Brian Gorman
206-526-6613

FOR IMMEDIATE RELEASE
April 22, 2009

NOAA's Fisheries Service Proposes Federal Protection for Three Georgia Basin Rockfish Species

NOAA's Fisheries Service today proposed to list three populations of rockfish in Puget Sound and the Strait of Georgia for protection under the Endangered Species Act. A final decision on the three will be made a year from now.

The Georgia Basin populations of two of the rockfish species – canary and yelloweye – are proposed for "threatened" status. A third rockfish species – bocaccio – is proposed as "endangered." An endangered species is at high risk of extinction; a threatened species is vulnerable to extinction in the near future and in need of protection.

Populations of all three rockfish species in the Georgia Basin, which encompasses Puget Sound and the Strait of Georgia, have been harvested at high levels, depleting their numbers. Rockfish, which are bottom dwellers, typically live long lives, and mature and reproduce slowly, making them especially vulnerable to overfishing.

Rockfish make up a substantial portion of the federally managed commercial bottomfish harvest off the West Coast, especially off the coast of California. Rockfish harvests in Puget Sound, by contrast, are managed by the state and the commercial catch there has been substantially restricted since the early 1990s, although there is still a small recreational harvest.

According to NOAA scientists, rockfish population growth has also been hampered by other fisheries unintentionally catching the stock and by environmental factors, such as loss of eelgrass beds, pollution and abandoned fishing gear that continues to catch fish.

If these rockfish are listed for Endangered Species Act protection next year, the agency's initial focus would be on fishing practices in Puget Sound. There is currently a broad state and federal effort to improve the sound's water quality and nearshore habitat through the Puget Sound Partnership, which is aimed at conserving all marine life, including rockfish. Resident killer whales, Chinook salmon, chum salmon, steelhead and bull trout are already protected in the sound under the ESA.

Today's proposed listing is in response to a petition from an Olympia resident who asked the agency in 2007 to list Puget Sound populations of five species of rockfish. In addition to the three proposed today, the petition also included greenstriped and redstriped rockfish. Agency scientists have said the greenstriped and redstriped rockfish are at a "low risk" of extinction, and protection under the ESA was not needed at this time.

The agency will take public comment through June 22 on the proposal and gather further scientific information on the species, the reasons for their decline, and possible efforts to restore their numbers before making its final decision within one year.

See the Web at http://www.nwr.noaa.gov/Other-Marine-Species/Puget-Sound-Marine-Fishes/esa-PS-rockfish.cfm for more information on this action.

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NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

Contact: Brian Gorman
206-526-6613

FOR IMMEDIATE RELEASE
March 16, 2010

NOAA Lists Pacific Smelt as "Threatened"

Small West Coast fish once ranged from California to British Columbia

NOAA's Fisheries Service said today it is listing Pacific smelt, a little fish with a big history, as threatened under the Endangered Species Act.

Under the ESA, a "threatened" species is in danger of becoming endangered in the foreseeable future. An "endangered" species is one in danger of extinction in all or part of its range.

Pacific smelt, known officially as eulachon, are small ocean-going fish that historically ranged from northern California to the Bering Sea in Alaska. They return to rivers to spawn in late winter and early spring. This little fish is so high in body fat during spawning that it can be dried, strung on a wick and burned, lending another name to its list of aliases—candlefish. There is a small and widely dispersed commercial and recreational fishery for pacific smelt.

A team of biologists from NOAA's Fisheries Service and two other federal agencies concluded last year that there are at least two Pacific smelt distinct population segments on the West Coast. The one listed today extends from the Mad River in northern California north into British Columbia. These population segments are different from the endangered delta smelt, a freshwater species found in California's Sacramento River delta.

Smelt have historically played an important role in the culture of Northwest native tribes, representing a seasonally important food source and a valuable trade item. Columbia River smelt were first described by Meriwether Lewis in 1806 during the Corps of Discovery; he lauded the fatty fish for their excellent taste.

The Cowlitz Indian tribe in Washington State petitioned NOAA's Fisheries Service in 2007 to list the fish populations in Washington, Oregon, and California. The tribe's petition described severe declines in smelt runs along the entire Pacific Coast, with possible local extinctions in California and Oregon.

NOAA's own scientific review found that this smelt stock is indeed declining throughout its range, and further declines are expected as climate change affects the availability of its prey. Climate change is also expected to change the timing and volume of spring flows in Northwest rivers. Those flows are critical to successful Pacific smelt spawning and these changes could have a negative effect on spawning success. The agency's review also concluded that Pacific smelt are vulnerable to being caught in shrimp fisheries in the United States and Canada, because the areas occupied by shrimp and smelt often overlap.

The agency said other threats to the fish include water flows in the Klamath and Columbia River basins and bird, seal and sea lion predation, especially in Canadian streams and rivers.

Recreational fishers catch smelt in dip nets, and typically fry and eat them whole. These fish are also the bait of choice for sturgeon fishers, and are often caught specifically for that purpose.

Now that Pacific smelt have been listed as threatened, the agency said it would turn its attention to determining what, if any, protective measures -- known as 4(d) rules -- are needed for smelt. It would also determine the extent of the fish's critical habitat. In addition to these protections, the ESA requires federal agencies to ensure that activities they authorize, fund or conduct are not likely to jeopardize the continued existence of a listed species.

Prohibitions against harming them would apply only to Pacific smelt in U.S. waters or to U.S. citizens on the high seas, even though the population extends into Canada.

All of the West Coast states individually manage their own small commercial and recreational smelt fisheries and are responsible for writing and enforcing fishing regulations.

For more information on the eulachon ESA listing, see the Web at: http://www.nwr.noaa.gov/Other-Marine-Species/Eulachon.cfm.

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LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN SKAGIT COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WESTERN WASHINGTON FISH AND WILDLIFE OFFICE

(Revised November 1, 2007)

LISTED

Bull trout (*Salvelinus confluentus*)

Canada lynx (*Lynx canadensis*)

Gray wolf (*Canis lupus*)

Grizzly bear (*Ursus arctos = U. a. horribilis*)

Marbled murrelet (*Brachyramphus marmoratus*)

Northern spotted owl (*Strix occidentalis caurina*)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for bull trout

Critical habitat for the marbled murrelet

Critical habitat for the northern spotted owl

PROPOSED

Dolly Varden (*Salvelinus malma*) due to similarity of appearance

CANDIDATE

Oregon spotted frog (*Rana pretiosa*)

SPECIES OF CONCERN

Bald eagle (*Haliaeetus leucocephalus*)
California wolverine (*Gulo gulo luteus*)
Cascades frog (*Rana cascadae*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Olive-sided flycatcher (*Contopus cooperi*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend=s big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Western toad (*Bufo boreas*)
Meconella oregana (white meconella)

U.S. Fish & Wildlife Service

Pacific Region News Release

January 9, 2001

Department of the Interior
U.S. Fish & Wildlife Service
Western Washington Office
510 Desmond Dr., SE
Suite 102
Lacey, WA 98503-1263

News Releases Home Page

U.S. Fish & Wildlife Service Home

Contact: Dr. L. Karolee Owens, USFWS,
360/753-4369 01-06
For Release: January 9, 2001

DOLLY VARDEN PROPOSED FOR SIMILARITY OF APPEARANCE PROTECTION UNDER THE ENDANGERED SPECIES ACT

The U.S. Fish and Wildlife Service announced today that it is proposing to protect the fish Dolly Varden in the Coastal-Puget Sound region of Washington under the "similarity of appearance" provision of the Endangered Species Act, because the Dolly Varden so closely resembles the bull trout, which is listed as a threatened species.

The proposal would extend some of the Act's protections to Washington's Coastal-Puget Sound population of Dolly Varden as if it were a threatened species. Under the Act, a species may be treated as if it were endangered or threatened when it so closely resembles a protected species that law enforcement personnel would have substantial difficulty in distinguishing between the two species. If the proposal is finalized, it will help eliminate situations where people mistakenly "take" bull trout when they believe they are "taking" Dolly Varden. "Take" is defined in the ESA as killing or harming a protected species or destroying or substantially altering its habitat.

Dolly Varden would only be treated as a listed species where its range overlaps with that of the Coastal-Puget Sound population of bull trout in Washington state.

"In the Coastal-Puget Sound areas, Dolly Varden occupy the same habitat as bull trout and are so similar that the two species cannot easily be told apart in the field," said Anne Badgley, regional director of the Service's Pacific region. "We are proposing protection for Dolly Varden to increase the chances that bull trout will be able to recover."

Under the proposal, Dolly Varden would be covered by the existing special rule for bull trout, which exempts certain activities from the ESA's "take" prohibition. These exemptions include fishing activities authorized under State, National Park Service, or Native American tribal laws. Fishing for Dolly Varden in other areas, outside of the Coastal-Puget Sound area covered by the bull trout listing, would not be affected.

The Service listed five distinct population segments of bull trout as threatened throughout the coterminous United States on November 1, 1999. Dolly Varden occur with the distinct population segment of bull trout found in rivers and streams of coastal Washington and the Puget Sound region.

Dolly Varden and bull trout are members of the char (*Salvelinus*) subgroup of the salmon family. They were once considered to be one species under the name Dolly Varden. Scientific research has recently separated the two species, but even specialists have difficulty in telling them apart visually.

Char have light-colored spots on a darker background, just the opposite of the pattern on salmon and trout, which have dark spots on a light background. Creamy to pale yellow spots cover the back, and red or orange spots cover the sides. The fins have white or cream-colored margins. This unique coloration is particularly striking in the male during spawning and led to the common name Dolly Varden, in reference to a colorfully clothed character in the Charles Dickens novel *Barnaby Rudge*.

The Washington Department of Fish and Wildlife manages the two species together as "native char" under state fisheries regulations.

The Service published its proposal to list the Dolly Varden as threatened due to similarity of appearance to bull trout in the Coastal-Puget Sound region of Washington in today's *Federal Register.* The public is invited to submit written comments until March 9, 2001, to: Manager, U.S. Fish and Wildlife Service, Western Washington Office, 510 Desmond Dr. SE, Suite 102, Lacey, WA 98503-1263.

The Western Washington Office is based in Lacey, Washington, and addresses Federal fish and wildlife issues from the crest of the Cascades to the Pacific Ocean, and from the Canadian border to the

Columbia River. The office is responsible for the listing, recovery and consultation on species protected under the Endangered Species Act; the development of Habitat Conservation Plans; implementation of the Service portion of the Northwest Forest Plan within the range of the northern spotted owl in Washington; issues involving migratory birds and other species protected by Federal laws; environmental contaminants assessment and spill response; fish and wildlife habitat restoration; review of proposed Federal projects, including Clean Water Act activities; monitoring and evaluation of species and effects of projects on species; and technical assistance on fishery resource issues.

###

(**Editor's Note:** If you would prefer to receive future USFWS Western Washington Office news releases by e-mail please send a message to that effect to Douglas_Zimmer@fws.gov .)

Question and anwsers about Dolly Varden Proposed for Similarity of Appearance Protection Under the Endangered Species Act

NOTE: This news release and others can be viewed on either the Services Pacific Regional home page on the internet at http://www.r1.fws.gov or the national home page at http://www.fws.gov/r9extaff/renews.html

APPENDIX C

Photographs of Project Site and Vicinity

APPENDIX C
PHOTOGRAPHS OF PROJECT SITE AND VICINITY

Former Custom Plywood Mill
Anacortes, Washington

Photograph 1 Aerial photograph of project site vicinity.

APPENDIX C
PHOTOGRAPHS OF PROJECT SITE AND VICINITY

Former Custom Plywood Mill
Anacortes, Washington

Photograph 2 Zone 1 – Before emergency action implementation.

Photograph 3 Zone 1 – During emergency action implementation.

APPENDIX C
PHOTOGRAPHS OF PROJECT SITE AND VICINITY

Former Custom Plywood Mill
Anacortes, Washington

Photograph 4 Zone 1 – Final grade before geotextile is laid down.

Photograph 5 Zone 1 – Geotextile completely rolled out.

APPENDIX C
PHOTOGRAPHS OF PROJECT SITE AND VICINITY

Former Custom Plywood Mill
Anacortes, Washington

Photograph 6 Zone 1 – Emergency action implementation complete.

Photograph 7 Zone 2 – Before emergency action implementation.

APPENDIX C
PHOTOGRAPHS OF PROJECT SITE AND VICINITY

Former Custom Plywood Mill
Anacortes, Washington

Photograph 8 Zone 2 – Berm transect line being leveled.

Photograph 9 Zone 2 – Placement of Ecology blocks along transect.

Former Custom Plywood Mill
Anacortes, Washington

Photograph 10 Zone 2 – Folding the PVC liner over the Ecology blocks.

Photograph 11 Zone 2 – Emergency action implementation complete.

APPENDIX D

Species' Life Histories

SPECIES' LIFE HISTORIES
CUSTOM PLYWOOD EMERGENCY ACTION PROJECT

Former Custom Plywood Mill

Anacortes, Washington

(Corps Reference No. NWS-2010-288)

Prepared for:

U.S. Army Corps of Engineers
Seattle District, Washington

Prepared by:

AMEC Geomatrix, Inc.
600 University Street, Suite 1020
Seattle, Washington 98101
(206) 342-1760

March 2010

Project No. 10654.000

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(Continued)

SPECIES' LIFE HISTORIES
Custom Plywood Emergency Action Project
Former Custom Plywood Mill
Anacortes, Washington

1.0 INTRODUCTION

This document provides brief descriptions of the life histories of species listed under the Endangered Species Act (ESA), and those proposed for listing, that may occur in the action area of the emergency action project. The species discussed herein include:

- Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*);
- Puget Sound steelhead trout (*O. mykiss*);
- Coastal/Puget Sound bull trout (*Salvelinus confluentus*) and Dolly Varden (*S. malma*);
- Bocaccio (*Sebastes paucispinis*);
- Yelloweye rockfish (*S. ruberrimus*);
- Canary rockfish (*S. pinniger*);
- Southern resident killer whale (*Orcinus orca*);
- Steller sea lion (*Eumetopias jubatus*); and
- Marbled murrelet (*Brachyramphus marmoratus marmoratus*).

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2.0 CHINOOK SALMON

This section presents descriptions of the biology, habitat, distribution, population trend, threats, and conservation efforts for Puget Sound Chinook salmon.

2.1 SPECIES DESCRIPTION

The Chinook salmon is the largest of the Pacific salmon. Also known as "king" salmon, adult Chinook salmon migrate from a marine environment into freshwater streams and rivers of their birth where they spawn and die. Among Chinook salmon, two distinct races have evolved:

1. A "stream-type" Chinook is found most commonly in headwater streams. Stream-type Chinook salmon have a longer freshwater residency and perform extensive offshore migrations before returning to their natal streams in the spring or summer months.

2. An "ocean-type" Chinook is commonly found in coastal streams in North America. Ocean-type Chinook typically migrate to sea within the first 3 months of emergence, but they may spend up to a year in fresh water prior to emigration. They also spend their ocean life in coastal waters. Ocean-type Chinook salmon return to their natal streams or rivers as spring, winter, fall, summer, and late-fall runs, but summer and fall runs predominate (Healey, 1991).

The difference between these life history types is physical, with both genetic and morphological foundations (Corps, 2000).

2.2 HABITAT

Adult female Chinook will prepare a spawning bed, called a redd, in a stream area with suitable gravel composition, water depth, and velocity. Redds will vary widely in size and in location within the stream or river. The adult female Chinook may deposit eggs in four to five "nesting pockets" within a single redd. After laying eggs in a redd, adult Chinook will guard the redd from 4 to 25 days before dying. Chinook salmon eggs will hatch, depending upon water temperatures, between 90 to 150 days after deposition. Streamflow, gravel quality, and silt load all significantly influence the survival of developing Chinook salmon eggs. Juvenile Chinook may spend from 3 months to 2 years in fresh water after emergence and before migrating to estuarine areas as smolts, and then into the ocean to feed and mature. Juvenile ocean-type Chinook tend to utilize estuaries and coastal areas more extensively for juvenile rearing. Juvenile Chinook salmon feed primarily on aquatic insect larvae and terrestrial insects, typically in the nearshore areas. Puget Sound Chinook salmon hatch and rear in streams and rivers flowing into Puget Sound and the Dungeness River and its tributaries (Corps, 2000).

2.3 DISTRIBUTION

The Puget Sound Chinook Evolutionarily Significant Unit (ESU) is listed as threatened under the ESA. The range for the Puget Sound Chinook salmon ESU includes all marine, estuarine, and river reaches accessible to listed Chinook salmon in Puget Sound. Puget Sound marine areas include South Sound, Hood Canal, and North Sound to the international boundary at the outer extent of the Strait of Georgia, Haro Strait, and the Strait of Juan De Fuca to a straight line extending north from the west end of Freshwater Bay, inclusive. Excluded are areas above Tolt Dam (Washington), Lansburg Diversion (Washington), Alder Dam (Washington), and Elwha Dam (Washington) or above longstanding, natural impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) (Corps, 2000).

Chinook salmon in the Puget Sound ESU spawn from Dakota Creek north of the Nooksack River in the north, through south Puget Sound, into Hood Canal, and out the Strait of Juan de Fuca to the Elwha River. These spawning distributions are relatively well known compared to information on the location of juvenile rearing areas and historical spawning distributions in most basins (Ruckelshaus et al., 2006).

Ruckelshaus et al. (2006) determined that the following 22 historical populations currently contain Chinook salmon:

1. North Fork Nooksack River
2. South Fork Nooksack River
3. Lower Skagit River
4. Upper Skagit River
5. Cascade River
6. Lower Sauk River
7. Upper Sauk River
8. Suiattle River
9. North Fork Stillaguamish River
10. South Fork Stillaguamish River
11. Skykomish River
12. Snoqualmie River
13. Sammamish River
14. Cedar River
15. Duwamish/Green River
16. White River
17. Puyallup River
18. Nisqually River
19. Skokomish River
20. Mid-Hood Canal Rivers
21. Dungeness River
22. Elwha River

2.4 POPULATION TRENDS

Overall, the natural spawning escapement estimates for Puget Sound Chinook salmon populations are improved relative to those at the time of the previous status review of Puget Sound Chinook salmon conducted with data through 1997. The differences between population escapement estimates based on status assessments using data from 1997 and the present assessment using data through 2002 could be due to (1) revised pre-1997 data, (2) differences in which fish are counted as part of a population, (3) new information on the fraction of natural spawners that are hatchery fish, or (4) true differences reflected in new data on natural spawners obtained over the most recent 5 years. The median across populations of the most recent 5-year geometric mean of natural escapement for the same 22 populations through 1997 was N = 438 (compared to N = 771 through 2002), and the range was 1 to 5,400. As was the case at the time of the previous status review, it is not possible to determine the status of the natural-origin, natural spawners in half the populations of Chinook salmon in Puget Sound. The most dramatic change in recent natural escapement estimates from the previous status assessment was in the Green River—the recent natural-origin escapement estimate is lower than the previous one by almost 5,000 spawners. This apparent drop in natural escapement is probably due primarily to new information about the fraction of hatchery fish that are spawning naturally (Good et al., 2005).

Throughout the ESU, the estimates of trends in natural spawning escapements for Puget Sound Chinook salmon populations are similar to the previous status review of Puget Sound Chinook salmon conducted with data through 1997. Some populations exhibit improvement in trends relative to the last status assessment, and others show more significant declines. The median across populations of the long-term trend in natural spawners was a 1.1 percent decline per year through 1997, compared to a median estimate indicating a flat trend through 2002. Twelve populations had declining long-term trends through 1997, and ten populations had declining long-term trends through 2002. Short-term trends were generally more positive in recent years—the median trend across 22 populations through 1997 was a 4 percent decline per year, and the median trend through 2002 was a 1.1 percent increase per year. Fourteen populations showed declining short-term trends at the time of the previous status reviews, and only four populations exhibited declining short-term trends in recent years. There is a lack information on the fraction of naturally spawning, hatchery-origin fish for 10 of the 22 populations of Chinook salmon in Puget Sound, so the understanding of the trend in natural-origin spawners among populations across the ESU is incomplete (Good et al., 2005).

2.5 THREATS

Habitat throughout the ESU has been blocked or degraded. In general, forest practices impacted upper tributaries, and agriculture or urbanization impacted lower tributaries and mainstem rivers. Diking for flood control, draining and filling of freshwater and estuarine wetlands, and sedimentation due to forest practices and urban development are problematic throughout the ESU. Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in several basins. A variety of critical habitat issues exist for streams in the range of this ESU, including changes in flow regime, sedimentation, high temperatures, streambed instability, estuarine loss, loss of large woody debris, loss of pool habitat, and blockage or passage problems associated with dams or other structures (Good et al., 2005).

The Puget Sound Salmon Stock Review Group of the Pacific Fishery Management Council (PFMC, 1997) provided an extensive review of habitat conditions for several stocks in this ESU. It concluded that reductions in habitat capacity and quality have contributed to escapement problems for Puget Sound Chinook salmon, citing evidence of direct losses of tributary and mainstem habitat due to dams, and of slough and side-channel habitat due to diking, dredging, and hydromodification. It also cited reductions in habitat quality due to land management activities. Eleven out of 29 stocks in this ESU are classified as being sustained, in part, through artificial propagation. Nearly 2 billion fish have been released into Puget Sound tributaries since the 1950s (Good et al., 2005). The vast majority of these fish were derived from local returning fall-run adults. Returns to hatcheries have accounted for 57 percent of total spawning escapement, although the hatchery contribution to spawner escapement is probably much higher than that due to hatchery-derived strays on the spawning grounds. Almost all releases into this ESU have come from stocks within this ESU, with the majority of within-ESU transfers coming from the Green River Hatchery or hatchery broodstocks derived from Green River stock (Good et al., 2005). The electrophoretic similarity between Green River fall-run Chinook salmon and several other fall-run stocks in Puget Sound suggests that there may have been a significant effect from some hatchery transplants. Overall, the pervasive use of Green River stock throughout much of the extensive hatchery network that exists in this ESU may reduce the genetic diversity and fitness of naturally spawning populations (Good et al., 2005).

Harvest impacts on Puget Sound Chinook salmon stocks were quite high. Ocean exploitation rates on natural stocks averaged 56 to 59 percent; total exploitation rates averaged 68 to 83 percent (1982 to 1989 brood years). Total exploitation rates on some stocks have exceeded 90 percent (Good et al., 2005).

Previous assessments of stocks within this ESU identified several stocks as being at risk or of concern (Good et al., 2005).

2.6 CONSERVATION EFFORTS

On January 19, 2007, the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Services (NOAA-Fisheries) adopted the final ESA-recovery plan for Puget Sound Chinook salmon. Under the ESA, a recovery plan must have quantitative recovery criteria and goals, identify threats to survival, site-specific management strategies and actions necessary to address the threats, cost estimates of the actions, and a schedule for implementation. A monitoring and adaptive management program is also included in the recovery plan. In addition to the general requirements, this plan was directed by the recovery criteria developed by the group of scientists appointed by NOAA-Fisheries and the Puget Sound Technical Recovery Team.

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3.0 PUGET SOUND STEELHEAD TROUT

This section presents descriptions of the biology, habitat, distribution, population trend, threats, and conservation efforts for Puget Sound steelhead trout.

3.1 SPECIES DESCRIPTION

The life history of steelhead trout is one of the most complex of any of the salmonid species. The species exhibits both anadromous forms (steelhead) and resident forms (usually referred to as rainbow or redband trout). They reside in the marine environment for 2 to 3 years before returning to their natal stream to spawn as 4- or 5-year-old fish. Unlike Pacific salmon, steelhead trout are iteroparous or capable of spawning more than once before they die. However, it is rare for steelhead to spawn more than twice before dying, and those that do are usually females (Corps, 2000).

Biologically, steelhead can be divided into two reproductive ecotypes, based on their state of sexual maturity at the time of river entry. These two ecotypes are termed “stream-maturing” and “ocean-maturing.” Stream-maturing steelhead enter fresh water in a sexually immature condition and require from several months to a year to mature and spawn. These fish are often referred to as “summer-run” steelhead. Ocean-maturing steelhead enter fresh water with well-developed gonads and spawn shortly after river entry. These fish are commonly referred to as “winter-run” steelhead. In the Columbia River Basin essentially all steelhead that return to streams east of the Cascade Mountains are stream-maturing. Ocean-maturing fish are the predominate ecotype in coastal streams and lower Columbia River tributaries (Corps, 2000).

3.2 HABITAT

Native steelhead in California generally spawn earlier than those to the north with spawning beginning in December. Washington populations begin spawning in February or March. Native steelhead spawning in Oregon and Idaho is not well-documented. In the Clackamas River in Oregon, winter-run steelhead spawning begins in April and continues into June. In the Washougal River, Washington, summer-run steelhead spawn from March into June whereas summer-run fish in the Kalama River, Washington, spawn from January through April. Among inland steelhead, Columbia River populations from tributaries upstream of the Yakima River spawn later than most downstream populations.

Depending on water temperature, fertilized steelhead eggs may incubate in redds for 1.5 to 4 months before hatching as “alevins.” Following yolk sac absorption, young juveniles or “fry” emerge from the gravel and begin active feeding. Juveniles rear in fresh water for 1 to 4 years, then migrate to the ocean as smolts. Downstream migration of wild steelhead smolts in the lower Columbia River begins in April, peaks in mid-May and is essentially complete by the end of June (FPC, 1993, 1995, 1997). Previous studies of the timing and duration of steelhead downstream migration indicate that they typically move quickly through the lower Columbia River estuary with an average daily movement of about 21 kilometers (km) (Dawley et al., 1979 and 1980).

3.2.1 Winter-Run Steelhead

In general, winter-run, or ocean-maturing steelhead return as adults to the tributaries of Puget Sound from December to April (WDF et al., 1973). Spawning occurs from January to mid-June, with peak spawning occurring from mid-April through May. Prior to spawning, maturing adults hold in pools or in side channels to avoid high winter flows.

Steelhead tend to spawn in moderate to high-gradient sections of streams. In contrast to semelparous Pacific salmon, steelhead females do not guard their redds or nests, but return to the ocean following spawning (Burgner et al., 1992). Spawned-out females that return to the sea are referred to as “kelts” (NOAA-Fisheries, 2005a).

3.2.2 Summer-Run Steelhead

The life history of summer-run steelhead is highly adapted to specific environmental conditions. Because these conditions are not common in Puget Sound, the relative incidence and size of summer-run steelhead populations is substantially less than that for winter-run steelhead. Summer-run steelhead have also not been widely monitored; in part, because of their small population size and the difficulties in monitoring fish in their headwater holding areas. Sufficient information exists for only 4 of the 16 Puget Sound summer-run steelhead populations identified in the 2002 Salmon Steelhead Inventory (SaSI) to determine the population status (WDFW, 2002).

3.2.3 Juvenile Life History

The majority of steelhead juveniles reside in fresh water for 2 years prior to emigrating to marine habitats, with limited numbers emigrating as 1- or 3-year old smolts. Smoltification and seaward migration occur principally from April to mid-May (WDF et al., 1973). Two-year-old naturally produced smolts are usually 140 to 160 millimeters (mm) in length (Wydoski and Whitney, 1979; Burgner et al., 1992). The inshore migration pattern of steelhead in Puget Sound is not well understood; it is generally thought that steelhead smolts move quickly offshore (Hartt and Dell, 1986).

3.2.4 Ocean Migration

Steelhead oceanic migration patterns are poorly understood. Evidence from tagging and genetic studies indicates that Puget Sound steelhead travel to the central North Pacific Ocean (French et al., 1975; Hartt and Dell, 1986; Burgner et al., 1992). Puget Sound steelhead feed in the ocean for 1 to 3 years before returning to their natal stream to spawn. Typically, Puget Sound steelhead spend 2 years in the ocean, although, notably, Deer Creek summer-run steelhead spend only a single year in the ocean before spawning (NOAA-Fisheries, 2005a).

3.3 DISTRIBUTION

Steelhead are found in most accessible larger tributaries to Puget Sound and the eastern Strait of Juan de Fuca. A survey of the Puget Sound District in 1929 and 1930, which did not include Hood Canal, identified steelhead in every major basin except the Deschutes River. The propensity for steelhead to spawn in side channels and tributaries during winter and spring months when flows are high and visibility is low would likely have resulted in an underreporting of steelhead sightings. Additionally, by the late 1920s steelhead abundance had already undergone significant declines and many marginal or ephemeral populations may have already disappeared (Hard et al., 2007).

3.4 POPULATION TRENDS

Declining trends in abundance have occurred despite widespread reductions in direct harvest of natural steelhead in this ESU since the mid-1990s. Natural run sizes (sum of harvest and escapement) for most populations show even more marked declining trends than indicated by escapements, indicating the substantially reduced harvest rates for natural fish since the early 1990s have not resulted in a rebound in steelhead production in Puget Sound. For many of the Puget Sound populations, the decline in adult recruits per spawner has been precipitous. Populations of summer-run steelhead occur throughout the Puget Sound ESU but are concentrated in the northern Puget Sound area, are generally small, and are characterized as isolated populations adapted to streams with distinct attributes (Hard et al., 2007).

3.5 THREATS

Habitat utilization by steelhead has been most affected by reductions in habitat quality and by fragmentation. A number of large dams in Puget Sound basins have affected steelhead. In addition to eliminating accessibility to habitat, dams affect habitat quality through changes in river hydrology, temperature profile, downstream gravel recruitment, and the movement of large woody debris. Many of the lower reaches of rivers and their tributaries in Puget Sound have been dramatically altered by urban development. Urbanization and suburbanization have resulted in the loss of historical land cover in exchange for large areas of imperious surface (buildings, roads, parking lots, etc.) (Hard et al., 2007).

The loss of wetland and riparian habitat has dramatically changed the hydrology of many urban streams, with increases in flood frequency and peak flow during storm events and decreases in groundwater-driven summer flows. Flood events result in gravel scour, bank erosion, and sediment deposition. Land development for agricultural purposes has also altered the historical land cover; however, because much of this development took place in river floodplains, there has been a direct impact on river morphology. River braiding and sinuosity have been reduced through the construction of dikes, hardening of banks with riprap, and channelizing the mainstem. Constriction of rivers, especially during high-flow events, increases likelihood of gravel scour and dislocation of rearing juveniles (Hard et al., 2007).

This ESU is likely to be at elevated risk due to the reduced complexity of spatial structure of its steelhead populations and, consequently, diminishing connectivity among them. The declines in natural abundance for most populations, coupled with large numbers of anthropogenic barriers such as impassable culverts, sharply reduce opportunities for natural adfluvial movement and migration between steelhead aggregations in different watersheds. Resident *O. mykiss* below migration barriers in watersheds throughout the ESU may provide short-term buffers against demographic stochasticity in many of these populations. Resident *O. mykiss* were considered to be a relatively minor component of these anadromous populations based on field surveys of juvenile fish in fresh water (Hard et al., 2007).

Reduced harvest levels and recent changes in management of natural steelhead, the recent onset of recovery efforts in Puget Sound and Hood Canal for Chinook salmon and summer-run chum salmon (*O. keta*) prompted by the listing of those ESUs, and reduced off-site plantings of hatchery steelhead were all considered as recent actions that could positively affect Puget Sound steelhead. However, the continued releases of out-of-ESU hatchery summer-run and winter-run steelhead throughout the region, reductions in steelhead escapement goals to help support harvest opportunities in several systems, evidence for diminishing marine survival rates, a recent increase in the Pacific Decadal Oscillation Index reflecting a general change in climate in the region toward warmer and drier conditions, increases in pinniped populations in Puget Sound, degradation of water quality in Hood Canal and southern Puget Sound, and continued land development and urbanization with associated impacts on freshwater habitat are all likely to increase risk to this ESU (Hard et al., 2007).

3.6 CONSERVATION EFFORTS

Reduced harvest levels and recent changes in management of natural steelhead, the recent onset of recovery efforts in Puget Sound and Hood Canal for Chinook salmon and summer-run chum salmon prompted by the listing of those ESUs, and reduced off-site plantings of hatchery steelhead are recent actions that could positively affect Puget Sound steelhead (Hard et al., 2007).

4.0 COASTAL/PUGET SOUND BULL TROUT AND DOLLY VARDEN

This section presents descriptions of the biology, habitat, distribution, population trend, threats, and conservation efforts for Coastal/Puget Sound bull trout and Dolly Varden. Dolly Varden have been proposed as threatened under the ESA by the U.S. Fish and Wildlife Service because of the similarity of appearance to bull trout. It is assumed that Dolly Varden share many of the same life history characteristics of bull trout.

4.1 SPECIES DESCRIPTION

Bull trout are native to western North America and are widespread throughout tributaries of the Columbia River Basin, including the headwaters in Montana and Canada. Bull trout are generally nonanadromous and live in a variety of habitats including small streams, large rivers, and lakes or reservoirs. However, Coastal/Puget Sound bull trout are anadromous, migrating and maturing in Puget Sound or the Pacific Ocean. They may spend the first 2 to 4 years in small natal streams and then migrate through the larger rivers, lakes, and reservoirs to Puget Sound and the Pacific Ocean (Corps, 2000).

Bull trout exhibit resident and migratory life history strategies through much of the current range (Rieman and McIntyre, 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear from 1 to 4 years before migrating to either a lake (adfluvial), river (fluvial), or in certain coastal areas, to salt water (anadromous), where maturity is reached in one of the three habitats (Fraley and Shephard, 1989; Goetz, 1989). Resident and migratory forms may be found together and it is suspected that bull trout give rise to offspring exhibiting either resident or migratory behavior (Rieman and McIntyre, 1993).

In some stocks of bull trout, maturing adults may begin migrating to spawning grounds in the spring or early summer. Female bull trout may deposit up to 5,000 or 10,000 eggs in redds they build, depending on their size. The embryos incubate during the fall, winter, and spring, and the surviving fry emerge from the redds in April and May. The rate of embryo development is dependent upon temperature. After they emerge, the young bull trout disperse upstream and downstream to find suitable areas to feed. Feeding areas for Coastal/Puget Sound bull trout include estuaries and nearshore marine waters. Young fish feed primarily on aquatic invertebrates in the streams during their first 2 or 3 years but become more piscivorous as they get larger (Corps, 2000).

The bull trout has been eliminated from some of its native range and seriously reduced in abundance in most of the remaining drainages. Excessive exploitation, habitat degradation, and introductions of exotic species are probably the major causes of the declines (Corps, 2000).

4.2 HABITAT

Bull trout have more specific habitat requirements compared to other salmonids (Rieman and McIntyre, 1993). Habitat components that appear to influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (Oliver, 1979; Pratt, 1984, 1992; Fraley and Shephard, 1989; Goetz, 1989; Hoelscher and Bjornn, 1989; Sedell and Everest, 1991; Rieman and McIntyre, 1993, 1995; Rich, 1996; Watson and Hillman, 1997). Bull trout typically spawn from August to November during periods of decreasing water temperatures. However, migratory bull trout frequently begin spawning migrations as early as April. Bull trout require spawning substrate consisting of loose, clean gravel relatively free of fine sediments (Fraley and Shephard, 1989). Depending on water temperature, incubation is normally 100 to 145 days (Pratt, 1992) and, after hatching, juveniles remain in the substrate. Time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May depending upon water temperatures and increasing streamflows (Pratt, 1992; Ratliff and Howell, 1992). Bull trout are opportunistic feeders with food habits primarily a function of size and life history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro zooplankton, and small fish (Boag, 1987; Goetz, 1989; Donald and Alger, 1993). Adult migratory bull trout are primarily piscivorous, known to feed on various fish species (Fraley and Shephard, 1989; Donald and Alger, 1993).

4.3 DISTRIBUTION

The Coastal/Puget Sound bull trout distinct population segment (DPS) is listed as threatened under the ESA. The Coastal/Puget Sound bull trout population segment encompasses all Pacific Coast drainages within Washington, including Puget Sound. This population segment is discrete because the Pacific Ocean and the crest of the Cascade Mountain Range geographically segregate it from subpopulations. The population segment is significant to the species as a whole because it is thought to contain the only anadromous forms of bull trout in the conterminous United States, thus, occurring in a unique ecological setting. No bull trout exist in coastal drainages south of the Columbia River (Corps, 2000).

4.4 POPULATION TRENDS

A 1998 Washington Department of Fish and Wildlife (WDFW) study found 80 bull trout/Dolly Varden populations in Washington: 14 (18 percent) were healthy, two (3 percent) were in poor condition, six (8 percent) were critical, and the status of 58 (72 percent) of the stocks were unknown. Bull trout are estimated to have occupied about 60 percent of the Columbia River

Basin, and presently occur in 45 percent of the estimated historical range (Quigley and Arbelbide, 1997).

Although specific data on population abundance, trends, and spatial distribution is scarce, ample information exists to indicate that the bull trout are threatened. Population abundance and distribution has declined within many individual river basins, and habitat is severely fragmented in many instances (SSDC, 2007).

4.5 THREATS

Bull trout display a high degree of sensitivity to environmental disturbance and have been significantly impacted by habitat degradation similar to other listed and sensitive species. In addition to migratory barriers, such as dams or diversion structures which isolate populations, bull trout are threatened by poor water quality, sedimentation, harvest, and the introduction of nonnative species. Although several populations lie completely or partially within national parks or wilderness areas, these local populations are threatened by the presence of introduced brook trout or from habitat degradation outside of the park boundaries. Based on biological and genetic information, the U.S. Fish and Wildlife Service (USFWS) has delineated two management units in the Coastal/Puget Sound population segment. Olympic Peninsula bull trout populations are thought to differ from those in the Puget Sound management unit, which originate in watersheds on the western slopes of the Cascade Mountains. Although the two units are connected by marine waters, there is currently no evidence that bull trout from Puget Sound migrate to the Strait of Juan de Fuca or Hood Canal (SSDC, 2007).

Land and water management activities that degrade bull trout habitat and continue to threaten all of the bull trout population segments include dams, forest management practices, livestock grazing, agriculture, and roads and mining (Beschta et al., 1987; Chamberlain et al., 1991; Furniss et al., 1991; Meehan, 1991; Nehlsen et al., 1991; Sedell and Everest, 1991; Craig and Wissmar, 1993; MBTSG, 1998). Fish barriers, timber harvesting, agricultural practices, and urban development are thought to be major factors affecting “native char” in the Coastal/Puget Sound DPS (64 Federal Register 58909-58933).

4.6 CONSERVATION EFFORTS

The USFWS has subdivided the Coastal/Puget Sound bull trout DPS into two separate management units: the Puget Sound and the Olympic Peninsula. Individual draft recovery plans have been prepared for each of these management units. Volume I of the Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout covers the Puget Sound Management Unit, addressing bull trout populations in all watersheds within the Puget Sound Basin north of the Columbia River in Washington and the marine nearshore areas of Puget Sound. It also includes the Chilliwack River and associated tributaries flowing in British Columbia, Canada. Volume II covers the Olympic Peninsula Management Unit, including all watersheds within the Olympic Peninsula and the nearshore marine waters of the Pacific Ocean, Strait of Juan de Fuca, and Hood Canal.

5.0 PUGET SOUND ROCKFISH SPECIES PROPOSED FOR LISTING UNDER THE ENDANGERED SPECIES ACT

On April 22, 2009, NOAA-Fisheries proposed listing three species of Puget Sound rockfish under the ESA. The three species are:

- The Georgia DPS of bocaccio (*Sebastes paucispinis*), listed as endangered;
- The Georgia Basin DPS of the yelloweye rockfish (*S. ruberrimis*), listed as threatened; and
- The Georgia Basin DPS of the canary rockfish (*S. pinniger*), listed as threatened.

The following sections will present brief descriptions of the species' biology, their habitats, distribution, population trends, threats, and conservation efforts.

5.1 BOCACCIO

This section presents descriptions of the biology, habitat, distribution, population trend, threats, and conservation efforts for the bocaccio.

5.1.1 Species Description

Bocaccio are large Pacific Coast rockfish that reach up to 3 feet (1 meter [m]) in length with a distinctively long jaw extending to at least the eye socket. Their body ranges in color from olive to burnt orange or brown as adults. Young bocaccio are light bronze in color and have small brown spots on their sides (NOAA-Fisheries, 2009a).

Rockfish are unusual among the bony fish in that fertilization and embryo development are internal, and female rockfish give birth to live larval young. Larvae are found in surface waters, and may be distributed over a wide area extending several hundred miles offshore. Fecundity in female bocaccio ranges from 20,000 to over 2 million eggs, considerably more than many other rockfish species. Larvae and small juvenile rockfish may remain in open waters for several months, being passively dispersed by ocean currents (NOAA-Fisheries, 2009a).

Larval rockfish feed on diatoms, dinoflagellates, tintinnids, and cladocerans, and juveniles consume copepods and euphausiids of all life stages. Adults eat demersal invertebrates and small fishes, including other species of rockfish, associated with kelp beds, rocky reefs, pinnacles, and sharp dropoffs. Approximately 50 percent of adult bocaccio mature in 4 to 6 years. Bocaccio are difficult to age but are suspected to live as long as 50 years (NOAA-Fisheries, 2009a).

5.1.2 Habitat

Bocaccio are most common at depths between 160 and 820 feet (50 to 250 m), but may be found as deep as 1,560 feet (475 m). Adults generally move into deeper water as they increase in size and age but usually exhibit strong site fidelity to rocky bottoms and outcrops. Juveniles and subadults may be more common than adults in shallower water, and are associated with rocky reefs, kelp canopies, and artificial structures, such as piers and oil platforms (NOAA-Fisheries, 2009a).

5.1.3 Distribution

Bocaccio range from Punta Blanca, Baja California, to the Gulf of Alaska off the Krozoff and Kodiak Islands. They are most common between Oregon and northern Baja California. In Puget Sound, most bocaccio are found south of the Tacoma Narrows (NOAA-Fisheries, 2009a).

5.1.4 Population Trends

Recreational catch and effort data spanning 12 years from the mid-1970s to mid-1990s suggests possible declines in abundance in Washington. Additional data over this period show the number of angler trips increased substantially and the average number of rockfish caught per trip declined. Taken together, these data suggest declines in the population over time. Currently there are no survey data being taken for this species, but few of these fish are caught by fishermen and none have been caught by Washington state biological surveys in 20 years, suggesting very low population abundance. They are thought to be at an abundance that is less than 10 percent of their unfished abundance. A 2005 stock assessment by NOAA-Fisheries suggests bocaccio may have higher populations than was thought to be the case (NOAA-Fisheries, 2009a).

Bocaccio were infrequently recorded in the recreational catch data reported by Buckley (1967, 1968, and 1970) and Bargmann (1977) for Puget Sound Proper from the mid-1960s into the early 1970s. However, bocaccio were reported up to 8 to 9 percent of the catch in the late-1970s from the Washington State Sport Catch Reports (WDF, 1975-86). The majority of the catch (66 percent) during 1975 to 1986 was from punch card area 13 (south of the Tacoma Narrows) (as reported in the Washington Sport Catch Reports); Point Defiance and the Tacoma Narrows were historically reported as local areas of high bocaccio abundance in punch card area 13. Bocaccio appear to have declined in frequency, relative to other species, from the 1970s to the 1980s to the 1990s. From 1975 to 1979, bocaccio were reported as an average of 4.63 percent of the catch (sample size unknown; reference Washington State Sport Catch Reports). During 1980 to 1989, they were 0.24 percent of the 8,430 rockfish identified (Palsson et al., 2008). From 1996 to 2007, bocaccio have not been observed out of the 2,238 rockfish identified in the dockside surveys of the recreational catches (Palsson et al., 2008). In a sample this large, the probability of observing at least one bocaccio would be 99.5 percent, assuming it was at the same frequency (0.24 percent) as in the 1980s. Also (as expected as a result of their habitat preferences), bocaccio have not been observed in the WDFW fisheries independent trawl surveys (Palsson et al., 2008).

5.1.5 Threats

Bocaccio are fished directly and are often caught as bycatch in other fisheries, including those for salmon. Adverse environmental factors led to recruitment failures in the early to mid-1990s (NOAA-Fisheries, 2009a).

5.1.6 Conservation Efforts

Various state restrictions on fishing have been put in place over the years. Current regulations in the State of Washington, where the species is most at risk, limit the daily rockfish catch to three rockfish total (of any species). Because this species is so slow-growing, late to mature, and long-lived, recovery from the above threats will take many years, even if the threats are no longer affecting the species (NOAA-Fisheries, 2009a).

5.2 YELLOWEYE ROCKFISH

This section presents descriptions of the biology, habitat, distribution, population trend, threats, and conservation efforts for the yelloweye rockfish.

5.2.1 Species Description

Yelloweye rockfish are very large rockfish that reach up to 3.5 feet (~1 m) in length and 39 pounds (18 kilograms [kg]) in weight. They are orange-red to orange-yellow in color and may have black on their fin tips. Their eyes are bright yellow. Adults usually have a light to white stripe on the lateral line; juveniles have two light stripes, one on the lateral line and a shorter one below the lateral line (NOAA-Fisheries, 2009b).

Rockfish are unusual among the bony fish in that fertilization and embryo development is internal and female rockfish give birth to live larval young. Larvae are found in surface waters and may be distributed over a wide area extending several hundred miles offshore. Fecundity in female yelloweye rockfish ranges from 1.2 to 2.7 million eggs, considerably more than many other rockfish species. Larvae and small juvenile rockfish may remain in open waters for several months being passively dispersed by ocean currents (NOAA-Fisheries, 2009b).

Larval rockfish feed on diatoms, dinoflagellates, tintinnids, and cladocerans, and juveniles consume copepods and euphausiids of all life stages. Adults eat demersal invertebrates and small fishes, including other species of rockfish, associated with kelp beds, rocky reefs, pinnacles, and sharp dropoffs. Approximately 50 percent of adult yelloweye rockfish are mature by 16 inches (41 centimeters [cm]) total length (about 6 years of age). Yelloweye rockfish are among the longest lived of rockfishes, living up to 118 years (NOAA-Fisheries, 2009b).

5.2.2 Habitat

Juveniles and subadults tend to be more common than adults in shallower water, and are associated with rocky reefs, kelp canopies, and artificial structures such as piers and oil platforms. Adults generally move into deeper water as they increase in size and age, but usually exhibit strong site fidelity to rocky bottoms and outcrops. Yelloweye rockfish occur in waters 80- to 1,560-feet (25- to 475-m) deep, but are most commonly found between 300 to 590 feet (91 to 180 m) (NOAA-Fisheries, 2009b).

5.2.3 Distribution

Yelloweye rockfish range from northern Baja California to the Aleutian Islands, Alaska, but are most common from central California northward to the Gulf of Alaska (NOAA-Fisheries, 2009b).

5.2.4 Population Trends

Recreational catch and effort data spanning 12 years from the mid-1970s to mid-1990s suggests possible declines in abundance. While catch data are generally constant over time, the number of angler trips increased substantially, and there was a decline in the average number of rockfish caught per trip. Taken together, these data suggest declines in the population over time. Currently there are no survey data being taken for this species, but few of these fish are caught by fishermen, suggesting low population abundance (NOAA-Fisheries, 2009b).

Yelloweye rockfish occur more consistently in the recreational catch than bocaccio but at lower frequency than canary rockfish and are still infrequently observed (typically 1 to 2 percent in Puget Sound Proper and 2 to 5 percent in north Puget Sound). The frequency of yelloweye rockfish in Puget Sound Proper appears to have increased from a frequency of 0.34 percent (sample size 8,430) in 1980 to 1989 to a frequency of 2.7 percent (sample size 550) in 1996 to 2001. There were 3 recent years (1999 to 2001) when yelloweye rockfish were not reported in the recreation catch; however, the sample sizes were low these years and zeros are expected for an infrequent species when sample sizes are low (NOAA-Fisheries, 2008a).

In north Puget Sound, in contrast, the frequency of yelloweye rockfish decreased between the 1980s and 1990s in the catch surveys. From 1980 to 1989, they were reported at a frequency of 1.9 percent (sample size 3,910), and from 1996 to 2001, they were reported at a frequency of 0.65 percent (sample size 1,718). Since 2002, fishing for yelloweye rockfish is prohibited in

Puget Sound and thus no frequency data are available since 2002 from the recreational fishery (NOAA-Fisheries, 2008a).

The early stock data do not report sample size (number of individuals identified), thus the uncertainty in the early estimates cannot be calculated. Species misidentification should not be a problem for yelloweye rockfish, but their frequency may be affected by nonrandom reporting in the 1960s and early 1970s. Buckley (1967, 1968, 1970) and Bargmann (1977) suggest that only a few (2 to 3) common species were being recorded in some punch card areas for the period 1965 to 1973 (NOAA-Fisheries, 2008a).

As expected, yelloweye rockfish have been observed infrequently in the WDFW fisheries independent trawl surveys in Puget Sound Proper, and in north Puget Sound, yelloweye rockfish were not observed in the WDFW trawl survey in 1987, 1989, 1991, or 2001, but were caught in 2004 (0.65 percent of the catch). In the Reef Environmental Education Foundation (REEF) scuba survey data, yelloweye rockfish have been sighted consistently throughout the Puget Sound (north and south) since 2001 at an average frequency of 0.5 percent of dives in the south reporting a sighting of yelloweye rockfish and 2 percent of dives in the north reporting a sighting. There is no evidence of a decline in the probability of sightings during dives (NOAA-Fisheries, 2008a).

In the Strait of Georgia, yelloweye rockfish are common in the recent recreational catches; the proportion of yelloweye rockfish in the 2006 and 2005 recreational catch (Department of Fisheries and Oceans Canada catch data) was 17.1 percent and 7.5 percent, respectively. The high frequency of yelloweye rockfish in the recreational catch may reflect targeting for this species, as yelloweye rockfish are a small proportion of the rockfish observed in the few fisheries independent surveys that are available. A genetic tagging study in 2003 (Yamanaka et al., 2004), where data were collected from tissue taken from hooks, 1 percent of samples were yelloweye rockfish. In a 2003 pilot camera study designed to estimate rockfish biomass (Yamanaka et al., 2006), 439 rockfish were observed, of which one (0.2 percent) was a yelloweye rockfish. Another survey in 2004 in the southern Strait of Georgia identified 105 rockfish species, of which 5 (4.8 percent) were yelloweye rockfish (NOAA-Fisheries, 2008a).

There appears to be limited information on population trends for yelloweye rockfish in the Strait of Georgia. Data from the recreational creel survey conducted by Department of Fisheries and Oceans Canada is of limited value because the species composition information and groundfish-targeted effort is lacking; salmon-targeted and groundfish-targeted trips are reported together. Submersible surveys were conducted in 1984 and 2003 in the Strait of Georgia (Yamanaka et al., 2004). Between the two surveys, there was a decline in the mean number of yelloweye rockfish per transect (8.57 to 4.65), but the difference was not statistically significant. Trend data are also available from the commercial long-line fishery (Yamanaka et al., 2004), which show generally declining trends in catch-per-unit-effort (CPUE) from the late 1980s through the 1990s, but interpretation is difficult given the effects of market forces and management regulations on commercial fisheries (NOAA-Fisheries, 2008a).

5.2.5 Threats

Yelloweye rockfish are targeted by recreational and commercial fisheries and are often caught as bycatch in other fisheries, including those for salmon. Adverse environmental factors led to recruitment failures in the early- to mid-1990s (NOAA-Fisheries, 2009b).

5.2.6 Conservation Efforts

Various state restrictions on fishing have been put in place over the years, leading to the current ban on retention of yelloweye rockfish in Washington in 2003. Because this species is slow-growing, late to mature, and long-lived, recovery from these threats will take many years, even if the threats are no longer affecting the species (NOAA-Fisheries, 2009b).

5.3 CANARY ROCKFISH

This section presents descriptions of the biology, habitat, distribution, population trend, threats, and conservation efforts for the canary rockfish.

5.3.1 Species Description

Canary rockfish are large rockfish that reach up to 2.5 feet (77 cm) in length and 10 pounds (4 kg) in weight. Adults have bright yellow to orange mottling over gray, three orange stripes across the head, and orange fins. Animals less than 14 inches long have dark markings on the posterior part of the spiny dorsal fin and gray along the lateral line (NOAA-Fisheries, 2009c).

Rockfish are unusual among the bony fish in that fertilization and embryo development are internal and female rockfish give birth to live larval young. Larvae are found in surface waters and may be distributed over a wide area extending several hundred miles offshore. Fecundity in female canary rockfish ranges from 260,000 to 1.9 million eggs, considerably more than many other rockfish species. Larvae and small juvenile rockfish may remain in open waters for several months, being passively dispersed by ocean currents (NOAA-Fisheries, 2009c).

Larval rockfish feed on diatoms, dinoflagellates, tintinnids, and cladocerans, and juveniles consume copepods and euphausiids of all life stages. Adults eat demersal invertebrates and small fishes, including other species of rockfish, associated with kelp beds, rocky reefs, pinnacles, and sharp dropoffs. Approximately 50 percent of adult canary rockfish are mature at 14 inches (36 cm) total length (about 5 to 6 years of age). Canary rockfish can live to be 75 years old (NOAA-Fisheries, 2009c).

5.3.2 Habitat

Canary rockfish primarily inhabit waters 160- to 820-feet (50- to 250-m) deep but may be found to 1,400 feet (425 m). Juveniles and subadults tend to be more common than adults in shallow water and are associated with rocky reefs, kelp canopies, and artificial structures, such as piers and oil platforms. Adults generally move into deeper water as they increase in size and age but usually exhibit strong site fidelity to rocky bottoms and outcrops where they hover in loose groups just above the bottom (NOAA-Fisheries, 2009c).

5.3.3 Distribution

Canary rockfish range between Punta Colnett, Baja California, and the Western Gulf of Alaska. Within this range, canary rockfish are most common off the coast of central Oregon (NOAA-Fisheries, 2009c).

5.3.4 Population Trends

Recreational catch and effort data spanning 12 years from the mid-1970s to mid-1990s suggests possible declines in abundance. While catch data are generally constant over this time period, the number of angler trips increased substantially, and the average number of canary rockfish caught per trip declined. Taken together, these data suggest declines in the population over time. Currently there are no survey data being taken for this species, but few of these fish are currently caught by fishermen, suggesting low population abundance. Canary rockfish used to be one of the three principal species caught in Puget Sound in the 1960s (NOAA-Fisheries, 2009c).

Canary rockfish occur more consistently in the recreational catch than bocaccio and yelloweye rockfish, but are still infrequently observed (typically 1 to 2 percent in Puget Sound Proper and 2 to 5 percent in north Puget Sound). Like bocaccio, canary rockfish appear to have become less frequent in the catch data since 1965 (NOAA-Fisheries, 2008a). From 1980 to 1989, they were reported at a frequency of 1.1 percent (sample size 8,430) and 1.4 percent (sample size 3,910) in south and north Puget Sound, respectively. From 1996 to 2001, they were reported at a frequency of 0.73 percent (sample size 550) and 0.56 percent (sample size 1,718) in south and north Puget Sound, respectively (NOAA-Fisheries, 2008a). The early stock data do not report sample size (number of individuals identified), thus the uncertainty in the early estimates cannot be calculated. Species misidentification should not be a problem for canary rockfish, but their reported frequency may be affected by nonrandom reporting of species in the catch in the 1960s and early 1970s. The data from Buckley (1967, 1968, 1970) and

Bargmann (1977) suggest that only a few (2 to 3) common species were being recorded in some punch card areas (NOAA-Fisheries, 2008a).

Since 2002, fishing for canary rockfish in Puget Sound is prohibited and thus no frequency data are available from the recreational fishery since then. Canary rockfish have not been observed in the WDFW fisheries independent trawl surveys (Palsson et al., 2008). In REEF scuba survey data (REEF, 2008), canary rockfish were not observed in the first 3 years of the survey, 1998 to 2000, when the number of dives was 100 to 130 per year. Since 2001, however, the number of dives per year has increased substantially, to 400 to 1,000 dives per year, and canary rockfish have been reported consistently since 2001 in 0.5 to 3.6 percent of dives with no evidence of a temporal decline in sightings (REEF, 2008). Canary rockfish have been documented in the Strait of Georgia, but the overwhelming research focus is on the large stocks that are commercially harvested off the west coast of Vancouver Island and in Queen Charlotte Strait (NOAA-Fisheries, 2008a). The prevalence of this species in recreational fishing in the Strait of Georgia indicates that they are probably well-distributed but rare (1 percent of total rockfish catch) in enclosed waters and inlets (DFO, 2008). However, wide interannual variations in some recreational catch data suggests that catch estimates may be unreliable due to poor species identification and changing bag limits (NOAA-Fisheries, 2008a). Recent long-line surveys throughout the Strait of Georgia collected 100 canary rockfish individuals from two shallow sets. All were adults (mean size 529 cm) in post-spawning condition (Lochead and Yamanaka, 2007). They have also been documented in Georgia Strait jig surveys (Yamanaka et al., 2006).

5.3.5 Threats

Canary rockfish are targeted by recreational and commercial fishers and are often caught as bycatch in other fisheries, including those for salmon. Adverse environmental factors led to recruitment failures in the early to mid-1990s (NOAA-Fisheries, 2009c).

5.3.6 Conservation Efforts

Various state restrictions on fishing have been put in place over the years, including banning retention of canary rockfish in Washington in 2003. Because this species is slow-growing, late to mature, and long-lived, recovery from these threats will take many years, even if the threats are no longer affecting the species (NOAA-Fisheries, 2009c).

6.0 SOUTHERN RESIDENT KILLER WHALE

This section presents descriptions of the biology, habitat, distribution, population trend, threats, and conservation efforts for the southern resident killer whale DPS.

6.1 SPECIES DESCRIPTION

The southern resident killer whales are a small (typically 80 to 90 animals) population of killer whales that range from the Queen Charlotte Islands in British Columbia to Monterey, California. They spend a considerably amount of the summer time in the San Juan Islands and Puget Sound areas, feeding mostly on Chinook salmon. Southern resident killer whales are fish-eating whales that grow to considerable size. The males can reach lengths of 32 feet or more and weigh 18,000 pounds. Females are typically a little smaller. They form family groups called pods. The typical pod often numbers between 3 and 25 individuals, but can reach a maximum of about 50. They range all over the world, including in the Atlantic Ocean and as far north as Iceland and as far south as Antarctica (NOAA-Fisheries, 2005b).

6.2 HABITAT AND DISTRIBUTION

Southern resident killer whales have a seasonal (summer) home range that includes Washington and southern British Columbia waters (Puget Sound, the Strait of Juan de Fuca, and the southern Strait of Georgia). Along the north Pacific Coast, resident killer whales occur from Oregon and Washington to the Bering Sea. In the Pacific Northwest, the two closest resident killer whale communities (groups of pods that share a common home range), are the southern residents and the northern residents, which live in northern British Columbia and southeast Alaska (NOAA-Fisheries, 2005b).

Most of the available information about southern resident killer whales has been collected in Puget Sound during the summer. Very little is known about their movements or feeding areas during the winter. In 1999, for the first time, scientists observed resident whales from Puget Sound as far south as Monterey, California (NOAA-Fisheries, 2005b).

Photo-identification work and tracking by boats have provided considerable information on the ranges and movements of southern resident killer whales since the early 1970s. Ranges are best known from late spring to early autumn, when survey effort is greatest. During this period, all three southern resident pods are regularly present in the Georgia Basin (defined as the Georgia Strait, San Juan Islands, and Strait of Juan de Fuca) (Wiles, 2004), with the K- and L-pods typically arriving in May or June and spending most of their time there until departing in October or November. However, during this season, both pods make frequent trips lasting a few days to the outer coasts of Washington and southern Vancouver Island

(Wiles, 2004). The J-pod differs considerably in its movements during this time and is present only intermittently in Georgia Basin and Puget Sound.

While in inland waters during warmer months, all of the pods concentrate their activity in Haro Strait, Boundary Passage, the southern Gulf Islands, the eastern end of the Strait of Juan de Fuca, and several localities in the southern Georgia Strait (Wiles, 2004). Orcas generally spend less time elsewhere, including other sections of the Georgia Strait, Strait of Juan de Fuca, San Juan Islands, Admiralty Inlet west of Whidbey Island, and Puget Sound. Individual pods are fairly similar in their preferred areas of use (Wiles, 2004), although the J-pod is the only group to venture regularly inside the San Juan Islands (Wiles, 2004). Pods commonly seek out and forage in areas that salmon most commonly occur, especially those associated with migrating salmon (Wiles, 2004). Notable locations of particularly high use include Haro Strait and Boundary Passage, the southern tip of Vancouver Island, Swanson Channel off North Pender Island, and the mouth of the Fraser River delta, which is visited by all three pods in September and October (Wiles, 2004). These sites are major corridors of migrating salmon (Wiles, 2004).

During early autumn, southern resident pods, especially the J-pod, expand their routine movements into Puget Sound to likely take advantage of chum and Chinook salmon runs (Wiles, 2004). In recent years, this is the only time of year that the K- and L-pods regularly occur in the Sound. Movements into seldom-visited bodies of water may occur at this time. One noteworthy example of such use occurred in Dyes Inlet near Bremerton in 1997. On October 21 of that year, 19 members of the L-pod entered the 19-square-kilometer (km^2) sized inlet (which is surrounded by urban and residential development) during a strong run of chum salmon into Chico Creek. The whales remained in the inlet until November 19, when salmon abundance finally tapered off (Wiles, 2004).

Orcas have been reported as far south as Commencement Bay, although they generally do not occur further south than the Tacoma Narrows (R. Osborne, Whale Museum, pers. comm., January 4, 2005). The L-pod was reported in Commencement Bay on October 29, 2001, while members of J-, K-, and L-pods were reported in Commencement Bay on January 3, 2003 (Orca Network, 2004).

6.3 POPULATION TRENDS

Available information indicates that the number of southern resident killer whales has never been large, perhaps numbering between 100 and 200 before 1960. Live captures of whales from the southern resident community (for the public display industry) reduced the number to fewer than 70 in 1973, when an annual killer whale census of the population began. The 2003 census counted 84 southern residents, including a solitary killer whale that has been living off

Canada's Vancouver Island since 2001. The 2003 number doesn't include two calves spotted that year. The peak southern resident number was reached in 1996, when 97 whales were counted. There is no comprehensive worldwide estimate of the total number of killer whales (NOAA-Fisheries, 2005b).

NOAA-Fisheries (2008b) reported that over the last three decades, 99 whales were born and counted as part of a survey (average of 3.3/yr). Of these individuals, 82 percent (or 81) survived beyond their first year. As some calves might be missed due to dying before being counted, this is a slightly optimistic survival rate. Only one calf that survived to at least 6 months was observed in 2008, which is lower than the expected number of approximately 3 to 4 based on the age structure of the population and the 2007 abundance of Chinook salmon off of West Coast Vancouver Island. However, there have been previous years with only one or no births.

Over the last 30 years, the southern resident population has included 183 unique individuals. Since 1978, there have been 98 deaths (average 3.25/yr). For a population of 90 individuals, this represents about 3.6 percent of all whales. Killer whales experience age-specific survival: mortality rates are generally highest among young calves, and lowest among reproductive age females. Like humans, survival is sex-specific; male killer whales have higher mortality rates (and decreased life expectancy) compared to females (NOAA-Fisheries, 2008b).

There were a total of seven deaths in 2008, although two of these were calves that, by convention, would not have been counted as part of the population at the time they died. High calf mortality is not considered unusual. The mortalities include: two calves; two old females, approximately 98- and 56-years old; two reproductive females, a 35-year old and a 32-year old; and one subadult, 5-year-old male (NOAA-Fisheries, 2008b).

6.4 THREATS

The primary threats to the southern resident killer whale DPS are prey availability, environmental contaminants, and vessel effects and sound. Killer whales are threatened by pollution and other human activities in many parts of their range. Because orcas are at the top of the food chain, much of their food is likely to carry high contamination from water pollution (NOAA-Fisheries, 2005c).

6.5 CONSERVATION EFFORTS

NOAA-Fisheries (2005c) developed a proposed conservation plan for the southern resident killer whale DPS. The plan lays out an adaptive management approach and a conservation strategy that addresses each of the potential threats based on the best available science. The conservation measures outline links the management actions to an active research program to fill data gaps, and monitoring to assess effectiveness. Feedback from research and monitoring will provide the information necessary to refine ongoing actions and develop and prioritize new actions. Conservation measures in the plan include:

- **Prey Availability.** Support salmon restoration efforts in the region including habitat, harvest, and hatchery management considerations and continued use of existing NOAA-Fisheries authorities under the ESA and Magnuson-Stevens Fishery Conservation and Management Act to ensure an adequate prey base.

- **Pollution/Contamination.** Clean up existing contaminated sites, minimize continuing inputs of contaminants harmful to killer whales, and monitor emerging contaminants.

- **Vessel Effects.** Continue with evaluation and improvement of guidelines for vessel activity near southern resident killer whales and evaluate the need for regulations or protected areas.

- **Oil Spills.** Prevent oil spills and improve response preparation to minimize effects on southern residents and their habitat in the event of a spill.

- **Acoustic Effects.** Continue agency coordination and use of existing Marine Mammal Protection Act (MMPA) mechanisms to minimize potential impacts from anthropogenic sound.

- **Education and Outreach.** Enhance public awareness and educate the public on actions they can participate in to conserve killer whales and improve reporting of southern resident killer whale sightings and strandings.

- **Respond to Sick, Stranded, Injured Killer Whales.** Improve responses to live and dead killer whales to implement rescues, conduct health assessments, and determine causes of death to learn more about threats and guide overall conservation efforts.

- **Transboundary and Interagency Coordination.** Coordinate monitoring, research, enforcement, and complementary recovery planning with international, federal, and state partners.

- **Research and Monitoring.** Conduct research to facilitate and enhance conservation efforts. Continue the annual census to monitor trends in the population, identify individual animals, and track demographic parameters.

7.0 STELLER SEA LION

This section presents descriptions of the biology, habitat, distribution, population trend, threats, and conservation efforts for the Steller sea lion DPS.

7.1 SPECIES DESCRIPTION

The Steller sea lion was listed as a threatened species under emergency rule by NOAA-Fisheries in April 1990; final listing for this species became effective in December 1990. Steller sea lions are opportunistic feeders and consume a variety of fishes such as flatfish, cod, and rockfish, and invertebrates such as squid and octopus. Demersal and off bottom schooling fishes predominate in the Steller sea lion diet (Jones, 1981). Steller sea lions along the coasts of Oregon and California have eaten rockfish, hake, flatfish, cusk eel, squid, and octopus (Fiscus and Baines, 1966; Jones, 1981; Treacy, 1985); rockfish and hake are considered to be consistently important prey items (NMFS, 1992). Feeding on lamprey in estuaries and river mouths has also been documented at sites in Oregon and California (Jones, 1981; Treacy, 1985). Spalding (1964) and Otesiuk et al. (1990) have documented Steller sea lions feeding on salmon, but salmon are not considered to be a major prey item (Osborne, 1988).

The Steller sea lion is the largest member of the Otariid (eared seal) family. Males may be up to 3.25 m (10 to 11 feet) in length and can weigh up to 1,100 kg (2,400 pounds). Females are smaller than males, 2.40 to 2.90 m (7.5 to 9.5 feet) in length and can weigh up to 350 kg (770 pounds). Males and females are light buff to reddish brown and slightly darker on the chest and abdomen; naked parts of the skin are black. Wet animals usually appear darker than dry ones. Pups are about 1 m (3.3 feet) in length and 16 to 23 kg (35 to 50 pounds) at birth and grow to about 30 to 40 kg (65 to 90 pounds) after 6 to 10 weeks. Pups are dark brown to black until 4 to 6 months old when they molt to a lighter brown. By the end of their second year, pups have taken on the same pelage color as adults (NOAA-Fisheries, 2009d).

Bulls become mature between 3 and 8 years of age, but typically are not massive enough to hold territory successfully until 9 or 10 years old. Females reproduce for the first time at 4 to 6 years of age, bearing at most a single pup each year. Pups are born from late May through early July, with peak numbers of births during the second or third week of June. Females stay with their pups for about 9 days before beginning a regular routine of foraging trips to sea. Females mate 11 to 14 days after giving birth. Implantation takes place in late September or early October, after a 3- to 4-month delay. Weaning is not as sharply defined as it is for most other pinniped species, but probably takes place gradually during the winter and spring prior to the following breeding season. It is not uncommon to observe 1- or 2-year-old sea lions suckling from an adult female (NOAA-Fisheries, 2009d).

The breeding range of Steller sea lions extends from southern California to the Bering Sea (Osborne, 1988). Breeding colonies consisting of small numbers of sea lions also exist on the outer coasts of Oregon and British Columbia. There are currently no breeding colonies in Washington (NMFS, 1992), although three major haul-out areas exist on the Washington outer coast and one major haul-out area is located at the Columbia River south jetty (NMFS, 1992). Steller sea lions use Jagged Island and Spit Rock as summer haul-out areas and use Umatilla Reef during the winter (National Marine Mammal Laboratory, unpublished data). Other rocks, reefs, and beaches as well as floating docks, navigational aids, jetties, and breakwaters are also used as haul-out areas (NMFS, 1992).

7.2 HABITAT

Steller sea lion habitat includes both marine and terrestrial areas that are used for a variety of purposes. Terrestrial areas (e.g., beaches) are used as rookeries for pupping and breeding. Rookeries usually occur on beaches with substrates that include sand, gravel, cobble, boulder, and bedrock (NMFS, 1992). Haul-out areas are used at other times than during the breeding and pupping season. Sites used as rookeries may be used as haul-out areas during other times of the year. When Steller sea lions are not using rookery or haul-out areas, they occur in nearshore waters and out over the continental shelf. Some individuals may enter rivers in pursuit of prey (Jameson and Kenyon, 1977).

7.3 DISTRIBUTION

The Steller sea lion is distributed around the North Pacific Ocean rim from northern Hokkaido, Japan through the Kuril Islands and Okhotsk Sea, Aleutian Islands and central Bering Sea, southern coast of Alaska, and south to the Channel Islands, California. The population is divided into Western and Eastern Stocks at 144° West longitude (NOAA-Fisheries, 2009d).

7.4 POPULATION TREND

The worldwide Steller sea lion population is estimated at just under 200,000, with the majority occurring in Alaska. The range of the Steller sea lion extends around the North Pacific Ocean rim from northern Japan, the Kuril Islands and Okhotsk Sea, through the Aleutian Islands and Bering Sea, along Alaska’s southern coast, and south to California (Kenyon and Rice, 1961; Loughlin et al., 1984).

The number of Steller sea lions in the western stock declined by 75 percent between 1976 and 1990. The extent of this decline led NOAA-Fisheries to list the Steller sea lion as threatened range-wide under the ESA in April 1990. In the 1990s, the decline continued for the western stock in Alaska, which was declared endangered in 1997. The eastern stock, which has increased at about 3 percent per year since the 1980s, remains listed as threatened (NOAA-Fisheries, 2009d).

NMFS conducted an aerial survey from June 7 to July 6, 2008, to assess trends in numbers of adult and juvenile of the western stock of Steller sea lions. The recent (2004 to 2008) overall trend in the population of adult and juvenile western Steller sea lions in Alaska is stable or declining slightly. The follows a 4-year period of population increase (approximately 3 percent annually) between 2000 and 2004, which is the only increasing period observed since trend information began to be collected in the 1970s. There continues to be considerable regional variability in recent (2004 to 2008) trends (information listed below is percent change annually):

- The eastern Aleutian Island is the only consistently increasing region (+7 percent);
- The central and western Aleutian Islands declined at relatively high rates (16 percent);
- The central and western Gulf of Alaska increased between 2004 and 2007, but declined slightly between 2007 and 2008; and
- The eastern Gulf of Alaska increased by 35 percent, but likely because of movement of eastern DPS animals from southeast Alaska (Fritz et al., 2008).

7.5 THREATS

Steller sea lion responses to various types of human-induced disturbances have not been specifically studied. Close approach by humans, boats, or aircraft will cause hauled-out sea lions to go into the water. Disturbances that cause stampedes on rookeries may cause trampling and abandonment of pups (Lewis, 1987). Areas subjected to repeated disturbance may be permanently abandoned (Kenyon, 1962), and/or the repeated disturbance may negatively affect the condition or survival of pups by interrupting normal nursing cycles. Low levels of occasional disturbance may have little long-term effect (NMFS, 1992).

Many factors could have contributed to the decline of the western Steller sea lion stock in the 1980s and 1990s. These include factors that cause mortality directly, such incidental take in fisheries, illegal and legal shooting, predation or certain diseases, as well as other factors that indirectly would lead to population declines by reducing productivity. Such indirect factors include the effects of climate change or fisheries, which would alter prey abundance, distribution or species composition leading to nutritional stress, as well as the effects of certain diseases or contaminants (NOAA-Fisheries, 2009d).

7.6 CONSERVATION EFFORTS

NOAA-Fisheries has promulgated regulations on human activity to promote sea lion recovery. As part of the emergency rulemaking when Steller sea lions were first listed as threatened in 1990, NOAA-Fisheries prohibited shooting at or near Steller sea lions, reduced the number that could be killed incidental to fishing operations, and designated 3-mile no-entry zones around rookeries (breeding locations) in western Alaska to protect sea lions from disturbance. In 1992, under the authority of the Magnuson-Stevens Fisheries Conservation and Management Act, NOAA-Fisheries established no-trawl zones around the same rookeries to protect sea lion prey resources. NOAA-Fisheries listed all rookeries, major haul-out sites, and aquatic feeding areas in the southeastern Bering Sea and in Shelikof Strait as Critical Habitat under the ESA in 1993. During 2001 to 2003, a complex suite of regulations to manage Steller sea lion and various groundfish fishery interactions was enacted (NOAA-Fisheries, 2009d).

8.0 MARBLED MURRELET

This section presents descriptions of the biology, habitat, distribution, population trend, threats, and conservation efforts for the marbled murrelet DPS.

8.1 SPECIES DESCRIPTION

The marbled murrelet is a small seabird that nests in the coastal, old-growth forests of the Pacific Northwest. In contrast to other seabirds, murrelets do not form dense colonies and may fly 70 km (about 43 miles) or more inland to nest, generally in older coniferous forests. They are more commonly found inland during the summer breeding season, but make daily trips to the ocean to gather food, primarily fish and invertebrates, and have been detected in forests throughout the year. When not nesting, the birds live at sea, spending their days feeding and then moving several kilometers offshore at night (SEI, 2006).

The breeding season of the marbled murrelet generally begins in April, with most egg-laying occurring in late May and early June. Peak hatching occurs in July after a 27- to 30-day incubation. Chicks remain in the nest and are fed by both parents. By the end of August, chicks have fledged and dispersed from nesting areas (Marks and Bishop, 1997). The marbled murrelet differs from other seabirds in that its primary nesting habitat is old-growth coniferous forest within 50 to 75 miles of the coast. The nest typically consists of a depression on a moss-covered branch where a single egg is laid. Marbled murrelets appear to exhibit high fidelity to their nesting areas and have been observed in forest stands for up to 20 years (Marks and Bishop, 1997). Marbled murrelets have not been known to nest in other habitats, including alpine forests, bog forests, scrub vegetation, or scree slopes (Marks and Bishop, 1997).

Marbled murrelets are presumably a long-lived species but are characterized by low fecundity (one egg per nest) and low nesting and fledging success. Fledging success has been estimated at 45 percent. Nest predation on both eggs and chicks appears to be higher for marbled murrelets than for other alcids and may be cause for concern. Principal predators are birds, primarily corvids (jays, ravens, and crows) (Marks and Bishop, 1997).

At sea, foraging murrelets are usually found as widely spaced pairs. In some instances murrelets form or join flocks that are often associated with river plumes and currents. These flocks may contain sizable portions of local populations (Ralph and Miller, 1994).

8.2 HABITAT

Marbled murrelets are more commonly found inland during the summer breeding season, but make daily trips to the ocean to gather food, primarily fish and invertebrates, and have been detected in forests throughout the year. When not nesting, the birds live at sea, spending their days feeding and then moving several kilometers offshore at night (SEI, 2006). Marbled murrelets feed in nearshore marine waters, mainly within 1 to 2 km from shore, consuming small fish such as Pacific herring, Pacific sand lance, sardines, and juvenile salmonids, as well as invertebrates such as euphasids and shrimp (USFWS, 1997).

Throughout the forested portion of the species' range, marbled murrelets used forest stands with old-growth forest characteristics, generally within 80 km of the coast for nesting. The farthest known nesting site from the marine environment in Washington is 63 km. In Washington, marbled murrelet detections increased when old-growth/mature forests comprised more than 30 percent of the landscape, but decreased when the percentage of clear-cut/meadow in the landscape increased above 25 percent (USFWS, 1997).

8.3 DISTRIBUTION

The marbled murrelet inhabits the Pacific Coast of North America from the Bering Sea to central California (SEI, 2006).

8.4 POPULATION TREND

With declines documented separately for Conservation Zones 1 through 5 (coastal area from California to Washington) and Conservation Zone 6 (Strait of Juan de Fuca/Puget Sound), the USFWS conclude that the listed population has declined significantly since 2002, the year of the estimate in the USFWS' previous 5-year review. For Conservation Zones 1 through 5 combined, population estimates from monitoring for 2000 to 2008 indicate an annual rate of decline in the range of 2.4 to 4.3 percent. For Conservation Zone 6, new data indicate an annual decline of about 15 percent between 2003 and 2008. Based on the tri-state estimate of about 24,400 birds used in the analysis for the 2004 5-year review, the 2008 population estimate of about 18,000 birds represents a decline of about 26 percent across the listed range from that estimate (USFWS, 2009).

8.5 THREATS

The most serious limiting factor for marbled murrelets is the loss of habitat through the removal of old-growth forests and fragmentation of forests. Forest fragmentation may be making nests near forest edges vulnerable to predation by other birds, such as jays, crows, ravens, and great horned owls (USFWS, 1996). Entanglement in fishing nets is also a limiting factor in coastal areas, because the areas of salmon fishing and the breeding areas of marbled murrelets overlap. The marbled murrelet is especially vulnerable to oil pollution; in both Alaska and British Columbia, it is considered the seabird most at risk from oil pollution. In 1989, an estimated 8,400 marbled murrelets were killed as a result of the *Exxon Valdez* oil spill (Marks and Bishop, 1997). Marbled murrelets forage in nearshore waters where recreational boats are most often found. Disturbance by boats may cause them to abandon the best feeding areas (Environment Canada, 2006).

New information regarding prey species indicates declining populations for those species with assessments. There are commercial and recreational fisheries for some prey species stocks; and the Pacific herring in Puget Sound are carrying high body loads of polychlorinated biphenyls (PCBs). In addition, new information indicates prey quality has declined over the last decade and murrelets are now feeding at lower trophic levels in central California and Puget Sound and possibly throughout the California, Oregon, and Washington, but information is not currently available for the Washington and Oregon coastal areas (USFWS, 2009).

Murrelets are exposed to harmful algal blooms (HABs) and dead zones throughout the three-state area, although the potential effects may be more pronounced in specific areas, such as the Oregon coast, Monterey Bay, and Puget Sound. These events result in significant mortality of fish and invertebrates and may be contributing to low food availability during the murrelet breeding season, thereby contributing to low murrelet reproductive success. In addition to the impacts to prey resources, HABs from certain algae species produce biotoxins that result in domoic acid poisoning or paralytic shellfish poisoning, causing murrelet mortality. HABs and dead zones may have been occurring all along and have just begun to be studied; however, scientists predict the scope and length of these events are likely to increase (USFWS, 2009).

Climate change is likely to result in changes to the murrelet's marine environment. While physical changes to the nearshore environment appear likely, much remains to be learned about the magnitude, geographic extent, and temporal and spatial patterns of change, and their effects on murrelets. Limitations on our knowledge of murrelet prey, and how global warming could affect those prey, constrain our ability to forecast effects (USFWS, 2009)

8.6 CONSERVATION EFFORTS

The USFWS published a recovery plan for threatened marbled murrelets in California, Oregon, and Washington (USFWS, 1997).

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APPENDIX E

Essential Fish Habitat Assessment

ESSENTIAL FISH HABITAT ASSESSMENT

Custom Plywood Emergency Action Project
Former Custom Plywood Mill
Anacortes, Washington

1.0 ACTION AGENCY

U.S. Army Corps of Engineers, Seattle District

2.0 LOCATION

The project site is located on the western shore of Fidalgo Bay in Anacortes, Skagit County, Washington, at Township 35N, Range 2E, and Section 18.

3.0 PROJECT NAME

Custom Plywood Emergency Action Project

4.0 ESSENTIAL FISH HABITAT BACKGROUND

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NOAA-Fisheries) on activities that may adversely affect Essential Fish Habitat (EFH). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." "Waters" include "aquatic areas and their associated physical, chemical, and biological properties that are used by fish." They may include aquatic areas historically used by fish. "Substrate" includes "sediment, hard bottom, structures underlying the waters, and associated biological communities" (NMFS, 1999).

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within and outside of EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside of EFH, such as upstream and upslope activities that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA-Fisheries is required by federal agencies undertaking, permitting, or funding activities that may adversely affect EFH, regardless of its location.

This assessment evaluates the impacts of the proposed project to determine whether it "may adversely affect" designated EFH for federally managed fisheries species in the proposed action area. The assessment also describes conservation measures to avoid, minimize, or otherwise offset potential adverse effects of the proposed action on designated EFH.

5.0 IDENTIFICATION OF EFH

The Pacific Fishery Management Council (PFMC) has designated EFH for federally managed fisheries within the waters of Washington, Oregon, and California. The designated EFH for groundfish (PFMC, 1998a; Casillas et al., 1998) and coastal pelagic species (PFMC, 1998b) encompasses all waters from the mean high water line and upriver extent of salt water to the boundary of the United States exclusive economic zones (370.4 km) (PFMC, 1998a, 1998b). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington, Oregon, California, and Idaho, except areas upstream of certain impassable manmade barriers (as identified by the PFMC), and longstanding, naturally impassable barriers (e.g., natural waterfalls in existence for several hundred years) (PFMC, 1999). In estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception, to the Canadian Border (PFMC, 1999).

Groundfish, coastal pelagic, and salmonid fish species that have designated EFH in Puget Sound are listed in Table 1. Some of these species may occur in the action area. Refer to the relevant EFH designations (Casillas et al., 1998; PFMC, 1998a, 1998b, 1999) for life-history stages of these species that may occur in the project vicinity. Assessment of the impacts to these species' EFH from the proposed project is based on this information.

6.0 DETAILED DESCRIPTION OF THE PROPOSED PROJECT

The major activities of the emergency action included:

- Implementing erosion control measures to prevent shoreline erosion and tidal inundation at a Washington State Model Toxics Control Act (MTCA) hazardous waste site.

For a more detailed project description, please refer to Section 2.0 of the biological evaluation (BE).

7.0 POTENTIAL ADVERSE EFFECTS OF PROPOSED PROJECT

The EFH designation for the Pacific salmon fishery includes all those streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except above the impassible barriers identified by PFMC (1999). In estuarine and marine areas, proposed designated EFH for salmon extends from nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone offshore of Washington, Oregon, and California north of Point Conception (PFMC, 1999).

The Pacific salmon management unit includes Chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), and pink salmon (*O. gorbuscha*). All three of these species use Puget Sound for adult migration, juvenile outmigration, and rearing where suitable habitat is present. Resident coho and Chinook remain within Puget Sound throughout their entire life histories.

The EFH designation for ground fishes and coastal pelagics is defined as those waters and substrate necessary to ensure the production needed to support a long-term sustainable fishery. The marine extent of ground fish and coastal pelagic EFH includes those waters from the nearshore and tidal submerged environment within Washington, Oregon, and California state territorial waters out to the exclusive economic zone (370.4 km [231.5 miles]) offshore between Canada and the Mexican border.

The West Coast ground fish management unit includes 83 species that typically live on or near the bottom of the ocean. Species groups include skates and sharks, rockfishes (55 species), flatfishes (12 species), and ground fishes. Some ground fishes, such as lingcod (*Ophiodon elongatus*), cabezon (*Scorpaenichthys marmoratus*), and species of rockfish (*Sebastes* spp.), potentially occur in the action area located in north Puget Sound.

Coastal pelagics are schooling fishes, not associated with the ocean bottom, that migrate in coastal waters. West Coast pelagics include the Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), northern anchovy (*Engraulis mordax*), jack mackerel (*Trachurus symmetricus*), and market squid (*Loligo opalescens*). These fishes are primarily associated with the open-ocean and coastal areas (PFMC, 1998a) and are not likely to occur in the action area.

The Pacific sand lance (*Ammodytes hexapterus*) and the surf smelt (*Hypomesus pretiosus pretiosus*) are an important forage fish for Chinook and coho salmon. Loss of prey is considered an adverse effect on EFH. Surf smelt are known to occur in the action area.

Essential fish habitat for ground fishes and Pacific salmon is present in the project action area. The existing shoreline prior to implementation of the emergency action was of marginal value, at best, as a foraging area for Pacific salmon and ground fishes. The erosion control measure is expected to be in place for a period of 18 to 24 months. No permanent adverse effects on

EFH for ground fishes, coastal pelagics, Pacific salmonids, or their prey species will result from the emergency action.

8.0 CONSERVATION MEASURES

Implementing the conservation measures specified in Section 2.3 of the BE helped to avoid and minimize any potential effects of the proposed project on EFH.

9.0 CONCLUSION

No permanent adverse effects on EFH for ground fishes, coastal pelagics, Pacific salmonids, or their prey species will result from the emergency action.

10.0 REFERENCES

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TABLE 1

SPECIES OF FISH WITH DESIGNATED ESSENTIAL FISH HABITAT IN THE ACTION AREA[1]

Former Custom Plywood Mill
Anacortes, Washington

Common Name	Scientific Name	Common Name	Scientific Name
Groundfish		**Groundfish (cont.)**	
Arrowtooth flounder	*Atheresthes stomias*	redstripe rockfish	*Sebastes proriger*
Big skate	*Raja binoculata*	rex sole	*Glyptocephalus zachirus*
Black rockfish	*Sebastes melanops*	rock sole	*Lepidopsetta bilineata*
Bocaccio	*Sebastes paucispinis*	rosethorn rockfish	*Sebastes helvomaculatus*
Brown rockfish	*Sebastes auriculatus*	rosy rockfish	*Sebastes rosaceus*
Butter sole	*Isopsetta isolepis*	rougheye rockfish	*Sebastes aleutianus*
Cabezon	*Scorpaenichthys marmoratus*	sablefish	*Anoplopoma fimbria*
California skate	*Raja inornata*	sand sole	*Psettichthys melanostictus*
Canary rockfish	*Sebastes pinniger*	sharpchin rockfish	*Sebastes zacentrus*
China rockfish	*Sebastes nebulosus*	shortspine thornyhead	*Sebastolobus alascanus*
Copper rockfish	*Sebastes caurinus*	spiny dogfish	*Squalus acanthias*
Curlfin sole	*Pleuronichthys decurrens*	splitnose rockfish	*Sebastes diploproa*
Darkblotch rockfish	*Sebastes crameri*	starry flounder	*Platichthys stellatus*
Dover sole	*Microstomus pacificus*	striptail rockfish	*Sebastes saxicola*
English sole	*Parophrys vetulus*	tiger rockfish	*Sebastes nigrocinctus*
Flathead sole	*Hippoglossoides elassodon*	vermilion rockfish	*Sebastes miniatus*
Greenstriped rockfish	*Sebastes elongatus*	yelloweye rockfish	*Sebastes ruberrimus*
Hake	*Merluccius productus*	yellowtail rockfish	*Sebastes flavidus*
Jack mackerel	*Trachurus symmetricus*		
Kelp greenling	*Hexagrammos decagrammus*	**Coastal Pelagic**	
Lingcod	*Ophiodon elongatus*	anchovy	*Engraulis mordax*
Longnose skate	*Raja rhina*	market squid	*Loligo opalescens*
Pacific cod	*Gadus macrocephalus*	Pacific mackerel	*Scomber japonicus*
Pacific ocean perch	*Sebastes alutus*	Pacific sardine	*Sardinops sagax*
Pacific sanddab	*Citharichthys sordidus*		
Petrale sole	*Eopsetta jordani*	**Salmonid Species**	
Quillback rockfish	*Sebastes maliger*	Chinook salmon	*Oncorhynchus tshawytscha*
Ratfish	*Hydrolagus colliei*	coho salmon	*Oncorhynchus kisutch*
Redbanded rockfish	*Sebastes babcocki*	pink salmon	*Oncorhynchus gorbuscha*

Note
1. Source: NEMS, 2001.