ENVIRONMENTAL ASSESSMENT OF PROPOSED GEODUCK HARVEST
ALONG THE SOUTHERN SHORELINE OF BAINBRIDGE ISLAND
AT THE RESTORATION POINT GEODUCK TRACT (#07850)

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 six 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 continued harvest along the southern shoreline of Bainbridge Island is described below.

Proposed Harvest Years: 2021-2022

Tract name: Restoration Point geoduck tract (Tract #07850)

Description: (Figure 1, Tract vicinity map)

The Restoration Point geoduck tract is a subtidal area of approximately 132 acres (Table 1) along the southern shoreline of Bainbridge Island in the Central Puget Sound Geoduck Management Region.

The Restoration Point tract is bounded by a line projected easterly along the -20 foot (MLLW) water depth contour from a control point (CP) at 47°34.425’ N. latitude, 122°31.381’ W. longitude (CP 1) to a point on the -20 foot (MLLW) water depth contour at 47°34.836’ N. latitude, 122°29.169’ W. longitude (CP 2); then south to a point on the -70 foot (MLLW) water depth contour at 47°34.769’ N. latitude, 122°29.169’ W. longitude (CP 3); then westerly along the -70 foot (MLLW) water depth contour to a point at 47°34.368’ N. latitude, 122°31.416’ W. longitude (CP 4); then northerly to the point of origin (Figure 2). These latitude and longitude positons are in WGS84 datum.

This estimate of the tract boundary was made using bathymetry data from the National Oceanic and Atmospheric Administration (NOAA), the Tulalip Tribes and WDFW geoduck surveys, and information provided by the Washington Department of Health (DOH). All contours are corrected to MLLW. Contour GIS layers from Dale Gombert (WDFW) were generated from NOAA soundings. Shoreline data was 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 -20 ft. contour was used for the shallow boundary.

No herring spawning habitat was found to be in the vicinity of this tract, therefore the nearshore tract boundary will not be affected by herring spawning habitat. The latitude and longitude positions are reported in 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. The most common sediments where geoducks are harvested are sand with varying amounts of mud and/or gravel. The specific sediment type of a 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 holes fill in within a few days to several weeks and have no long-term effects. The substrate holes refill in areas with strong water currents much faster than in areas with weak water currents. Water currents tend to be moderate and variable in the vicinity of the Restoration Point tract. In the upcoming year, currents will reach a predicted maximum flood velocity of 1.0 knots per hour and maximum ebb velocity of 1.2 knots (Tides and Currents software; station #1686; Restoration Point; April 1, 2021 to April 1, 2022).

Sub-surface substrates have gravel and shell as observed substrate types (Table 2). The surface substrates within this tract are primarily sand, with sand predominant on 76 transects and mud predominant on 6 transects (total transects = 90, Table 3).

Water Quality:

Water mixing at this tract is affected by the convergence of currents from Rich Passage and the Puget Sound main basin, which 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 the Puget Sound main basin at the West Point station (PSB003) at 47.6600° N. latitude; 122.4417° W. longitude. The DOE latitude and longitude positions are recorded in decimal degrees. For 2015 (most recently completed data year available), between water depths of 20 and 70 feet, the mean

reported dissolved oxygen concentration was 7.9 mg/l with a range from 6.2 mg/l to 9.9 mg/l. The mean salinity at this station was 29.3 ppt with a range from 27.1 ppt to 30.6 ppt. The mean water temperature at this station in 2015 was 53.0° F with a range from 48.8° F to 57.8° F.

This geoduck tract is classified as "Approved" by DOH. An area classified as "Prohibited" by DOH is westerly and immediately adjacent to the western boundary line of this tract.

Biota:

Geoduck:

The Restoration Point geoduck tract is approximately 132 acres. The abundance of geoducks on this tract is moderate, with a current estimated average density of 0.15 geoducks/sq.ft. This tract currently contains an estimated 1,907,358 pounds of geoducks (Table 1). On all 17 dig stations, geoducks are considered commercial quality (Table 2). Digging difficulty ranged from "easy" to "very difficult" to dig.

The average density range from the 2006 pre-fishing survey is 0.85 geoducks/sq.ft. at station #T-63 and 0.01 geoducks/sq.ft. at station #T-15 (Table 3, Figure 3). The geoducks at the Restoration Point tract have typical weight, averaging 2.2 pounds, while the average geoduck in Puget Sound is 2.1 pounds. The lowest average whole weight is 1.40 pounds per geoduck at dig station #T-1 and the highest average whole weight is 3.25 pounds per geoduck at dig station #T-8 (Table 4). Transect locations, and geoduck counts corrected with siphon "show factors", are listed in Table 5.

The Restoration Point geoduck tract was first surveyed in 2006 by the Tulalip Tribes. Additional transects were done by WDFW in 2010. Additional dig samples were taken in 2010 and 2011. The results of the 2006, 2010, and 2011 survey work are combined and 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 between the -18 ft. and -70 ft. water depth contours (corrected to mean lower low water - MLLW). Other geoducks which are not harvestable are found inshore and offshore of the harvest areas (commercial tracts). 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. Geoducks located outside of commercial harvest tracts are not included in commercial biomass calculations, even though they spawn and contribute to the total population.

The low rate of harvest is due primarily to geoduck's low rate of natural recruitment. WDFW has studied the regeneration rate of geoducks on certain previously harvested tracts scattered throughout Puget Sound. The estimated average time to regenerate a new crop of geoducks after removal of 100 percent of the original geoducks on a tract was 39 years. The longest regeneration time was 73 years, and the shortest regeneration time is 11 years. In actual fishing, 100 percent of the geoducks are never removed from a tract. The average percentage removal of the tracts mentioned above was 69 percent. The regeneration 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 only fish observed during the surveys at the Restoration Point tract were various flatfish, sculpins, ling cod, cabezon, poachers, and skate egg cases (Table 6).

WDFW marine fish managers were asked of their concerns of any possible impacts on groundfish and baitfish that geoduck fishing would have. 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.

There are no Pacific herring spawning grounds along the southern shoreline of Bainbridge Island in the vicinity of the Restoration Point tract (Figure 4). A Pacific herring holding area has been identified south of Orchard Point, southwesterly of the Restoration Pont tract. Surf smelt and sand lance spawning have not been identified at the Restoration Point tract. With a horizontal separation from known forage fish spawning sites and a nearshore geoduck harvest restriction of -20 ft. or deeper, geoduck fishing on the Restoration Point tract should have no detrimental impacts on herring, surf smelt, or 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 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 on March 16, 1999 as threatened species under ESA. Critical habitat for summer run chum salmon populations include 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. The Restoration Point tract is outside of the critical habitat range for Hood Canal summer run chum salmon.

Critical habitat for Puget Sound chinook salmon include 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 subyearlings.

Major tributaries in the general vicinity of the Restoration Point geoduck tract, which support chinook salmon runs, are the Duwamish Waterway/Green River basin and the Lake Washington basin (mouth at Shilshole Bay; with Cedar River, Issaquah Creek, and north Lake Washington tributaries and sub-basins). Three viable runs of chinook salmon have been identified in the Duwamish Waterway/Green River basin. The status of the Spring run of chinook salmon in the Duwamish Waterway/Green River basin is extinct. The status of the natural Summer/Fall run of chinook salmon in the Duwamish Waterway/Green River basin is mixed native and non-native origin; a composite of wild, cultured, or unknown/unresolved production; and healthy with a 5-year geometric mean for total estimated escapement at 4,889 fish. The timing of the Duwamish River run is uncertain and has a 5-year geometric mean for total estimated escapement at 5,216 fish. The status of the Summer/Fall run in Newaukum Creek is mixed native and non-native origin; wild production; and healthy (NMFS, Appendix E, TM-35, Chinook Status Review).

The production of the Lake Washington Summer/Fall run of chinook salmon is natural

with a 5-year geometric mean for total estimated escapement at 557 fish. The status of the natural Cedar River Summer/Fall run of chinook salmon is native origin; wild production; with a 5-year geometric mean for total estimated escapement at 377 fish. The status of the mixed Summer/Fall run of chinook salmon in Issaquah Creek is non-native origin; a composite of wild, cultured, or unknown/unresolved production; and healthy. The status of the natural Summer/Fall run of chinook salmon in the North Lake Washington tributaries is native origin; wild production; with a 5-year geometric mean for total estimated escapement at 145 fish (NMFS, Appendix E, TM-35, Chinook Status Review).

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 impact on salmon populations.

On May 7, 2007 NOAA Fisheries Service announced 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 southern shoreline of Bainbridge Island that support steelhead stocks. The horizontal separation between tributaries that support steelhead runs and the Restoration Point tract will assure 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. NMFS 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

Restoration Point geoduck tract is outside of the critical habitat range of green sturgeon and 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 and obvious of these include: [1] mollusks (geoducks, horse clams, truncated mya clams, false geoducks, heart cockles, horse mussels, jingle shell oysters, piddocks, spiny scallops, unidentified hardshell clams, octopus, moon snails, and various nudibranchs,); [2] echinoderms (sea cucumbers, vermillion stars, sand stars, short-spined stars, spiny stars, blood stars, leather stars, sun stars, rose stars, and sunflower sea stars), [3] cnidarians (sea pens, sea whips, burrowing anemones, striped anemones, and plumed anemones); [4] arthropods (Dungeness crabs, red rock crabs, decorator crabs, hermit crab, graceful crabs, ghost shrimp, and unspecified arthropods); and [5] annelid worms (chaetopterid, sabellid, and terebellid). 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. No Dungeness crab were observed during the 2006 biological survey. 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 -360 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 approximately 1,664 acres. There were about 1,703,000 harvestable geoducks in the entire 132 acre tract, from the 2006, 2010, and 2011 pre-fishing survey estimate. With a harvest of 65 percent, the total number harvested would be 1,106,950 geoducks. Approximately 1.18 square feet of substrate is disturbed for every geoduck harvested, so 1,106,950 x 1.18 = 1,306,201 square feet of substrate. This equals about 30 acres. This is about 1.8 percent of the total available crab habitat in the vicinity of this tract. Based on few observations of Dungeness crab on this tract during the pre-fishing survey, the

low amount of disturbance of potential crab habitat in the vicinity of the tract, plus 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 survey (Table 7) include:

> Laminarian algae, Desmarestian algae, small red algae, and other small species of algae.

John Boettner and Tim Flint, from the WDFW Habitat Division, have stated that as long as geoduck fishing was restricted seaward of the eelgrass beds they have no concerns about the fishing. This was confirmed by WDFW Habitat Division who stated that the existing conditions in the fishery SEIS are sufficient to protect fish and wildlife habitat and natural resources. The shallow boundary of geoduck harvest will be set at least two vertical feet seaward of the deepest occurrence of eelgrass to protect all eelgrass along the tract from harvest activities. A survey found eelgrass to a maximum depth of -18 ft. (MLLW), therefore the geoduck tract nearshore boundary shall be set along the -20 ft. (MLLW) water depth contour.

Marine Mammals:

Several species of marine mammals, including seals, sea lions, and river otters may be observed in the vicinity of this geoduck tract. There have also been sporadic reports of gray whales feeding near Bainbridge Island and rare reports of humpback whales near Bainbridge Island. Killer whales may also be observed in the vicinity of this tract, particularly between November and March. The Southern Resident stock of killer whales resides 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 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 draft conservation plan for this stock can be found at the NOAA website (http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/ESA-Act-Status/Listing-Final.cfm).

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 "rural" and "natural" 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, some recreational salmon fishing for blackmouth and silvers could occur seasonally in proximity to this geoduck bed. Sport fishing is open year round for surfperch. Rockfish is closed year-round in this area. Lingcod can only be taken May 1-June 15 by hook and line or May 21 to June 15 by spearfishing. 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 Central Sound treaty tribes through state/tribal geoduck harvest management plans. The non-Indian geoduck fishery should not be in conflict with any concurrent tribal fisheries.

Navigation:

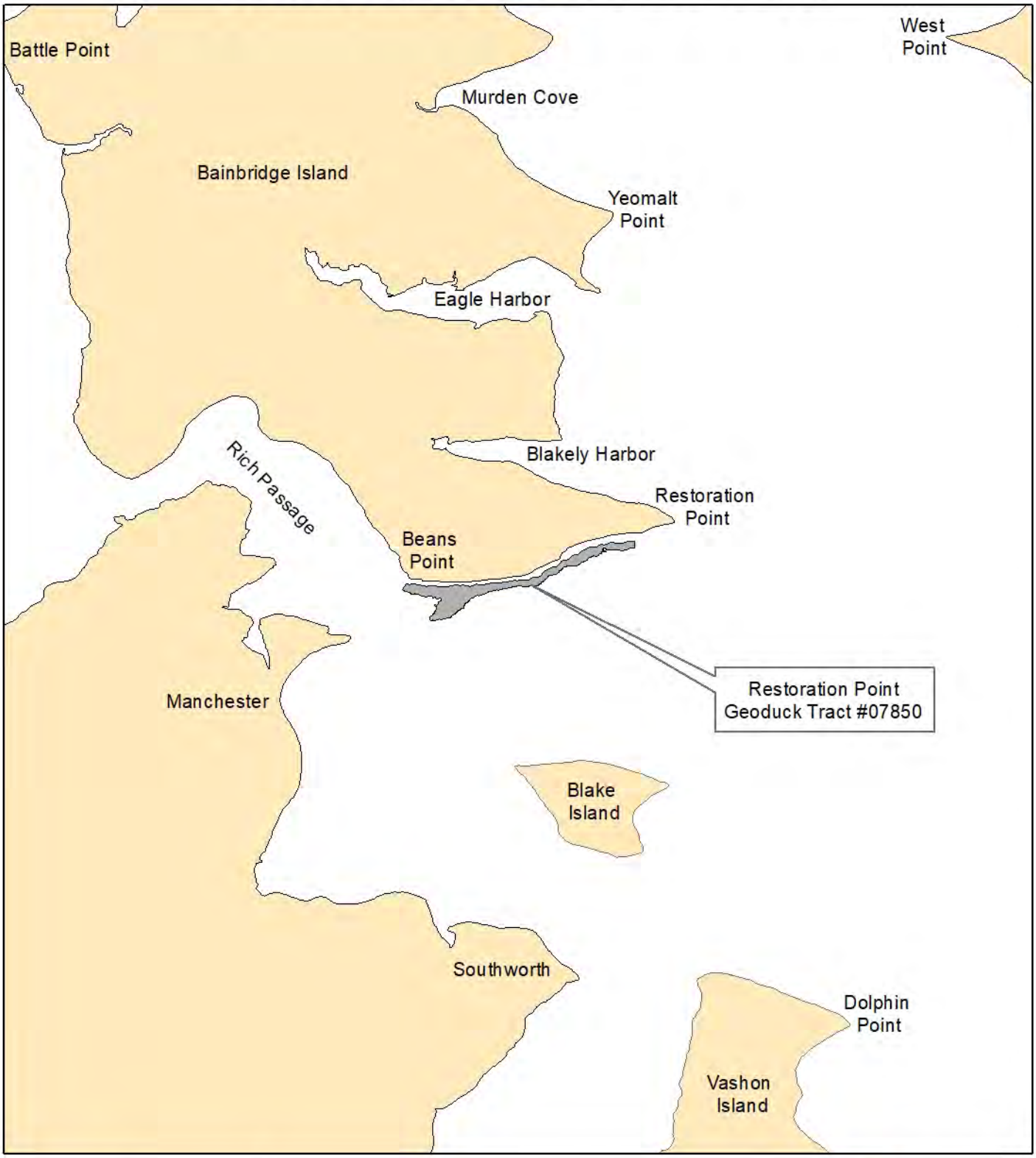
The Restoration Point area is used by recreational and commercial vessels traveling in Central Puget Sound and through Rich Passage. Geoduck harvesting at this site should not result in any significant navigational conflicts. The Washington Department of Natural Resources will notify the local boating community prior to any harvest.

Summary:

Commercial geoduck harvest is proposed for one tract along the southern shoreline of Bainbridge Island. The tract was recently surveyed in 2006, 2010, and 2011 by the Tulalip Tribes and WDFW. The current geoduck biomass estimate for the 132 acre harvest area is 1,907,358 pounds. The commercial tract is presently classified by DOH as “Approved”. The shoreward boundary of the tract will be set along the -20 ft. MLLW water depth contour. 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: 210401_Restoration Point_EA_07850.doc

Figure 1. Vicinity Map, Restoration Point Commercial Geoduck Tract #07850



N
W E
S

1:100,000
1 inch = 1.58 miles

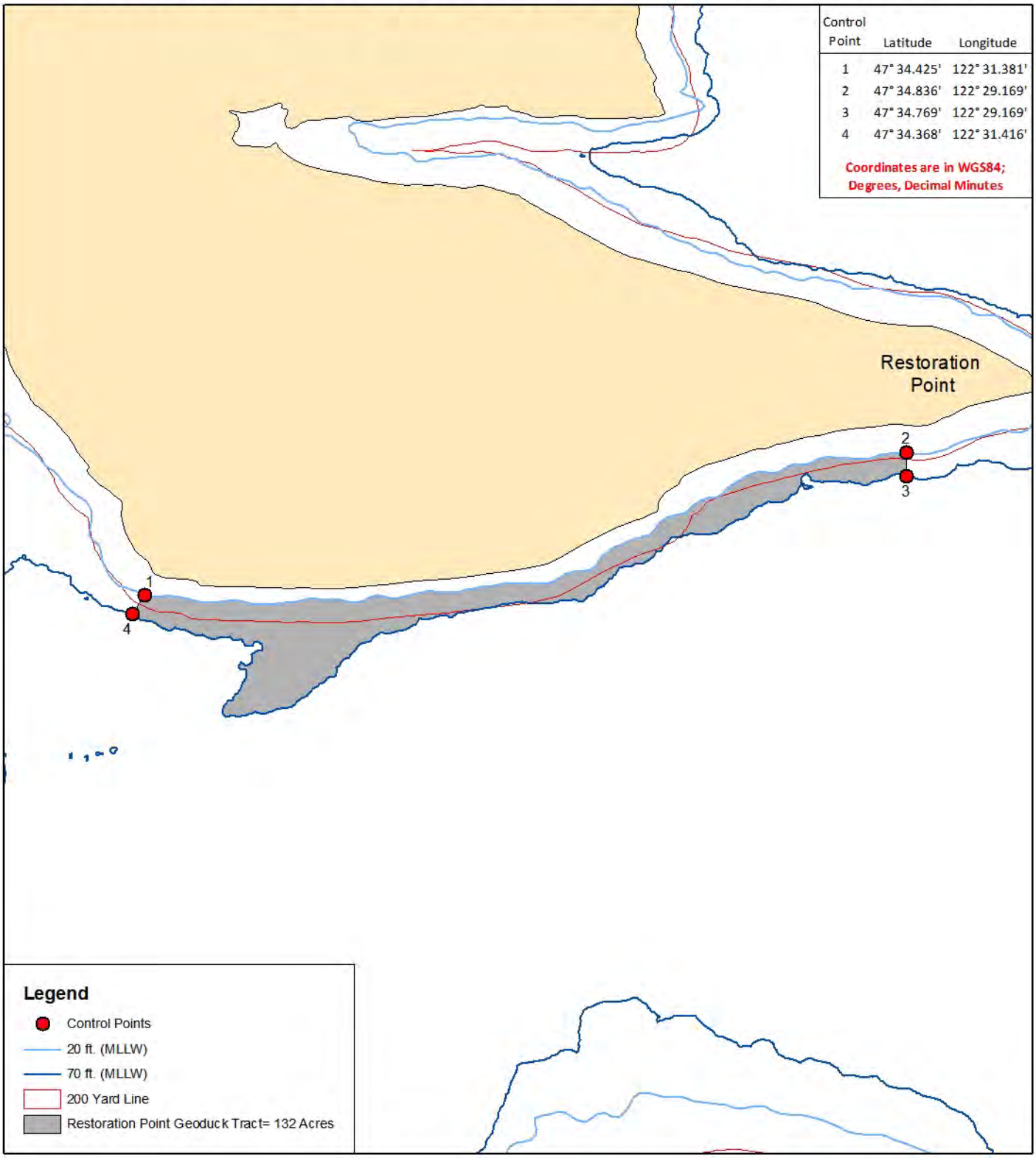
Data Sources:
Projection for data is GCS_Washington Geographic System 1984,
Units: Decimal Degrees. Coastline layer is from DNR, 1: 24,000 scale,
created 09-20-99. Contours are from NOAA soundings.

0 0.75 1.5 3 4.5 Miles

Washington Department of FISH and WILDLIFE

Map Date: April 17, 2018
Map Author: O. Working
File: Data\Geoduck\EAs

Figure 2. Control Points Map, Restoration Point Commercial Geoduck Tract #07850



N
W E
S

1:30,000
1 inch = 0.47 miles

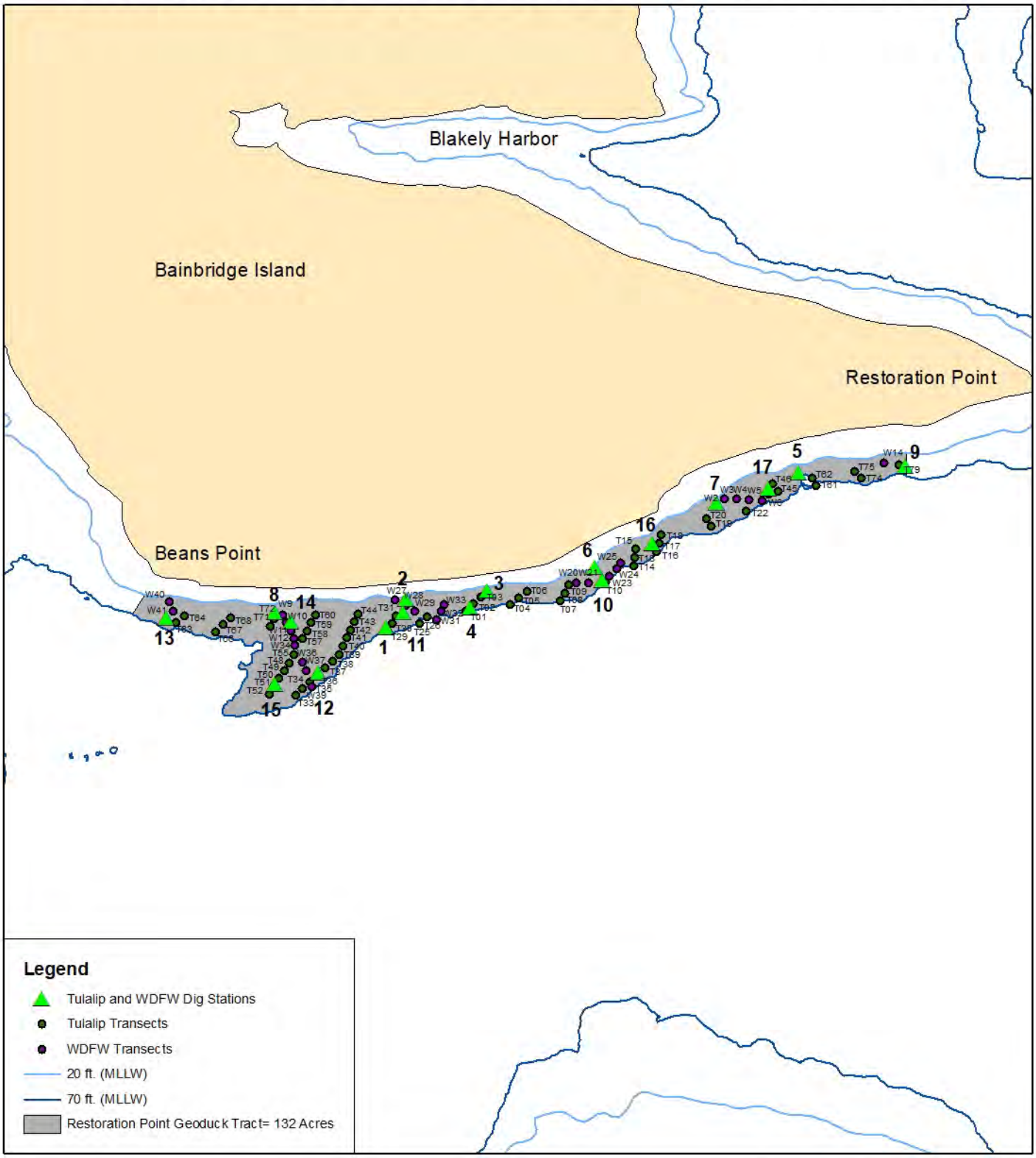
Data Sources:
Projection for data is GCS_Washington Geographic System 1984, Units: Decimal Degrees. Coastline layer is from DNR, 1: 24,000 scale, created 09-20-99. Contours are from NOAA soundings.

0 0.225 0.45 0.9 1.35 Miles

Washington Department of FISH and WILDLIFE

Map Date: April 1, 2021
Map Author: O. Working
File: Data\Geoduck\EAs

Figure 3. Transect and Dig Station Map, Restoration Point Commercial Geoduck Tract #07850



N
W E
S

1:30,000
1 inch = 0.47 miles

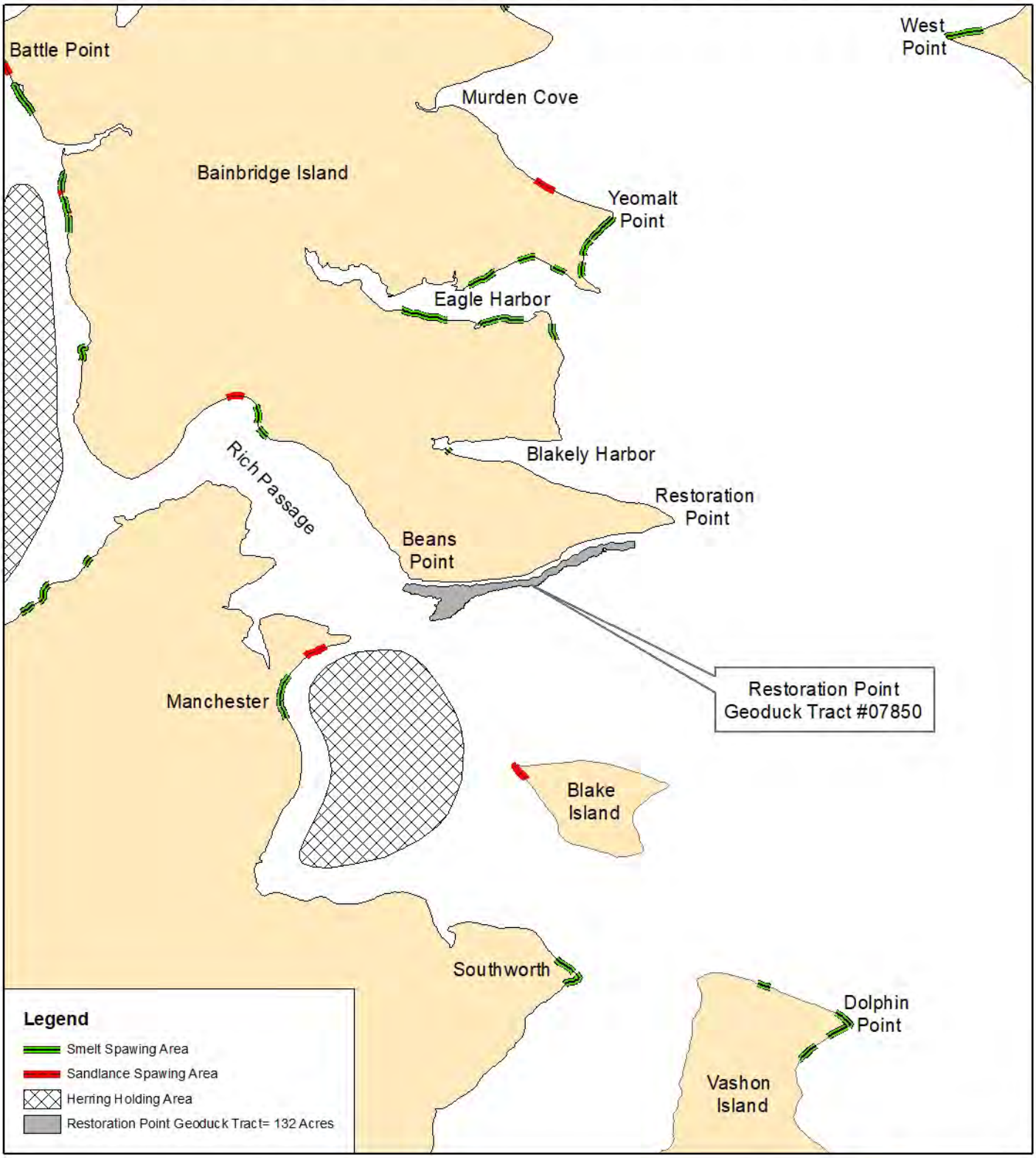
Data Sources:
Projection for data is GCS_Washington Geographic System 1984,
Units: Decimal Degrees. Coastline layer is from DNR, 1: 24,000 scale,
created 09-20-99. Contours are from NOAA soundings.

0 0.225 0.45 0.9 1.35
Miles

Washington Department of FISH and WILDLIFE

Map Date: April 17, 2018
Map Author: O. Working
File: Data\Geoduck\EAs

Figure 4. Fish Spawning Areas Near the Restoration Point Commercial Geoduck Tract #07850



N
W E
S

1:100,000
1 inch = 1.58 miles

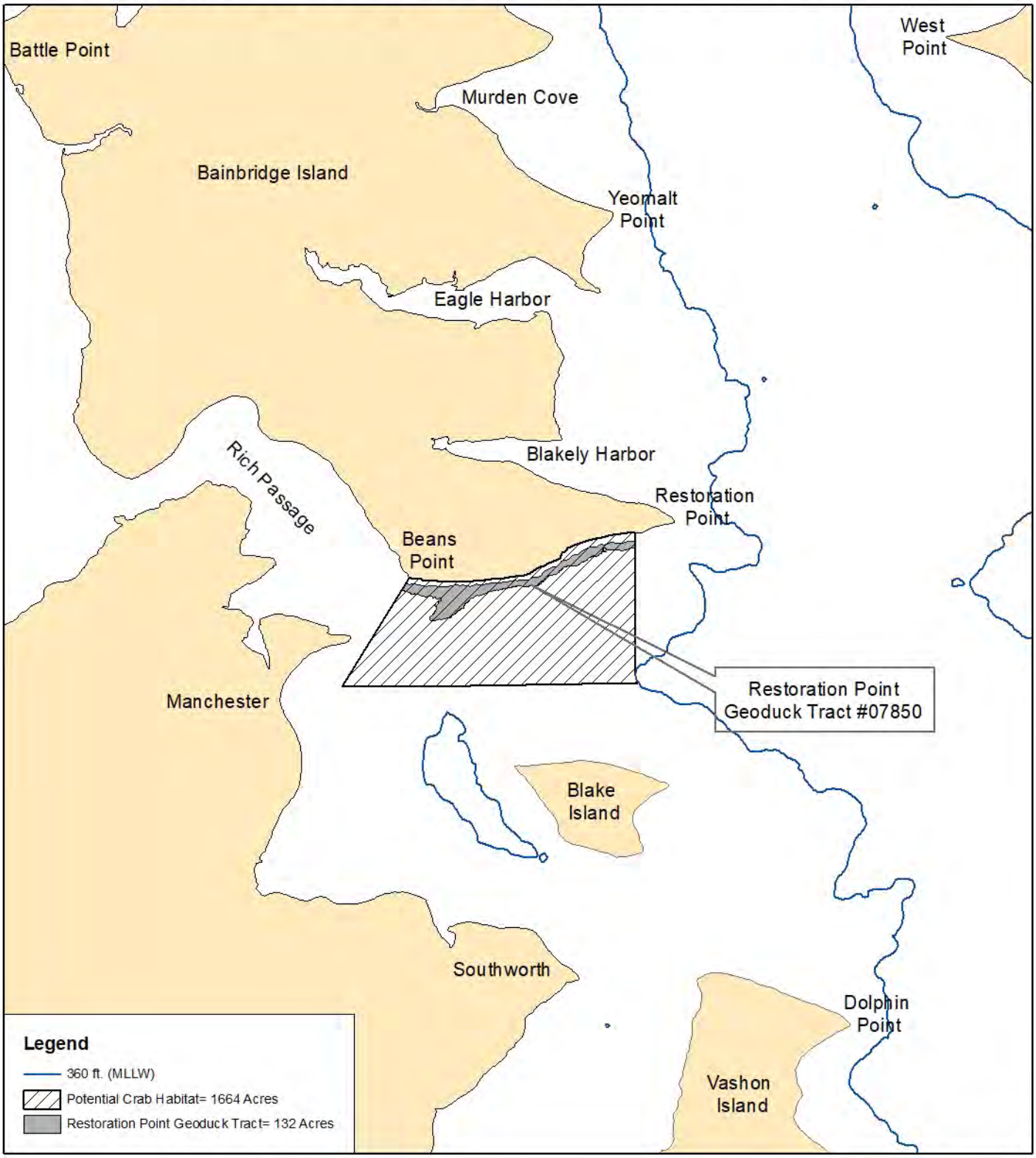
Data Sources:
Projection for data is GCS_Washington Geographic System 1984,
Units: Decimal Degrees. Coastline layer is from DNR, 1: 24,000 scale,
created 09-20-99. Contours are from NOAA soundings.

0 0.75 1.5 3 4.5 Miles

Washington Department of FISH and WILDLIFE

Map Date: April 17, 2018
Map Author: O. Working
File: Data\Geoduck\EAs

Figure 5. Dungeness Crab Habitat Map, Restoration Point Commercial Geoduck Tract #07850



N
W E
S

1:100,000
1 inch = 1.58 miles

Data Sources:
Projection for data is GCS_Washington Geographic System 1984,
Units: Decimal Degrees. 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: April 17, 2018
Map Author: O. Working
File: Data\Geoduck\EAs

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 or	Some difficulty	Substrate may be compact or contain gravel, shell 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

Tract Name	Restoration Point
Tract Number	07850
Tract Size (acres) [a]	132
Density of geoducks/sq.ft. [b]	0.15
Total Tract Biomass (lbs.) [b]	1,907,358
Total Number of Geoducks on Tract [b]	857,672
Confidence Interval (%)	15.9%
Mean Geoduck Whole Weight (lbs.)	2.22
Mean Geoduck Siphon Weight (lbs.)	0.13
Siphon Weight as a % of Whole Weight	6%
Number of 900 sq.ft. Transect Stations	90
Number of Geoducks Weighed	167

[a.] The tract area estimate is between the -20 ft. and -70 ft. (MLLW) water depth contours.

[b.] Biomass is based on the 2006, 2010, and 2011 Tulalip and WDFW pre-fishing geoduck survey biomass of 3,788,175 minus reported harvest of 1,880,817 pounds through April 1, 2021

Note: The pre-fishing biomass estimate used in the 2012-2013 Central Puget Sound Geoduck Harvest Management Plan includes an area estimate of 132 acres and a biomass estimate of 3,656,145 pounds. This estimate was generated by the Tulalip Tribes and differs from the current WDFW estimate. The WDFW biomass estimate for this Environmental Assessment report eliminates dig samples for water loss and/or broken valves. The WDFW pre-fishing estimate of 3,788,175 pounds also eliminates WDFW transects 1, 8, 13 and 19, which are non-commercial due to high quantities of cobble in the substrate.

Generated On:	April 1, 2021
Generated By:	O. Working, WDFW
File:	S:FP\FishMgmt\Geoduck\EAs\2021

Table 2: DIGGING DIFFICULTY TABLE

Restoration Point geoduck tract # 07850; 2006, 2010 and 2011 Tulalip and WDFW pre-fishing surveys.

Dig Date	Dig Station	Survey Party	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)
8/22/2006	1	Tulalip	4	2	1	2			1		Y
8/25/2006	2	Tulalip	3	2	1	2					Y
8/25/2006	3	Tulalip	3	2	1		1	1			Y
8/25/2006	4	Tulalip	0	2	1						Y
7/25/2007	5	Tulalip	2	2	1	1	0	0	0	0	Y
7/25/2007	6	Tulalip	3	0	1	0	1	0	0	1	Y
5/11/2010	7	WDFW	2	2	0	2	0	0	1	0	Y
5/11/2010	8	WDFW	0	2	1	0	0	0	0	0	Y
5/11/2010	9	WDFW	3	2	0	1	1	2	0	0	Y
5/11/2010	10	WDFW	1	2	0	1	0	0	1	1	Y
5/11/2010	11	WDFW	0	2	0	1	0	0	1	0	Y
4/8/2011	12	Tulalip	2	2	1	1	0	0	0	0	Y
8/1/2011	13	Tulalip	3	2	1	2	1	0	0	1	Y
8/1/2011	14	Tulalip	2	2	1	1	0	0	0	0	Y
8/1/2011	15	Tulalip	2	2	1	1	0	0	0	0	Y
8/1/2011	16	Tulalip	2	0	1	1	0	0	0	0	Y
8/1/2011	17	Tulalip	2	2	1	1	0	0	0	0	Y

Generated On: April 1, 2021
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2021

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

Restoration Point geoduck tract # 07850; 2006, 2010 and 2011 Tulalip and WDFW pre-fishing surveys.

Date	Transect	Start depth (ft.) [a]	End depth (ft.) [a]	Geoduck Density (no. / sq. ft.) [b]	Substrate [c]						
					mud	sand	cobble	gravel	shell	solid rock	boulder
8/15/2006	T_01	59	50	0.2830		2					
8/15/2006	T_02	50	42	0.4578		2					
8/15/2006	T_03	42	22	0.3274		2					
8/15/2006	T_04	57	43	0.5807		2					
8/15/2006	T_05	43	32	0.5644		2					
8/15/2006	T_06	32	18	0.1837		2					
8/15/2006	T_07	64	51	0.0133		1	2	1	1		
8/15/2006	T_08	51	44	0.6459		2					
8/15/2006	T_09	44	26	0.8222		2					
8/15/2006	T_10	60	55	0.4933		2					
8/18/2006	T_13	63	43	0.0193		2					
8/18/2006	T_14	43	29	0.0178		2					
8/18/2006	T_15	29	19	0.0089		2					
8/18/2006	T_16	61	43	0.0163		2					
8/18/2006	T_17	43	30	0.0193		2					
8/18/2006	T_18	30	21	0.0281		2					
8/18/2006	T_19	60	41	0.0563		2					
8/18/2006	T_20	41	21	0.0800		2					
8/18/2006	T_22	61	45	0.0148		2					
8/22/2006	T_25	67	58	0.5170		2					
8/22/2006	T_26	58	51	0.4607		2					
8/22/2006	T_29	66	58	0.5541		2					
8/22/2006	T_30	58	49	0.5570		2					
8/22/2006	T_31	49	44	0.4178		2					
9/7/2006	T_33	48	52	0.4044		2					
9/7/2006	T_34	52	57	0.4030		2					
9/7/2006	T_35	57	59	0.3126		2					
9/7/2006	T_36	59	58	0.2830		2					
9/7/2006	T_37	58	59	0.2178		2					
9/7/2006	T_38	59	61	0.1807		2					
9/7/2006	T_39	61	59	0.1719		2					
9/7/2006	T_40	59	56	0.2978		2					
9/7/2006	T_41	56	52	0.3659		2					
9/7/2006	T_42	52	47	0.5156		2					
9/7/2006	T_43	47	39	0.5170		2					
9/7/2006	T_44	39	27	0.3022		2					
9/7/2006	T_45	53	38	0.1170	1	2					
9/7/2006	T_46	38	20	0.0874	1	2					
9/8/2006	T_47	64	66	0.1837		2					
9/8/2006	T_48	66	67	0.1230		2					
9/8/2006	T_49	67	67	0.2711		2					
9/8/2006	T_50	67	66	0.2237		2					

Table 3: Continued

Restoration Point geoduck tract # 07850; 2006, 2010 and 2011 Tulalip and WDFW pre-fishing surveys.

Date	Transect	Start depth (ft.) [a]	End depth (ft.) [a]	Geoduck Density (no. / sq. ft.) [b]	Substrate [c]						
					mud	sand	cobble	gravel	shell	solid rock	boulder
9/8/2006	T_51	66	62	0.3793		2					
9/8/2006	T_52	62	55	0.5185		2					
9/8/2006	T_55	65	65	0.1956		2					
9/8/2006	T_57	59	51	0.5970		2					
9/8/2006	T_58	51	45	0.6756		2					
9/8/2006	T_59	45	36	0.6815		2					
9/8/2006	T_60	36	26	0.5244		2					
9/8/2006	T_61	55	39	0.1170	1	2					
9/8/2006	T_62	39	19	0.0548	1	2					
9/13/2006	T_63	57	44	0.8504		2					
9/13/2006	T_64	44	30	0.4341		2					
9/13/2006	T_66	59	50	0.4311		2					
9/13/2006	T_67	50	40	0.6104		2					
9/13/2006	T_68	40	30	0.4667		2					
9/13/2006	T_70	60	50	0.5585		2					
9/13/2006	T_71	50	41	0.5496		2					
9/13/2006	T_72	41	29	0.4993		2					
9/27/2006	T_74	62	42	0.2385		2					
9/27/2006	T_75	42	24	0.2193		2					
9/27/2006	T_79	28	19	0.0770		2					
5/5/2010	W_2	30	39	0.0370	2	1					
5/5/2010	W_3	39	47	0.0548	2	1					
5/5/2010	W-4	47	56	0.0385	2	1					
5/5/2010	W_5	56	52	0.0637	2	1					
5/5/2010	W_6	52	42	0.1096	2	1					
5/5/2010	W_9	34	45	0.5496	1	2					
5/5/2010	W_10	45	51	0.4815	1	2					
5/5/2010	W_11	51	56	0.4178	1	2					
5/5/2010	W_12	56	60	0.3289	1	2					
5/6/2010	W_14	29	37	0.2800	2	1					
5/6/2010	W_20	28	36	0.3200		2					1
5/6/2010	W_21	36	55	0.3585	1	2	1				1
5/6/2010	W_23	58	53	0.1096		2					
5/6/2010	W_24	53	45	0.0222	1	2					
5/6/2010	W_25	45	40	0.0222	1	1					
5/6/2010	W_26	40	33	0.0252	1	1					
5/10/2010	W_27	20	36	0.0356	1	1	1	1			
5/10/2010	W_28	36	46	0.2222	1	1					
5/10/2010	W_29	46	55	0.1644	1	1					
5/10/2010	W_31	63	53	0.2622	1	2					
5/10/2010	W_32	53	40	0.2815	1	2					
5/10/2010	W_33	40	21	0.1704	1	2	1	1			

Table 3: Continued

Restoration Point geoduck tract # 07850; 2006, 2010 and 2011 Tulalip and WDFW pre-fishing surveys.

Date	Transect	Start depth (ft.) [a]	End depth (ft.) [a]	Geoduck Density (no. / sq. ft.) [b]	Substrate [c]						
					mud	sand	cobble	gravel	shell	solid rock	boulder
5/10/2010	W_34	60	61	0.3126	1	2					
5/10/2010	W_36	61	60	0.1926	1	1					
5/10/2010	W_37	60	58	0.1600	1	2					
5/10/2010	W_39	60	57	0.1704	1	1					
5/10/2010	W_40	23	38	0.3274	1	2	1			1	
5/10/2010	W_41	38	51	0.3244	1	2	1		1		

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

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

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

Generated On: April 1, 2021
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2021

Table 4: GEODUCK SIZE AND QUALITY

Restoration Point geoduck tract # 07850; 2006, 2010 and 2011 Tulalip and WDFW pre-fishing surveys.

Dig Date	Dig Station	Survey Party	Number Dug	Avg. Whole Weight (lbs.)	Avg. Siphon Weight (lbs.)	% of geoducks on station greater than 2 lbs.
8/22/2006	1	Tulalip	10	1.40	-	0%
8/25/2006	2	Tulalip	8	3.00	-	100%
8/25/2006	3	Tulalip	11	3.17	-	100%
8/25/2006	4	Tulalip	15	1.63	-	7%
7/25/2007	5	Tulalip	9	3.24	-	100%
7/25/2007	6	Tulalip	8	3.25	-	88%
5/11/2010	7	WDFW	10	2.75	0.54	100%
5/11/2010	8	WDFW	10	2.57	0.66	100%
5/11/2010	9	WDFW	10	1.65	0.22	0%
5/11/2010	10	WDFW	11	1.55	0.25	18%
5/11/2010	11	WDFW	10	1.73	0.43	20%
4/8/2011	12	Tulalip	10	1.76	-	30%
8/1/2011	13	Tulalip	10	1.45	-	0%
8/1/2011	14	Tulalip	10	1.98	-	60%
8/1/2011	15	Tulalip	10	1.85	-	40%
8/1/2011	16	Tulalip	9	3.16	-	100%
8/1/2011	17	Tulalip	10	2.30	-	60%

Generated On: April 1, 2021
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2021

Table 5: TRANSECT CORRECTED GEODUCK COUNT AND POSITION TABLE

Restoration Point geoduck tract # 07850; 2006, 2010 and 2011 Tulalip and WDFW pre-fishing sur

Date	Transect	Corrected Count	Show Factor [a]	Latitude [b]	Longitude [b]
8/15/2006	T_01	255	0.75	47° 34.378	122° 30.449
8/15/2006	T_02	412	0.75	47° 34.398	122° 30.427
8/15/2006	T_03	295	0.75	47° 34.418	122° 30.404
8/15/2006	T_04	523	0.75	47° 34.397	122° 30.321
8/15/2006	T_05	508	0.75	47° 34.416	122° 30.297
8/15/2006	T_06	165	0.75	47° 34.434	122° 30.272
8/15/2006	T_07	12	0.75	47° 34.407	122° 30.174
8/15/2006	T_08	581	0.75	47° 34.430	122° 30.162
8/15/2006	T_09	740	0.75	47° 34.454	122° 30.150
8/15/2006	T_10	444	0.75	47° 34.461	122° 30.042
8/18/2006	T_13	17	0.75	47° 34.509	122° 29.962
8/18/2006	T_14	16	0.75	47° 34.533	122° 29.959
8/18/2006	T_15	8	0.75	47° 34.558	122° 29.957
8/18/2006	T_16	15	0.75	47° 34.550	122° 29.895
8/18/2006	T_17	17	0.75	47° 34.575	122° 29.888
8/18/2006	T_18	25	0.75	47° 34.599	122° 29.881
8/18/2006	T_19	51	0.75	47° 34.623	122° 29.736
8/18/2006	T_20	72	0.75	47° 34.646	122° 29.749
8/18/2006	T_22	13	0.75	47° 34.668	122° 29.634
8/22/2006	T_25	465	0.75	47° 34.341	122° 30.583
8/22/2006	T_26	415	0.75	47° 34.361	122° 30.561
8/22/2006	T_29	499	0.75	47° 34.318	122° 30.676
8/22/2006	T_30	501	0.75	47° 34.341	122° 30.664
8/22/2006	T_31	376	0.75	47° 34.364	122° 30.651
9/7/2006	T_33	364	0.75	47° 34.132	122° 30.944
9/7/2006	T_34	363	0.75	47° 34.152	122° 30.922
9/7/2006	T_35	281	0.75	47° 34.172	122° 30.901
9/7/2006	T_36	255	0.75	47° 34.192	122° 30.879
9/7/2006	T_37	196	0.75	47° 34.212	122° 30.858
9/7/2006	T_38	163	0.75	47° 34.232	122° 30.837
9/7/2006	T_39	155	0.75	47° 34.252	122° 30.815
9/7/2006	T_40	268	0.75	47° 34.275	122° 30.805
9/7/2006	T_41	329	0.75	47° 34.299	122° 30.794
9/7/2006	T_42	464	0.75	47° 34.322	122° 30.783
9/7/2006	T_43	465	0.75	47° 34.346	122° 30.772
9/7/2006	T_44	272	0.75	47° 34.370	122° 30.762
9/7/2006	T_45	105	0.75	47° 34.724	122° 29.542
9/7/2006	T_46	79	0.75	47° 34.746	122° 29.558
9/8/2006	T_47	165	0.75	47° 34.250	122° 30.947
9/8/2006	T_48	111	0.75	47° 34.227	122° 30.962
9/8/2006	T_49	244	0.75	47° 34.204	122° 30.977
9/8/2006	T_50	201	0.75	47° 34.182	122° 30.991
9/8/2006	T_51	341	0.75	47° 34.159	122° 31.006
9/8/2006	T_52	467	0.75	47° 34.137	122° 31.020
9/8/2006	T_55	176	0.75	47° 34.250	122° 30.947
9/8/2006	T_57	537	0.75	47° 34.296	122° 30.923
9/8/2006	T_58	608	0.75	47° 34.319	122° 30.911
9/8/2006	T_59	613	0.75	47° 34.343	122° 30.898

Table 5: Continued
Restoration Point geoduck tract # 07850; 2006, 2010 and 2011 Tulalip and WDFW pre-fishing sur

Date	Transect	Corrected Count	Show Factor [a]	Latitude [b]	Longitude [b]
9/8/2006	T_60	472	0.75	47° 34.366	122° 30.886
9/8/2006	T_61	105	0.75	47° 34.742	122° 29.430
9/8/2006	T_62	49	0.75	47° 34.765	122° 29.444
9/13/2006	T_63	765	0.75	47° 34.345	122° 31.291
9/13/2006	T_64	391	0.75	47° 34.364	122° 31.267
9/13/2006	T_66	388	0.75	47° 34.318	122° 31.177
9/13/2006	T_67	549	0.75	47° 34.337	122° 31.155
9/13/2006	T_68	420	0.75	47° 34.357	122° 31.133
9/13/2006	T_70	503	0.75	47° 34.309	122° 31.031
9/13/2006	T_71	495	0.75	47° 34.332	122° 31.018
9/13/2006	T_72	449	0.75	47° 34.355	122° 31.004
9/27/2006	T_74	215	0.75	47° 34.762	122° 29.301
9/27/2006	T_75	197	0.75	47° 34.783	122° 29.319
9/27/2006	T_79	69	0.75	47° 34.801	122° 29.191
5/5/2010	2	33	0.75	47° 34.703	122° 29.697
5/5/2010	3	49	0.75	47° 34.703	122° 29.662
5/5/2010	4	35	0.75	47° 34.701	122° 29.627
5/5/2010	5	57	0.75	47° 34.699	122° 29.587
5/5/2010	6	99	0.75	47° 34.717	122° 29.568
5/5/2010	9	495	0.75	47° 34.367	122° 30.980
5/5/2010	10	433	0.75	47° 34.345	122° 30.971
5/5/2010	11	376	0.75	47° 34.320	122° 30.956
5/5/2010	12	296	0.75	47° 34.297	122° 30.947
5/6/2010	14	252	0.75	47° 34.808	122° 29.233
5/6/2010	20	288	0.75	47° 34.459	122° 30.128
5/6/2010	21	323	0.75	47° 34.459	122° 30.092
5/6/2010	23	99	0.75	47° 34.477	122° 30.033
5/6/2010	24	20	0.75	47° 34.499	122° 30.011
5/6/2010	25	20	0.75	47° 34.517	122° 29.998
5/6/2010	26	23	0.75	47° 53.538	122° 29.967
5/10/2010	27	32	0.75	47° 34.409	122° 30.655
5/10/2010	28	200	0.75	47° 34.393	122° 30.623
5/10/2010	29	148	0.75	47° 34.376	122° 30.597
5/10/2010	31	236	0.75	47° 34.353	122° 30.533
5/10/2010	32	253	0.75	47° 34.377	122° 30.521
5/10/2010	33	153	0.75	47° 34.396	122° 30.511
5/10/2010	34	281	0.75	47° 34.277	122° 30.944
5/10/2010	36	173	0.75	47° 34.228	122° 30.923
5/10/2010	37	144	0.75	47° 34.205	122° 30.912
5/10/2010	39	153	0.75	47° 34.157	122° 30.895
5/10/2010	40	295	0.75	47° 34.404	122° 31.310
5/10/2010	41	292	0.75	47° 34.378	122° 31.300

[a.] A siphon show factor was used to correct combined geoduck counts
[b.] Latitude and longitude are in degrees and decimal minutes (WGS84)

Generated On: April 1, 2021
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2021

Table 6: MOST COMMON AND OBVIOUS ANIMALS OBSERVED

Restoration Point geoduck tract # 07850; 2006, 2010 and 2011 Tulalip and WDFW pre-fishing surveys.

# of Transects where Observed	Group	Common Name	Taxonomer
44	ANEMONE	BURROWING ANEMONE	*Pachycerianthus fimbriatus*
16	ANEMONE	PLUMED ANEMONE	*Metridium spp.*
3	ANEMONE	STRIPED ANEMONE	*Urticina spp.*
10	BIVALVE	HARDSHELL CLAMS	*Veneridae spp.*
2	BIVALVE	TRUNCATED MYA	*Mya truncata*
3	BIVALVE	FALSE GEODUCK	*Panomya spp.*
6	BIVALVE	HEART COCKLE	*Clinocardium nuttalli*
1	BIVALVE	HORSE MUSSEL	*Modiolus rectus*
1	BIVALVE	JINGLESHELL OYSTER	*Pododesmus macrochisma*
1	BIVALVE	PIDDOCK	*Unspecified Pholadidae*
1	BIVALVE	SPINY SCALLOP	*Chlamys hastata*
1	CEPHALOPOI	OCTOPUS	*Octopus or Enteroctopus spp.*
62	CNIDARIA	SEA WHIP	*Stylatula elongata*
60	CNIDARIA	SEA PEN	*Ptilosarcus gurneyi*
18	CRAB	DECORATOR CRAB	*Oregonia gracilis*
44	BIVALVE	HORSE CLAM	*Tresus spp.*
36	CRAB	HERMIT CRAB	Unspecified hermit crab
16	CRAB	DUNGENESS CRAB	*Cancer magister*
22	CRAB	RED ROCK CRAB	*Cancer productus*
34	CRAB	GRACEFUL CRAB	*Cancer gracilis*
3	CUCUMBER	SEA CUCUMBER	*Parastichopus californicus*
4	FISH	FISH	Unspecified Fish
11	FISH	STARRY FLOUNDER	*Platichthys stellatus*
11	FISH		*Citharichthys spp.*
56	FISH	FLATFISH	Unspecified flatfish
1	FISH	ROCK SOLE	*Lepidopsetta bilineata*
8	FISH	SCULPIN	Unspecified Cottidae
1	FISH	C-O SOLE	*Pleuronichthys coenosus*
1	FISH	LINGCOD	*Ophiodon elongatus*
1	FISH	CABEZON	*Scorpaenichthys marmoratus*
6	FISH	POACHER	Unspecified Agonidae
8	FISH EGGS	SKATE EGG CASE	*Raja spp. egg case*
15	GASTROPOD	MOON SNAIL EGGS	*Polinices lewisii egg case*
1	GASTROPOD	MOON SNAIL	*Polinices lewisii*
23	MISC	MYSIDS	Unspecified mysid
9	NUDIBRANCH	ROSY TRITONIA	*Tritonia diomedea*
16	NUDIBRANCH	ARMINA	*Armina californica*
1	NUDIBRANCH	DENDRONOTUS	*Dendronotus spp.*
9	NUDIBRANCH	NUDIBRANCH	Unspecified nudibranch
38	SEA STAR	SUNFLOWER STAR	*Pycnopodia helianthoides*
18	SEA STAR	SAND STAR	*Luidia foliolata*
68	SEA STAR	SHORT-SPINED STAR	*Pisaster brevispinus*
1	SEA STAR	SPINY STAR	*Hippasteria spinosa*
1	SEA STAR	BLOOD STAR	*Henricia leviuscula*
13	SEA STAR	LEATHER STAR	*Dermasterias imbricata*

Table 6: Continued
Restoration Point geoduck tract # 07850; 2006, 2010 and 2011 Tulalip and WDFW pre-fishing surveys.

# of Transects where Observed	Group	Common Name	Taxonomer
54	SEA STAR	SUN STAR	*Solaster spp.*
8	SEA STAR	ROSE STAR	*Crossaster papposus*
30	SHRIMP	GHOST SHRIMP	Unspecified ghost shrimp
37	SHRIMP	SHRIMP	Unspecified shrimp
8	WORM	WORM	Unspecified Annelid worm
24	WORM	TEREBELLID TUBE WORM	*Terebellid spp.*
29	WORM	SABELLID TUBE WORM	*Sabellid spp.*
30	WORM	ROOTS	*Chaetopterid polychaete tubes*

Generated On: April 1, 2021
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2021

Table 7: MOST COMMON AND OBVIOUS ALGAE OBSERVED

Restoration Point geoduck tract # 07850; 2006, 2010 and 2011 Tulalip and WDFW pre-fishing surveys.

# of Transects where observed	Taxonomer
5	Unspecified small mixed algae
37	Unspecified small red algae
58	*Laminaria spp.*
11	*Desmarestia spp.*

Generated On: April 1, 2021
Generated By: O. Working, WDFW
File: S:FP\FishMgmt\Geoduck\EAs\2021