ENVIRONMENTAL ASSESSMENT OF PROPOSED GEODUCK HARVEST
ALONG THE NORTHEASTERN SHORELINE OF HOOD CANAL
AT THE COON BAY 1-4 GEODUCK TRACT (#19900)

Commercial geoduck harvest is jointly managed by the Washington Departments of Fish and Wildlife (WDFW) and Natural Resources (DNR) and is coordinated with treaty tribes through harvest management plans. Harvest is conducted by divers from subtidal beds between the -18 foot and -70 foot water depth contours (corrected to mean lower low water, hereafter MLLW). Harvest is rotated throughout Puget Sound in seven geoduck management regions. The fishery, its management, and its environmental impacts are presented in the Puget Sound Commercial Geoduck Fishery Management Plan (DNR & WDFW, 2008) and the Final Supplemental Environmental Impact Statement (WDFW & DNR, 2001). The proposed harvest along the northeastern shoreline of the Hood Canal is described below.

Proposed Harvest Dates: Periodic harvest continuing in 2023-2024

Tract name: Coon Bay 1-4 geoduck tract (#19900)

Description: (Figure 1, Tract vicinity map)

The Coon Bay 1-4 geoduck tract is a subtidal area of approximately 104 acres (Table 1) along the northeastern shoreline of the Hood Canal, in the Hood Canal Geoduck Management Region. The tract is located south of and adjacent to the Foulweather 2 geoduck tract (#19750) and north of and adjacent to the Port Gamble geoduck tract (#20000). The Coon Bay 1-4 tract is bounded by a line projected from a Control Point (CP) on the -25 foot (MLLW) water depth contour in the northeastern corner of the tract at 47°54.406’ N. latitude, 122°35.601’ W. longitude (CP 1) southerly along the -25 ft. (MLLW) water depth contour to a point at 47°52.760’ N. latitude, 122°34.725’ W. longitude (CP 2); then westerly to a point on the -70 ft. (MLLW) water depth contour at 47°52.744’ N. latitude, 122°34.907’ W. longitude (CP 3); then northerly along the -70 ft. (MLLW) water depth contour to a point at 47°54.400’ N. latitude, 122°35.706’ W. longitude (CP 4); then easterly to the point of origin (Figure 2).

This estimate of the tract boundary is made using GIS and the WDFW 2008 geoduck survey transect data. All contours are corrected to MLLW. Contour GIS layers from Dale Gombert (WDFW) were generated from NOAA soundings. Shoreline data is from DNR, digitized at 1:24000 scale in 1999. The -70 ft. (MLLW) water depth contour was used for the deep-water boundary, and the -25 ft. (MLLW) contour was used for the shallow boundary, due to herring spawning habitat nearshore of the tract. The latitude and longitude positions are reported in degrees and decimal minutes to the closest thousandths of a minute. Corner latitude and longitude positions were generated using

GIS, and have not been field verified to determine consistency with area estimates, landmark alignments, or water depth contours.

The delineation of the tract boundary will be field verified by DNR prior to any geoduck harvest. Any variance to the stated boundary will be coordinated between WDFW and DNR prior to geoduck harvest.

Substrate:

Geoducks are found in a wide variety of sediments ranging from soft mud to gravel. Geoducks are most commonly harvested in sand with varying amounts of mud and/or gravel. The specific sediment type of a subtidal bed is primarily determined by water current velocity. Coarse sediments are generally found in areas of fast currents and finer (muddier) sediments in areas of weak currents. The major impact of harvest will be the creation of small holes where the geoducks are removed. The substrate holes refill in areas with strong water currents much faster than in areas with weak water currents, but generally fill within a few days to several weeks with no long-term effects. Water currents tend to be moderate in the vicinity of the Coon Bay 1-4 tract. At a water current station located at the mouth of Port Gamble Bay, currents are predicted to reach a maximum flood velocity of 2.2 knots and maximum ebb velocity of 1.3 knots (Tides and Currents software; station #1576).

The surface substrates within this tract were recorded during the 2008 survey. Sand was the predominant substrate type on all transects within this tract. Wood debris was noted on certain transects at the north portion of the tract (transects8-12 and 30). Shell and/or shell hash were also noted as substrate components at the northern portion of the tract (transects15-28 and 69). In the southerly portion of the tract, mud was observed as a substrate component (transects51-55, 66-69, and 73-78).

Water Quality:

Water quality is good at the Coon Bay 1-4 geoduck tract. Water mixing at this tract is affected by the convergence of currents from the central basin of Puget Sound, Hood Canal, and Admiralty Inlet. This convergence prevents stratification (water layering) and brings deeper nutrient-rich waters to the surface. As a result, the marine waters in this area are well oxygenated and productive. The following data on water quality has been provided by the Washington Department of Ecology (DOE) for Puget Sound for the Port Gamble station (PGA001) at 47.8400° N. latitude; 122.5800° W. longitude. The DOE latitude and longitude positions are recorded in decimal degrees. Between 1997 and 2001 (last year of data available at this location), at a water depth of 10 meters (33 ft.), the range of dissolved oxygen concentration was 5.6 mg/l to 12.0 mg/l. The range of salinity at this station and depth was 27.7 ppt. to 30.1 ppt. The range of water temperature at this station was 8.59° C to 14.38° C.

This geoduck tract has been classified as "Approved" by the Washington Department of Health.

Biota:

Geoduck:

The Coon Bay 1-4 geoduck tract is a subtidal area of approximately 104 acres. The current abundance of geoducks on this tract is low, with an estimated average density of 0.005 geoducks/sq.ft. This tract contains a current estimated biomass of 58,326 pounds of geoducks (Table 1). On all geoduck survey dig stations sampled in 2009, geoducks are considered commercial quality (Table 2). Digging difficulty ranged from "very easy" to "very difficult." The factors which influenced the "very difficult" rating (dig station #67) included moderate depth of geoducks in the substrate and shell in the substrate that hindered digging. Shell in the substrate that interfered with digging geoducks was noted on 6 out of 11 dig stations (stations 17, 23, 33, 55, 67, and 73).

The geoduck densities from the 2008 survey range from 0.01 geoducks/sq.ft. at transect #21 to 0.59 geoducks/sq.ft. at transect #76 (Table 3 and Figure 3). The geoducks at the Coon Bay 1-4 tract are large for Puget Sound, averaging 2.7 pounds, while the average geoduck in Puget Sound is 2.1 pounds. The lowest station average whole weight is 2.3 pounds per geoduck at dig station #55 and the highest station average whole weight is 3.7 pounds per geoduck at dig station #49, (Table 4). Transect locations and geoduck counts corrected with siphon "show factors" are listed in Table 5.

The Coon Bay 1-4 geoduck tract was surveyed in 1970, 1975, and 1976 by WDFW. This tract was previously harvested from 1977 to 1979, and 839,141 pounds of geoduck clams were harvested The tract was surveyed again in 1980 and 1986 by WDFW. A tribal survey was done in 1997. This tract was most recently surveyed in 2008 (geoduck density transects) and 2009 (geoduck weight samples) by WDFW. A total of 63 transects from the 2008 survey are used in the preparation of this environmental assessment.

Geoducks are managed for long term sustainable harvest. No more than 2.7% of the fishable stocks are harvested (total fishing mortality) each year in each management region throughout Puget Sound. The fishable portion of the total Puget Sound population includes geoducks that are found in water deeper than -18 feet and shallower than -70 feet (corrected to mean lower low water - MLLW). Other geoducks which are not harvestable are found inshore and offshore of the harvest areas. Observations in south Puget Sound show that major geoduck populations continue to depths of 360 feet. Additional geoducks exist in polluted areas and are also unavailable for harvest but continue to spawn and contribute to the total population.

The low rate of harvest is due to the geoduck's low rate of natural recruitment. WDFW has studied the regeneration rate of geoducks on certain tracts throughout Puget Sound. The estimated average time to regenerate a tract to its original density, after removal of 65 percent of the geoducks, is 55 years. The recovery time for the Coon Bay tract is unknown. The research to empirically analyze tract recovery rates is continuing.

Fish:

Geoduck beds are generally devoid of rocky outcroppings and other relief features that attract and support many fish species, such as rockfish and lingcod. On geoduck tracts, the bathymetry is typically relatively flat, and the substrate is typically composed of soft sediments, which provide few attachments for macroalgae associated with rockfish and lingcod. The fish observed during the survey at the Coon Bay 1-4 tract (Table 6) were sculpins and various flatfish including rock sole, sanddab, and starry flounder..

WDFW marine fish managers were asked of their concerns regarding possible impacts of geoduck fishing on groundfish and baitfish. Greg Bargmann of WDFW stated that geoduck fishing would have no long-term detrimental impacts and may have some short-term benefits to flatfish populations by increasing the availability of food. Dan Penttila of the WDFW Fish Management Program recommended that eelgrass beds within the harvest tract should be preserved for any spawning herring.

Eelgrass has been observed along this tract to a maximum depth of -18 ft. (MLLW) during a 2008 eelgrass survey. The nearshore tract boundary will be along the -25 ft. (MLLW) water depth to provide a vertical buffer between eelgrass beds and geoduck harvest.

There are Pacific herring spawning grounds along the northeastern shoreline of Hood Canal in the vicinity of the Coon Bay 1-4 tract (1996 Washington State Baitfish Stock Status Report, Figure 4). A pre-spawner holding area is located outside of Port Gamble Bay (Figure 4). The Port Gamble stock is considered the second largest spawning stock in Washington (1996 Washington State Baitfish Stock Status Report). Along the shorelines in the vicinity of Port Gamble and Coon Bay, herring spawning timing is reported to occur between January 15 through April 15. During the herring spawning period, geoduck harvesting will occur between the -35 foot (MLLW) and -70 foot (MLLW) water depth contours. Based on a nearshore tract boundary of -25 feet (MLLW), and a deeper nearshore tract boundary of -35 feet (MLLW) during the herring spawning season, geoduck fishing on the Port Gamble tract should have no detrimental impacts on herring.

Surf smelt spawning habitat has been identified south of the proposed harvest area of the

Coon Bay 1-4 geoduck tract. Surf smelt spawning habitat also occurs west of the Coon Bay 1-4 geoduck tract along the northern shoreline of Hood Head (Figure 4). Surf smelt deposit adhesive, semi-transparent eggs on beaches that have a specific mixture of coarse sand and pea gravel. Inside Puget Sound, surf smelt spawning is thought to be associated with freshwater seepage, where the water keeps the spawning gravel moist. Eggs are deposited in water a few inches deep, around the time of the high water slack tide. There is substantial vertical separation between surf smelt spawning (slack high tide) and geoduck harvest activity (-25 feet to -70 feet, MLLW on the Coon Bay 1-4 tract).

Sand lance spawning has been documented inshore of this tract. Sand lance populations are widespread within Puget Sound, the Strait of Juan de Fuca and the coastal estuaries of Washington. They are most commonly observed along shorelines of the eastern Strait of Juan de Fuca and Admiralty Inlet. However, WDFW plankton surveys and ongoing exploratory spawning habitat surveys suggest that there are very few, if any, bays and inlets in the Puget Sound basin that will not be found to support sand lance spawning activity. Spawning of sand lance occurs at tidal elevations ranging from +5 feet to the mean higher high water line. After deposition, wave action may distribute sand lance eggs over a wider range of the intertidal zone. The incubation period is approximately four weeks. Sand lance are an important part of the trophic link between zoolplankton and larger predators in local marine food webs. Like all forage fish, sand lance are a significant component in the diet of many economically important resources in Washington. On average, 35 percent of juvenile salmon diets are comprised of sand lance. For juvenile Chinook salmon, sand lance are particularly important, composing 60 percent of their diet.. Other economically important species such as Pacific cod (*Gadus macrocephalus)*, Pacific hake (*Merluccius productus*) and dogfish (*Squalus acanthias*) feed heavily on juvenile and adult sand lance. There is substantial vertical separation between sand lance spawning (+5 feet to mean higher high water) and geoduck harvest activity (-25 feet to -70 feet, MLLW on the Coon Bay 1-4 tract). Geoduck harvesting on the Coon Bay 1-4 tract should have no detrimental impacts on sand lance spawning.

NOAA Fisheries Service announced on April 27, 2010, that it was listing canary and yelloweye rockfish as “threatened” and bocaccio as “endangered” under ESA (federal Endangered Species Act). The listings became effective on July 27, 2010. Historic high levels of fishing and poor water quality are cited as reasons that these rockfish populations are in peril and have been slow to recover. On January 23, 2017, canary rockfish were delisted based on newly obtained samples and genetic analysis (Federal Register 82 FR 7711). Geoduck fishery managers are tracking this process and will take actions necessary to reduce the risk of “take” of any listed rockfish species that could potentially result from geoduck harvest activity.

Two salmon populations, Puget Sound Chinook salmon and Hood Canal summer run chum salmon, were listed by the National Marine Fisheries Service (renamed NOAA Fisheries Service) on March 16, 1999, as threatened species under the federal Endangered

Species Act. Critical habitat for summer run chum salmon populations includes all marine, estuarine, and river reaches accessible to the listed chum salmon between Dungeness Bay and Hood Canal and within Hood Canal. The timing for summer run chum spawning is early September to mid-October. Out-migration of juveniles has been observed in Hood Canal during February and March, though out-migration may be as late as mid-April. Recent recovery and supplementation efforts have reversed the trend of decline in Hood Canal summer run chum salmon stocks. Total escapement for Hood Canal summer run chum salmon has reached historic high levels and risk of extinction has decreased for all stocks (Adicks, K. *et al*., 2007). The Coon Bay 1-4 tract is within the critical habitat range for Hood Canal summer run chum salmon. Salmon managers have indicated that geoduck harvest at this location would likely not affect Hood Canal summer run chum salmon stocks.

Critical habitat for Puget Sound Chinook salmon includes all marine, estuarine and river reaches accessible to listed Chinook salmon in Puget Sound. WDFW recognizes 27 distinct stocks of Chinook salmon; 8 spring-run, 4 summer-run, and 15 summer/fall and fall-run stocks. The existence of an additional five spring-run stocks is in dispute. The majority of Puget Sound Chinook salmon emigrate to the ocean as sub-yearlings.

There are no tributaries in the immediate vicinity of the Coon Bay tract that support runs of Hood Canal summer run chum or Puget Sound Chinook salmon. Streams near the Coon Bay 1-4 tract are Shine Creek which empties into Squamish Harbor (approximately 5.1 miles from the tract) and Thorndyke Creek (approximately 8.9 miles from the tract). The geographic separation (horizontal) of this tract from known spawning tributaries and vertical separation of geoduck harvest (deeper and seaward of the -18 ft. MLLW contour) from juvenile salmon rearing areas and migration corridors (upper few meters of the water column) reduces or eliminates potential impacts to salmon populations. Charles Simenstad of the University of Washington School of Fisheries stated that the exclusionary principle of not allowing leasing/harvesting in water shallower than -18 ft. (MLLW), the 2+ ft. vertically from elevation of the lower eelgrass margin, and within any regions of documented herring or forage fish spawning should under most conditions remove the influences of harvest-induced sediment plumes from migrating salmon. Geoduck harvest should have no major impacts on salmon populations.

On May 7, 2007, NOAA Fisheries Service announced the listing of Puget Sound steelhead as “threatened” under ESA. This listing includes more than 50 stocks of summer- and winter-run steelhead. Steelhead share many of the same waters as Puget Sound Chinook salmon, which are already protected by ESA, and will benefit from shared conservation strategies. There are no identified streams or rivers in the vicinity of the Coon Bay 1-4 geoduck tract that support steelhead stocks. The horizontal separation between tributaries that support steelhead runs and the Coon Bay 1-4 tract will ensure that geoduck harvest will likely have no impact on steelhead populations.

Green sturgeon have undergone ESA review in recent years, due to depressed populations. NOAA Fisheries Service produced an updated status review on February 22, 2005, and reaffirmed that the northern green sturgeon Distinct Population Segment (DPS) warranted listing as a Species of Concern, however proposed that the Southern DPS should be listed as threatened under the ESA. NOAA Fisheries Service published a final rule on April 7, 2006, listing the Southern DPS as threatened (71 FR 17757), which took effect June 6, 2006. The green sturgeon critical habitat proposed for designation includes the outer coast of Washington within 110 meters (m) depth (including Willapa Bay and Grays Harbor) to Cape Flattery and the Strait of Juan de Fuca to its United States boundary. Puget Sound proper has been excluded from this critical habitat designation. The Coon Bay 1-4 geoduck tract is outside of the critical habitat range of green sturgeon, therefore geoduck harvest at this location will have no adverse effects on ESA recovery efforts for green sturgeon populations.

Invertebrates:

Marine invertebrates, which are frequently found on geoduck beds, were also observed on this tract. The most common of these include: [1] mollusks (geoducks, horse clams, truncated mya clams, false geoducks, moon snails, moon snail egg cases, olive snails, octopus, and nudibranchs); [2] echinoderms (sea cucumbers, sand dollars, sunflower sea stars, sand stars, short-spined stars, blood stars, leather stars, sun stars, and rose stars); [3] cnidarians (sea pens, sea whips, hydroids, striped anemones, and plumed anemones); [4] arthropods (Dungeness crabs, red rock crabs, graceful crabs, decorator crabs, hermit crabs, and ghost shrimp); [5] annelid worms (chaetopterid, terebellid, sabellid) and flat worms; [6] ascidians (sessile tunicates); [7] sponges; and [8] bryozoans (Table 6). Geoduck harvest has not been shown to have long-term adverse effects on these invertebrates. Geoduck harvest can depress some local populations of benthic invertebrates, however most of these populations recover within one year.

WDFW and DNR have studied the effects of geoduck harvest on the population of Dungeness crab at Thorndyke Bay in Hood Canal. The results of 4.6 years of study have shown no adverse effects on crab populations due to geoduck fishing. Dungeness crab were observed on 50 out of 63 transects done during the 2008/2009 geoduck survey at Coon Bay 1-4. Dungeness crab, which are present on the tract, may experience peak molt in mid-April, based on data from the Kingston area (Cain, 10/15/01).

To determine the potential impacts to Dungeness crab, the percentage of substrate disturbed during fishing was calculated and compared to the entire crab habitat within the tract and shoreward of the tract to the +1 ft. level and seaward out to -330 ft. (MLLW) water depth contour (Figure 5, Potential crab habitat map). Dr. Dave Armstrong at the University of Washington has determined that Dungeness crab utilize Puget Sound bottoms from the +1 ft. level out to the -330 ft. level. The entire crab habitat along this tract is roughly 920 acres. There were approximately 1,208,952 harvestable geoducks in the entire 104 acre tract, from the 2008/2009 survey estimate. With a harvest of 65 percent, the total number harvested would be roughly 785,819 geoducks. Approximately 1.18 square feet of substrate is disturbed for every geoduck harvested; therefore 785,819 x 1.18 = 927,266 square feet of substrate, or roughly 21.3 acres. This is approximately 2.3 percent of the total available crab habitat in the vicinity of this tract. Based on the low amount of disturbance of potential crab habitat in the vicinity of the tract, and the lack of effects observed at the Thorndyke Bay study, we conclude that any effects on Dungeness crab will be very minor, if they occur at all.

Aquatic Algae:

Large attached aquatic algae are not generally found in geoduck beds in large quantities. Light restriction often limits algal growth to areas shallower than where most geoduck harvest occurs. Aquatic algae observed during the pre-fishing geoduck surveys (Table 7) include:

> Laminarian algae, large and small red algae, Desmarestiales algae, sea lettuce, and a diatom layer.

John Boettner and Tim Flint, from the WDFW Habitat Division, have stated that ifgeoduck fishing remainsrestricted seaward of the eelgrass beds, they have no concerns about harvesting, and that the existing conditions in the fishery SEIS are sufficient to protect fish and wildlife habitat and natural resources. WDFW divers performed an eelgrass survey on this tract on May 5, 2008, by swimming the entire shoreward boundary of the tract. Eelgrass was documented at a maximum depth of -18 ft. (MLLW). The shoreward boundary of this tract will be no shallower than the -25 ft. (MLLW) water depth contour, which should provide a sufficient buffer for any eelgrass beds in the vicinity of the tract.

Marine Mammals:

Several species of marine mammals, including seals, sea lions, river otters, gray whales, and killer whales may be observed in the vicinity of this geoduck tract. The Southern Resident stock of killer whales reside mainly in the San Juan Islands throughout spring and summer, but incursions south into Puget Sound occur more frequently during Winter months (Brent Norberg, NOAA, pers. comm. 5/15/06). The Southern Resident stock of killer whales was listed as “endangered” under the federal Endangered Species Act (ESA) by the National Marine Fisheries Service on November 15, 2005. This is in addition to the designation of this stock in May 2003 as “depleted” under the Marine Mammal Protection Act. More information and a recovery plan for this stock can be found at the NOAA website: https://www.fisheries.noaa.gov/action/listing-southern-resident-killer-whale-under-esa.

Hand pick shellfish fisheries, like geoduck harvesting, are considered Category III under the Marine Mammal Authorization Program for Commercial Fisheries. This means that there is a “rare or remote” likelihood of marine mammal “take,” (Brent Norberg, NOAA, pers. comm. 5/15/06). Precautions should be taken by commercial divers, when marine mammals are in the area, to be aware of marine mammal movements and behavior to eliminate the remote risk of entanglement with diver hoses and lines.

Birds:

A variety of marine birds are common in Puget Sound and the general vicinity of this tract. The most significant of these are guillemots, murres, murrelets, grebes, loons, scoters, dabbing ducks, black brant, mergansers, buffleheads, cormorants, gulls, and terns. Blue heron, bald eagles, and osprey are also regularly observed. Geoduck harvest does not appear to have any significant effect on these birds or their use of the waters where harvest occurs. A study by DNR and the WDFW was conducted at northern Hood Canal to learn the effects of geoduck fishing on bald eagles (Watson et al., 1995). A significant conclusion of this study is that commercial geoduck clam harvest is unlikely to have any adverse impacts on bald eagle productivity.

Other uses:

Adjacent Upland Use:

The upland properties adjacent to the tract are primarily designated as “semi-rural” shoreline environmental designations.

To minimize possible disturbance to adjacent residents, harvest vessels are not allowed shoreward of the 200 yards seaward of the ordinary high tide line (OHT). Harvest is allowed only during daylight hours and no harvest is allowed on Saturday, Sunday, or state holidays.

The only visual effect of harvest is the presence of the harvest vessels on the tract. These boats (normally 35-40 feet long) are anchored during harvest and divers conduct all harvest out of sight. Noise from boats, compressors and pumps may not exceed 50 dB measured 200 yards from the noise source, which is 5 dBA below the state noise standard.

Fishing:

The waters around this tract are not prime sport fishing areas; however, this area is popular for recreational crab harvest. Sport fishing is open year-round for surfperch. Rockfish is closed for recreational harvest. Lingcod can only be taken May 1 to June 15 by hook and line or May 21 to June 15 by spearfishing. This area is closed to salmon harvest except for shore fishing between Salsbury Point Park and the Hood Canal bridge. The WDFW Sport Fishing Rules pamphlet describes additional seasons, size limits, daily limits, specific closed areas, and additional rules for salmon and other marine fish species. The fishing which does occur should not create any problems for the geoduck harvesting effort in the area.

Geoduck fishing on this tract is managed in coordination with the Hood Canal treaty tribes through state/tribal geoduck harvest management plans. The non-Indian geoduck fishery should not conflict with any concurrent tribal fisheries.

Navigation:

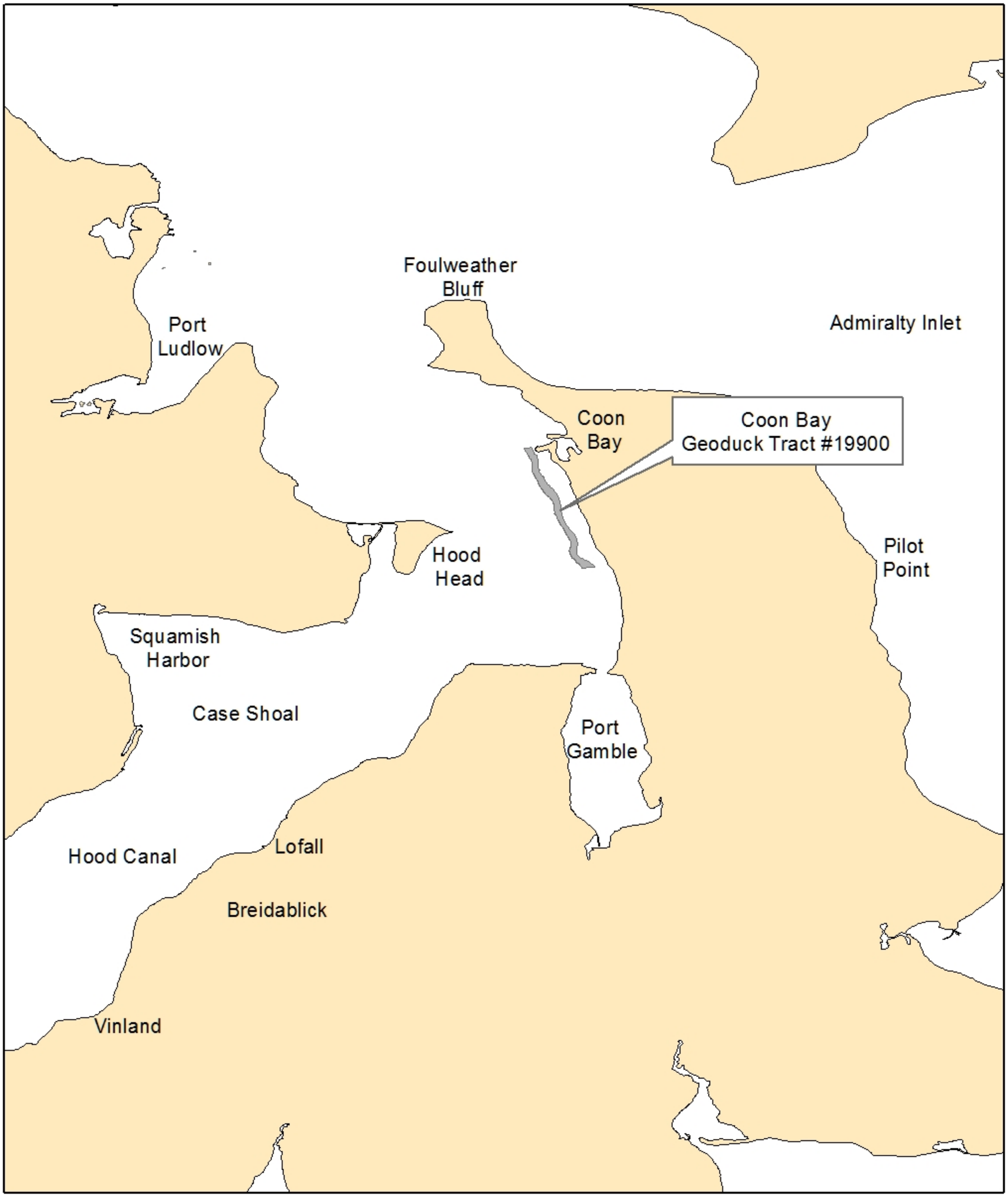
The Coon Bay area is used by recreational and commercial vessels traveling in Hood Canal. Geoduck harvesting at this site should not result in any significant navigational conflicts. The Washington Department of Natural Resources will notify the local boating community prior to any harvest.

Summary:

Commercial geoduck harvest is proposed for one tract along the northeastern shoreline of the Hood Canal. The tract was most recently surveyed in 2008/2009 by WDFW and after subtracting harvest, the current biomass estimate for the 104 acre harvest area is 58,326 pounds. The commercial tract is presently classified by DOH as “Approved” for shellfish harvest. An eelgrass survey was completed, and eelgrass was observed to a maximum depth of -18 ft. (MLLW). The shoreward boundary of the tract will be set at -25 ft. (MLLW) or deeper to provide a buffer between forage fish spawning habitat and geoduck harvest. The anticipated environmental impacts of this harvest are within the range of conditions discussed in the 2001 Final Supplemental Environmental Impact Statement. No significant impacts are expected from this harvest.

File: 230425_Coon Bay_EA_19900.doc

Figure 1. Vicinity Map, Coon Bay Commercial Geoduck Tract #19900



1:150,000

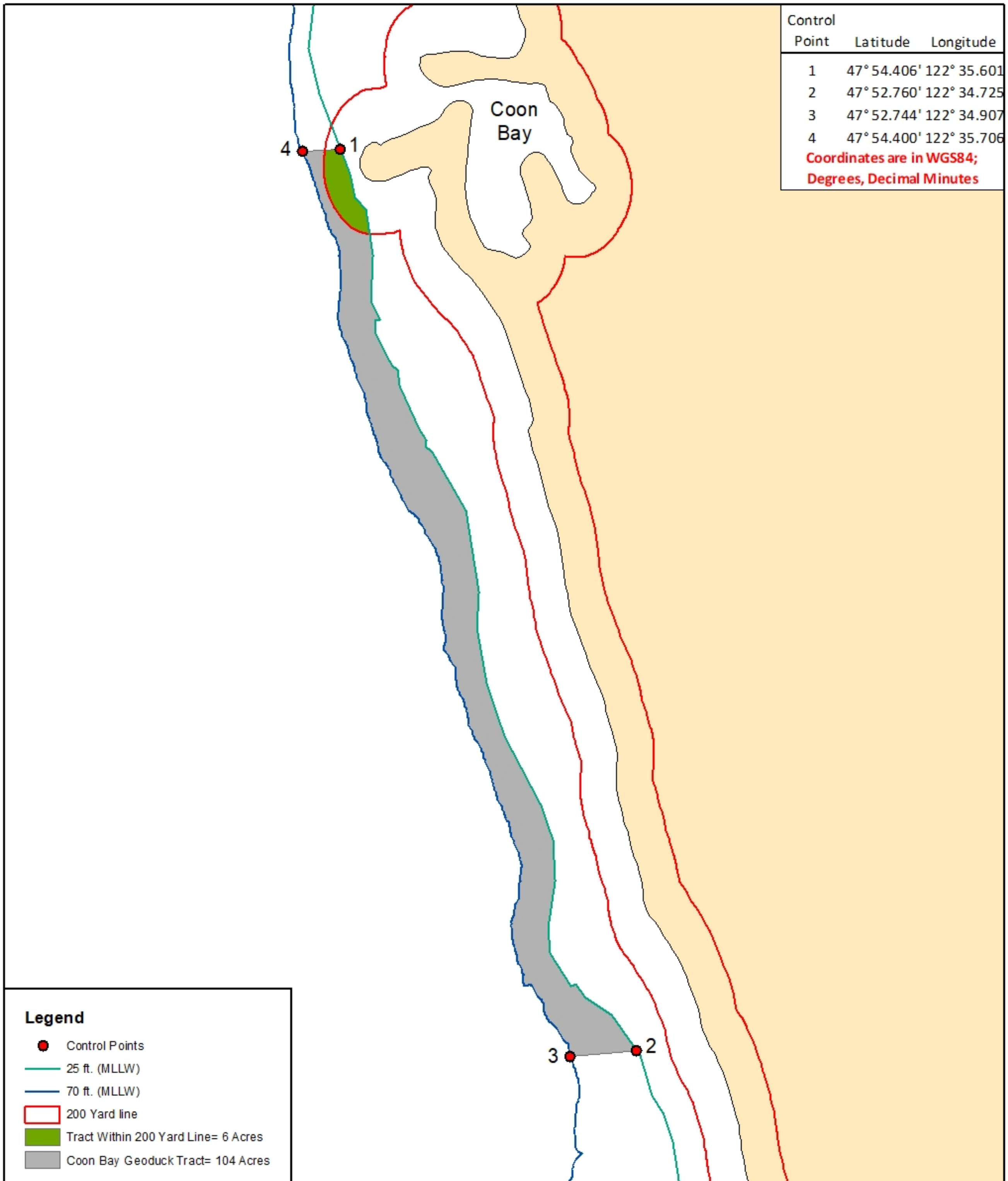
1 inch = 2.37 miles

Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Meters. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.75 1.5 3 4.5 Miles

Map Date: January 2, 2018
Map Author: O. Working
File: Data\Ocean\Geoduck

Figure 2. Control Points Map, Coon Bay Commercial Geoduck Tract #19900



Control Point	Latitude	Longitude
1	47° 54.406'	122° 35.601
2	47° 52.760'	122° 34.725
3	47° 52.744'	122° 34.907
4	47° 54.400'	122° 35.706

Coordinates are in WGS84; Degrees, Decimal Minutes

N W E S

1:20,000
1 inch = 0.32 miles

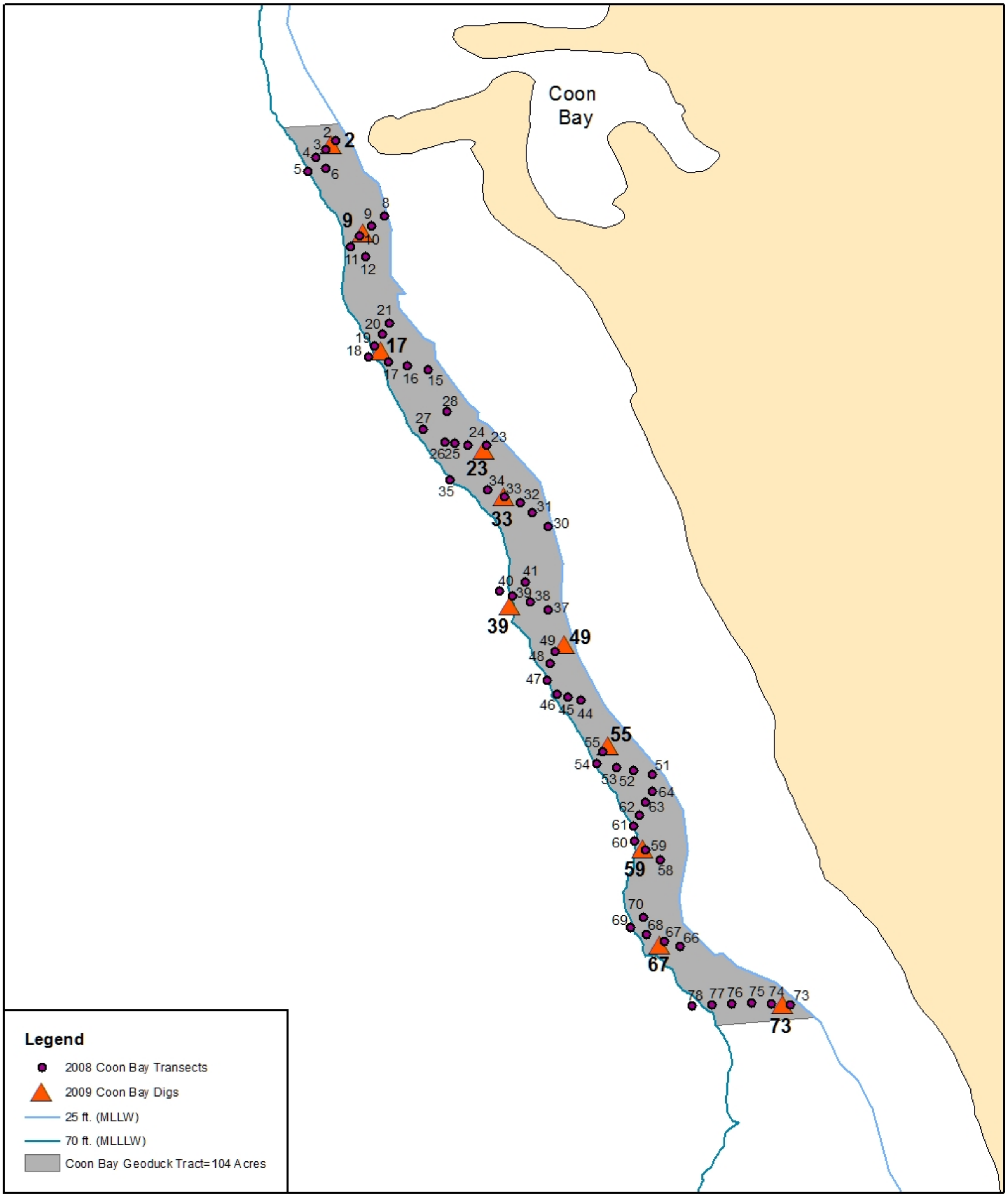
Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Meters. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.1 0.2 0.4 0.6 Miles

Washington Department of FISH and WILDLIFE

Map Date: March 21, 2022
Map Author: O. Working
File: Data\Ocean\Geoduck

Figure 3. Transect and Dig Station Map, Coon Bay Commercial Geoduck Tract #19900



N
W E
S

1:20,000

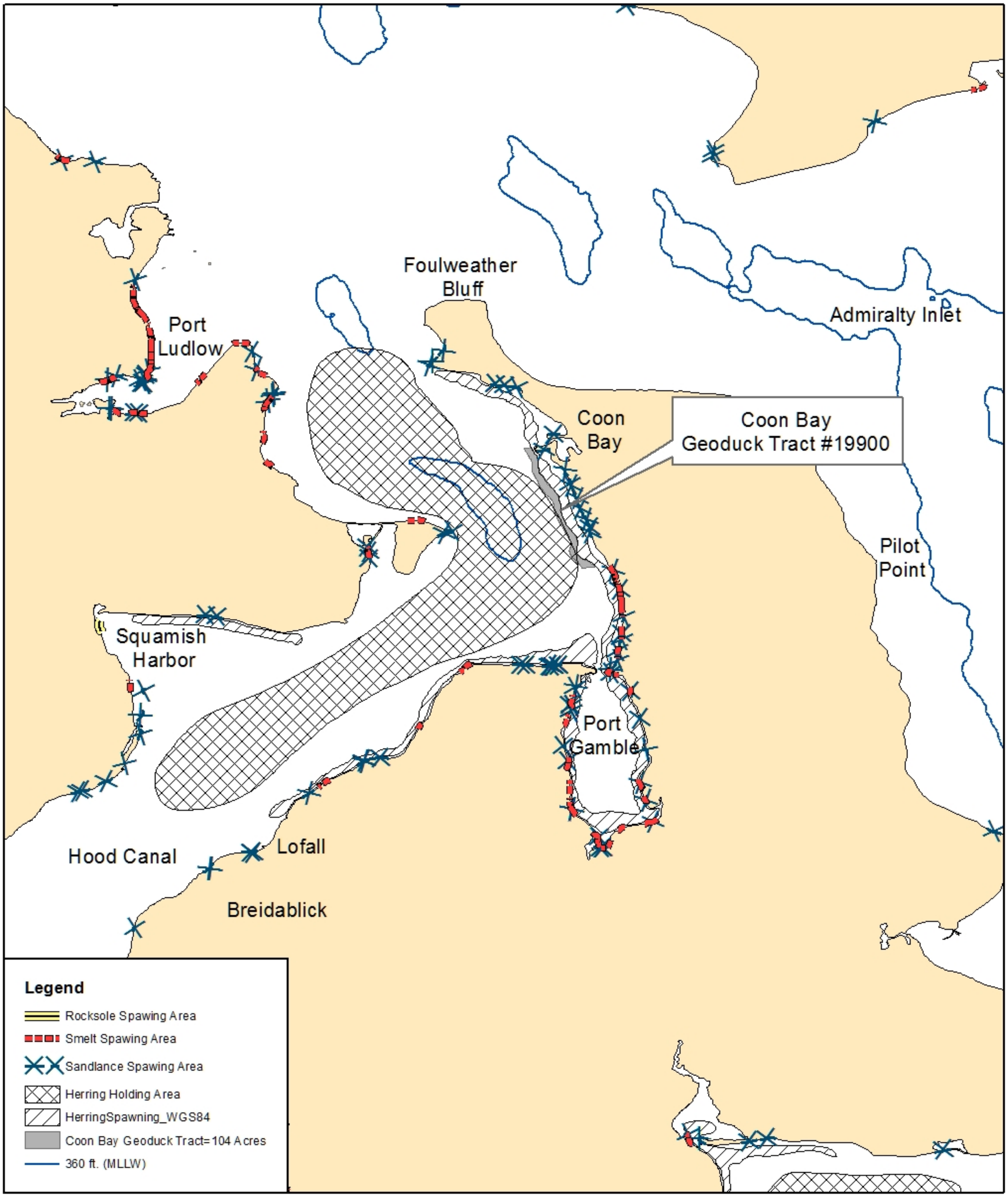
1 inch = 0.32 miles

Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Meters. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.1 0.2 0.4 0.6 Miles

Map Date: January 2, 2018
Map Author: O. Working
File: Data\Ocean\Geoduck

Figure 4. Fish Spawning Areas Near the Coon Bay Commercial Geoduck Tract #19900



N W E S

1:150,000

1 inch = 2.37 miles

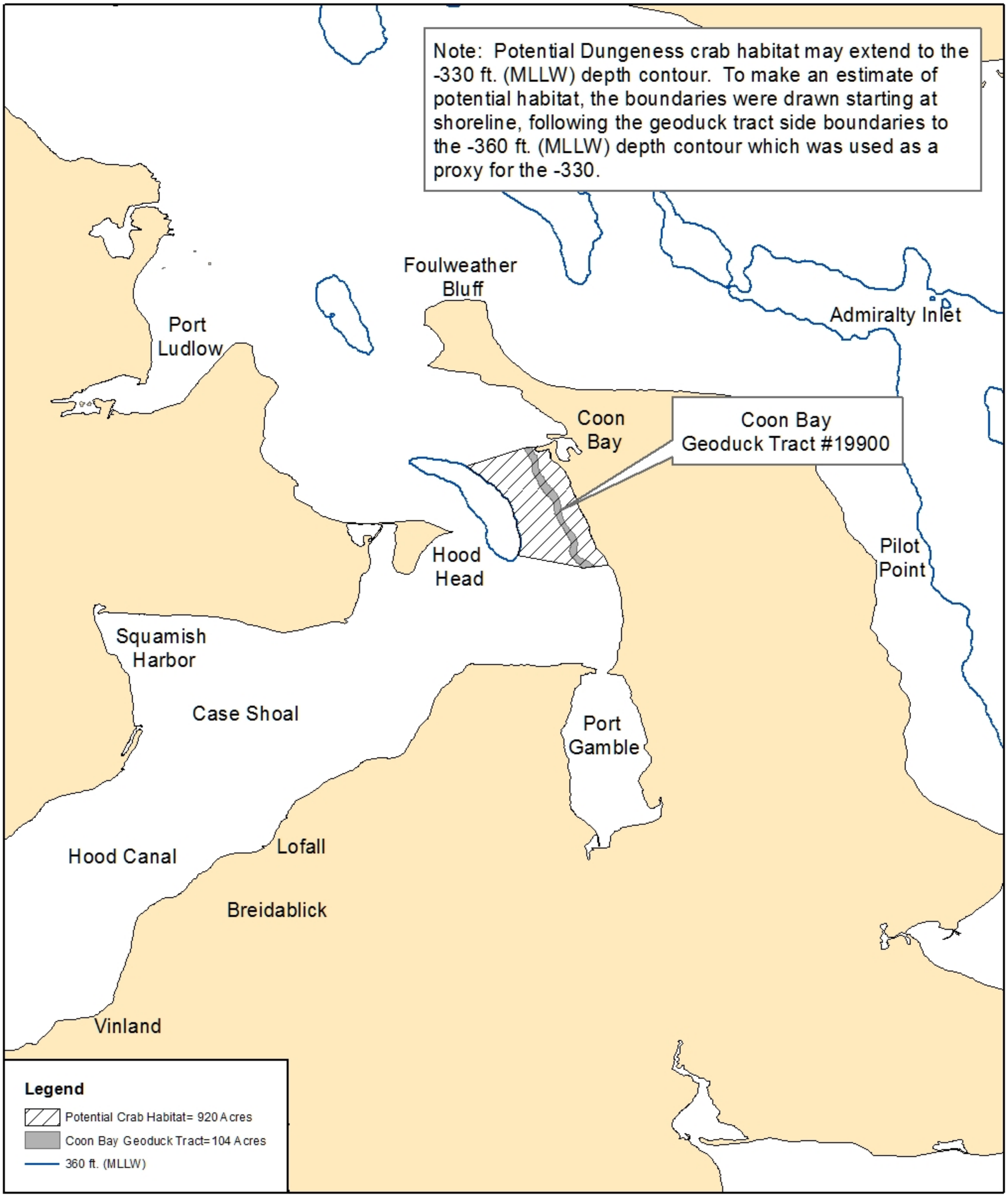
Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Meters. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.75 1.5 3 4.5 Miles

Washington Department of FISH and WILDLIFE

Map Date: January 2, 2018
Map Author: O. Working
File: Data\Ocean\Geoduck

Figure 5. Dungeness Crab Habitat Map, Coon Bay Commercial Geoduck Tract #19900



N
W E
S

1:150,000

1 inch = 2.37 miles

Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Meters. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.75 1.5 3 4.5 Miles

Washington Department of FISH and WILDLIFE

Map Date: January 2, 2018
Map Author: O. Working
File: Data\Ocean\Geoduck

EXPLANATION OF SURVEY DATA TABLES

The geoduck survey data for each tract is reported in seven computer-generated tables. These tables contain specific information gathered from transect and dig samples and diver observations. The following is an explanation of the headings and codes used in these tables.

Tract Summary

This table is a general summary of survey information for the geoduck tract including estimates of *Tract Size* in acres, average geoduck *Density* in animals per sq.ft., *Total Tract Biomass* in pounds with statistical confidence, and *Total Number of Geoducks*. Mass estimators are reported in average values for *Whole Weight* and *Siphon Weight* in pounds. Geoduck siphon weights are also reported in *Siphon Weight as a percentage of Whole Weight.* Biomass estimates are adjusted for any harvest that may occur subsequent to the pre-fishing survey.

Digging Difficulty

This table presents a station-by-station evaluation of the factors contributing to the difficulty of digging geoduck samples with a 5/8" inside nozzle diameter water jet. Codes for the overall subjective summary of the digging difficulty are given in the *Difficulty* column. An explanation of the codes for the dig difficulty follows:

Code	Degree of Difficulty	Description
0	Very Easy	Sediment conducive to quick harvest.
1	Easy	Significant barrier in substrate to inhibit digging.
2	Some difficulty	Substrate may be compact or contain gravel, shell or clay; most geoducks still easy to dig.
3	Difficult	Most geoducks were difficult to dig, but most attempts were successful.
4	Very Difficult	It was laborious to dig each geoduck. Unable to dig some geoducks.
5	Impossible	Divers could not remove geoducks from the substrate.

Abundance refers to the relative geoduck abundance; a zero (0) indicates that geoducks were very sparse, a one (1) indicates that they were moderately abundant and a two (2) indicates that they were very abundant. *Depth* refers to the depth that the geoducks were found in the substrate. A zero (0) indicates that they were shallow, a one (1) indicates that they were moderately deep and a two (2) indicates that they were very deep. The columns labeled *Compact*, *Gravel*, *Shell*, *Turbidity* and *Algae* refer to factors that contribute to digging difficulty by interfering with the digging process. A zero (0) in one of these columns indicates that the factor was not a problem, a one (1) indicates that the factor caused moderate difficulty and a two (2) indicates that the factor caused a significant amount of difficulty when digging. *Compact* refers to the compact or sticky nature of a muddy substrate. *Gravel* and *Shell* refer to the difficulty caused by these substrate types. *Turbidity* refers to the turbidity within the water near the dig hole caused by the digging activity. High turbidity makes it difficult to find the geoduck siphon shows. The difficulty of digging associated with turbidity varies with the amount of tidal current present. Therefore, the turbidity rating refers only to the conditions occurring when the sample was collected. *Algae* refers to algal cover, which also makes it difficult for the diver to find geoduck siphon shows. Because algal cover varies seasonally, this value only applies to the conditions when the sample was collected. The *Commercial* column gives a subjective assessment of whether or not it would be feasible to harvest geoducks on a commercial basis at the given station.

Transect Water Depths, Geoduck Densities and Substrate Observations

This table reports findings for each transect. *Start Depth* and *End Depth* (corrected to MLLW) are given for each transect. *Geoduck Density* is reported as the average number of geoducks per square foot for each 900 square foot transect. *Substrate Type* and *Substrate Rating* refer to evaluations of the substrate surface. A two (2) rating indicates that the substrate type is predominant. A one (1) rating indicates the substrate type was present.

Geoduck Weights and Proportion Over 2 Pounds

This table summarizes the size and quality of the geoducks at each of the stations where dig samples were collected. Weight values for any geoduck dig samples that were damaged during sampling to the extent that water loss occurred, are excluded from calculations. The *Number Dug* column lists the number of geoducks collected. The *Avg. Whole Weight (lbs.)* column gives the average sample weight of whole geoduck clams for each dig station. The *Avg. Siphon Weight (lbs.)* column gives the average weight of the siphons of the geoducks for each dig station. The percentage of geoducks greater than two pounds is given in the *% Greater than 2 lbs.* column.

Transect - Corrected Geoduck Count and Position Table

This table reports the diver *Corrected Count*, the geoduck siphon *Show Factor* used to correct the count, and the *Latitude/Longitude* position of the start point of each survey transect. Raw (observed) siphon counts are “corrected” by dividing diver observed counts for each transect with a siphon “show” factor (See WDFW Tech. Report FPT00-01 for explanation of show factor) to estimate the sample population density. Transect positions are reported in degrees and decimal minutes to the thousandth of a minute, datum WGS84.

Most Common and Obvious Animals Observed

This table summarizes the animals, other than geoducks, that were observed during the geoduck survey, and reports the total number of transects on which they were present (*# of Transects Where Observed)*. This is qualitative presence/absence data only, and only animals that can be readily seen by divers at or near the surface of the substrate are noted. The *Group* designation allows for the organization of similar species together in the table. Whenever possible, the scientific name of the animal is listed in *Taxonomer*, and a generally accepted *Common Name* is also listed. Many variables may make it difficult for divers to notice other animals on the tract, including but not limited to poor visibility, diver skill, animals fleeing the divers, animal size, or cryptic appearance or behavior (in crevasses or under rocks).

Most Common and Obvious Algae Observed

This table summarizes marine algae observed during the geoduck survey, and reports the total number of transects on which they were seen (*# of Transects Where Observed)*. This is qualitative presence/absence data only, and only for macro algae, with the exception of diatoms. At high densities diatoms form a “layer” on or above the substrate surface that is readily visible and obvious to divers. Other types of phytoplankton are not sampled and are rarely noted. Whenever possible, the scientific name or a general taxonomic grouping of each plant is listed in *Taxonomer*.

Last Updated: April 14, 2020
S:\FP\FishMgmt\Geoduck\EnvironmentalAssessmentReports\Forms\EAcodesexplanation_7tables.doc

Table 1. GEODUCK TRACT SUMMARY

Coon Bay geoduck tract #19900.

Tract Name	Coon Bay
Tract Number	19900
Tract Size (acres) [a]	104
Density of geoducks/sq.ft. [b]	0.005
Total Tract Biomass (lbs.) [b]	58,326
Total Number of Geoducks on Tract [b]	21,405
Confidence Interval (%)	15.3%
Mean Geoduck Whole Weight (lbs.)	2.72
Mean Geoduck Siphon Weight (lbs.)	0.64
Siphon Weight as a % of Whole Weight	23%
Number of 900 sq.ft. Transect Stations	63
Number of Geoducks Weighed	114

[a.] Tract area is between the -25 ft. and the -70 ft. (MLLW) water depth contours

[b.] Biomass is based on the 2008 and 2009 WDFW pre-fishing geoduck survey biomass of 3,294,250 lbs. minus total harvest of 3,235,924 lbs. through Aprril 24, 2023. Tocas was used to estimate tribal harvest and WaFT was used for state harvest.

Generation Date:	April 24, 2023
Generated By:	O. Working, WDFW
File:	S:FP\FishMgmt\Geoduck\EAs\2023

Table 2. DIGGING DIFFICULTY TABLE

Coon Bay geoduck tract # 19900, 2009 WDFW pre-fishing survey.

Dig Station	Difficulty (0-5)	Abundance (0-2)	Depth (0-2)	Compact (0-2)	Gravel (0-2)	Shell (0-2)	Turbidity (0-2)	Algae (0-2)	Commercial (Y/N)
2	2	2	1	0	0	1	0	0	Y
9	0	2	0	0	0	1	0	0	Y
17	3	1	0	0	0	2	0	0	Y
23	3	1	2	0	0	2	1	0	Y
33	3	2	2	0	0	2	0	0	Y
39	0	2	1	0	0	1	0	0	Y
49	2	1	2	0	0	1	1	0	Y
55	3	2	1	0	0	2	0	0	Y
59	0	2	0	0	0	0	0	0	Y
67	4	2	1	0	0	2	0	0	Y
73	2	2	0	0	0	2	1	0	Y

Generation Date: April 24, 2023
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2023

Table 3. TRANSECT WATER DEPTHS, GEODUCK DENSITIES, AND SUBSTRATE OBSERVATIONS

Coon Bay geoduck tract # 19900, 2008 WDFW pre-fishing survey.

Transect [a]	Start Depth (ft.) [b]	End Depth (ft.) [b]	Geoduck Density (no. / sq.ft.) [c]	Substrate [d]				
				mud	sand	shell	shell hash	wood debris
2	31	45	0.3927		2			
3	45	58	0.5783		2			
4	58	67	0.5743		2			
5	67	55	0.4914		2			
6	55	43	0.4500		2			
8	30	43	0.2013		2			1
9	43	57	0.3809		2			1
10	57	65	0.4283		2			1
11	66	62	0.2506		2			1
12	62	40	0.1421		2			1
15	33	45	0.0197		2	1		
16	45	54	0.0336		2	1		
17	54	68	0.0533		2	1		
18	68	62	0.0197		2	1		
19	62	53	0.0375		2	1		
20	53	43	0.0237		2	1		
21	43	33	0.0138		2		1	
23	28	38	0.1401		2			
24	39	50	0.1835		2	1	1	
25	50	62	0.2980		2	1	1	
26	62	60	0.2763		2	1	1	
27	60	50	0.1756		2	1	1	
28	50	48	0.0770		2		1	
30	27	32	0.1184		2			1
31	32	35	0.2625		2			
32	36	41	0.1638		2			
33	41	50	0.2230		2			
34	50	61	0.2210		2			
35	61	65	0.2270		2			
37	33	45	0.0639		2			
38	45	59	0.2038		2			
39	59	56	0.1519		2			
40	56	45	0.1519		2			
41	45	39	0.3397		2			
44	40	55	0.5708		2			
45	55	60	0.4444		2			
46	60	60	0.3942		2			
47	60	51	0.4231		2			
48	51	38	0.5556		2			
49	38	25	0.1598		2			
51	27	34	0.1341	1	2			
52	33	47	0.2508	1	2			
53	47	62	0.3292	1	2			
54	62	50	0.3605	1	2			

Table 3. Continued

Transect [a]	Start Depth (ft.) [b]	End Depth (ft.) [b]	Geoduck Density (no. / sq.ft.) [c]	Substrate [d] mud	sand	shell	shell hash	wood debris
55	50	38	0.4058	1	2			
58	39	55	0.1654		2			
59	55	62	0.2247		2			
60	62	62	0.1933		2			
61	62	51	0.2734		2			
62	51	41	0.2874		2			
63	41	32	0.2456		2			
64	32	25	0.1324		2			
66	30	39	0.2648	1	2			
67	39	51	0.2924	1	2			
68	51	61	0.3736	1	2			
69	61	45	0.2502	1	2	1		
70	45	31	0.2827		2			
73	25	32	0.1560	1	2			
74	32	41	0.3697	1	2			
75	41	50	0.4423	1	2			
76	50	57	0.5855	1	2			
77	57	69	0.4466	1	2			
78	69	60	0.4145	1	2			

[a.] 15 Transects were eliminated because they fell shallow of 25 ft. (MLLW)

[b.] All depths are corrected to mean lower low water (MLLW)

[c.] Densities were calculated using a daily siphon show factor

[d.] Substrate ratings: 1 = present; 2 = predominant; blank = not observed

Generation Date: April 24, 2023
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2023

Table 4. GEODUCK SIZE AND QUALITY

Coon Bay geoduck tract # 19900, 2009 WDFW pre-fishing survey.

Dig Station	Number Dug	Avg. Whole Weight (lbs.)	Avg. Siphon Weight (lbs.)	% of geoducks on station greater than 2 lbs.
2	10	2.85	0.63	100%
9	10	2.40	0.53	80%
17	11	3.02	0.73	82%
23	11	3.08	0.77	82%
33	9	2.85	0.70	78%
39	13	2.36	0.52	77%
49	11	3.69	1.03	100%
55	10	2.29	0.50	70%
59	9	2.31	0.54	78%
67	10	2.40	0.56	60%
73	11	2.73	0.49	91%

Generation Date: April 24, 2023
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2023

Table 5. TRANSECT CORRECTED GEODUCK COUNT AND POSITION TABLE

Coon Bay geoduck tract # 19900, 2008 WDFW pre-fishing survey.

Transect [a]	Corrected Count	Show Factor [b]	Latitude [c]	Longitude [c]
2	353	0.56	47° 54.387	122° 35.533
3	520	0.56	47° 54.371	122° 35.551
4	517	0.56	47° 54.357	122° 35.570
5	442	0.56	47° 54.331	122° 35.585
6	405	0.56	47° 54.336	122° 35.552
8	181	0.56	47° 54.248	122° 35.443
9	343	0.56	47° 54.231	122° 35.468
10	385	0.56	47° 54.212	122° 35.490
11	226	0.56	47° 54.192	122° 35.506
12	128	0.56	47° 54.174	122° 35.479
15	18	0.56	47° 53.965	122° 35.364
16	30	0.56	47° 53.972	122° 35.401
17	48	0.56	47° 53.980	122° 35.437
18	18	0.56	47° 53.989	122° 35.473
19	34	0.56	47° 54.009	122° 35.462
20	21	0.56	47° 54.031	122° 35.448
21	12	0.56	47° 54.052	122° 35.434
23	126	0.56	47° 53.826	122° 35.255
24	165	0.56	47° 53.827	122° 35.290
25	268	0.56	47° 53.830	122° 35.315
26	249	0.56	47° 53.832	122° 35.332
27	158	0.56	47° 53.855	122° 35.373
28*	69	0.56	47° 53.871	122° 35.350
30	107	0.56	47° 53.677	122° 35.142
31	236	0.56	47° 53.702	122° 35.171
32	147	0.56	47° 53.720	122° 35.193
33	201	0.56	47° 53.732	122° 35.223
34	199	0.56	47° 53.744	122° 35.253
35	204	0.56	47° 53.763	122° 35.324
37	58	0.56	47° 53.523	122° 35.142
38	183	0.56	47° 53.537	122° 35.175
39	137	0.56	47° 53.548	122° 35.208
40	137	0.56	47° 53.557	122° 35.231
41	306	0.56	47° 53.575	122° 35.185
44	514	0.73	47° 53.356	122° 35.082
45	400	0.73	47° 53.362	122° 35.105
46	355	0.73	47° 53.367	122° 35.126
47	381	0.73	47° 53.393	122° 35.145
48	500	0.73	47° 53.425	122° 35.138
49	144	0.73	47° 53.447	122° 35.130
51	121	0.64	47° 53.220	122° 34.950
52	226	0.64	47° 53.227	122° 34.986
53	296	0.64	47° 53.233	122° 35.017

Table 5. Continued

Transect [a]	Corrected Count	Show Factor [b]	Latitude [c]	Longitude [c]
54	324	0.64	47° 53.239	122° 35.053
55	365	0.64	47° 53.261	122° 35.042
58	149	0.64	47° 53.063	122° 34.935
59	202	0.64	47° 53.080	122° 34.963
60	174	0.64	47° 53.098	122° 34.983
61	246	0.64	47° 53.124	122° 34.986
62	259	0.64	47° 53.145	122° 34.974
63	221	0.64	47° 53.168	122° 34.964
64	119	0.64	47° 53.189	122° 34.950
66	238	0.68	47° 52.904	122° 34.899
67	263	0.68	47° 52.913	122° 34.928
68	336	0.68	47° 52.925	122° 34.962
69	225	0.68	47° 52.939	122° 34.990
70	254	0.68	47° 52.957	122° 34.966
73	140	0.52	47° 52.795	122° 34.696
74	333	0.52	47° 52.797	122° 34.731
75	398	0.52	47° 52.799	122° 34.767
76	527	0.52	47° 52.798	122° 34.805
77	402	0.52	47° 52.795	122° 34.840
78	373	0.52	47° 52.793	122° 34.877

[a.] Show factor was used to correct combined geoduck counts

[b.] Latitude and longitude are in degrees and decimal minutes (NAD 27). Position for transect #48 was unclear, therefore not recorded

*Start position for transect #28 was extrapolated from other known postions.

Generation Date: April 24, 2023
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2023

Table 6. MOST COMMON AND OBVIOUS ANIMALS OBSERVED

Coon Bay geoduck tract # 19900, 2008 WDFW pre-fishing survey.

# of Transects where Observed	Group	Common Name	Taxonomer
69	ANEMONE	PLUMED ANEMONE	*Metridium spp.*
16	ANEMONE	STRIPED ANEMONE	*Urticina spp.*
41	ASCIDIAN	SESSILE TUNICATE	Unspecified Tunicate
4	BIVALVE	FALSE GEODUCK	*Panomya spp.*
1	BIVALVE	HARDSHELL CLAMS	*Veneridae spp.*
71	BIVALVE	HORSE CLAM	*Tresus spp.*
7	BIVALVE	TRUNCATED MYA	*Mya truncata*
1	CEPHALOPOD	OCTOPUS	Octopus or *Enteroctopus spp.*
17	CNIDARIA	HYDROIDS	Unspecified Hydroid
75	CNIDARIA	SEA PEN	*Ptilosarcus gurneyi*
68	CNIDARIA	SEA WHIP	*Stylatula elongata*
24	CRAB	DECORATOR CRAB	*Oregonia gracilis*
50	CRAB	DUNGENESS CRAB	*Cancer magister*
7	CRAB	GRACEFUL CRAB	*Cancer gracilis*
53	CRAB	HERMIT CRAB	Unspecified hermit crab
34	CRAB	RED ROCK CRAB	*Cancer productus*
23	CUCUMBER	SEA CUCUMBER	*Parastichopus californicus*
3	FISH	FISH	Unspecified Fish
9	FISH	FLATFISH	Unspecified flatfish
3	FISH	ROCK SOLE	*Lepidopsetta bilineata*
5	FISH	SANDDAB	*Citharichthys spp.*
28	FISH	SCULPIN	Unspecified Cottidae
5	FISH	STARRY FLOUNDER	*Platichthys stellatus*
7	GASTROPOD	MOON SNAIL	*Polinices lewisii*
8	GASTROPOD	MOON SNAIL EGGS	*Polinices lewisii* egg case
25	GASTROPOD	NUDIBRANCH	Unspecified nudibranch
3	GASTROPOD	OLIVE SNAIL	*Olivella biplicata*
5	MISC	BRYOZOAN COLONY	Unspecified Bryozoan
1	MISC	SAND DOLLAR	*Dendraster excentricus*
15	MISC	SPONGE	Unspecified Porifera
48	NUDIBRANCH	ARMINA	*Armina californica*
4	NUDIBRANCH	DENDRONOTUS	*Dendronotus spp.*
1	NUDIBRANCH	DIRONA	*Dirona albolineata*
5	NUDIBRANCH	HERMISSENDA	*Hermissenda crassicornis*
2	SEA STAR	BLOOD STAR	*Henricia leviuscula*
1	SEA STAR	LEATHER STAR	*Dermasterias imbricata*
7	SEA STAR	ROSE STAR	*Crossaster papposus*
10	SEA STAR	SAND STAR	*Luidia foliolata*
20	SEA STAR	SHORT-SPINED STAR	*Pisaster brevispinus*
1	SEA STAR	SUN STAR	*Solaster spp.*
65	SEA STAR	SUNFLOWER STAR	*Pycnopodia helianthoides*
1	SHRIMP	GHOST SHRIMP	Unspecified ghost shrimp
11	SHRIMP	SHRIMP	Unspecified shrimp

Table 6. Continued

# of Transects where Observed	Group	Common Name	Taxonomer
1	WORM	FLATWORM	Unspecified Platyhelminthes
28	WORM	ROOTS	Chaetopterid polychaete tubes
36	WORM	SABELLID TUBE WORM	*Sabellid spp.*
17	WORM	TEREBELLID TUBE WORM	*Terebellid spp.*
2	WORM	WORM	Unspecified Annelid worm

Generation Date: April 24, 2023
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2023

Table 7. MOST COMMON AND OBVIOUS ALGAE OBSERVED

Coon Bay geoduck tract # 19900, 2008 WDFW pre-fishing survey.

Number of transects where observed	Taxonomer
14	Diatoms
36	*Desmarestia spp.*
70	*Laminaria spp.*
3	Unspecified large red algae
62	Unspecified small red algae
78	*Ulva spp.*

Generation Date: April 24, 2023
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2023