United States Department of the Interior

FISH AND WILDLIFE SERVICE

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In Reply Refer To:
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Evan Lewis, Acting Chief Environmental Resource Section
Seattle District, Corps of Engineers
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P.O. Box 3755
Seattle, Washington 98124-3755

Dear Mr. Lewis:

Subject: Puget Sound Dredge Disposal Analysis (PSDDA) Program

This correspondence is in response to your letter dated August 27, 2010, and Biological Evaluation requesting our concurrence with your determination of "may affect, not likely to adversely affect" for marbled murrelet (murrelet; *Brachyramphus marmoratus*), bull trout (*Salvelinus confluentus*), and bull trout critical habitat, for the Puget Sound Dredge Disposal Analysis Program (PSDDA). The U.S. Army Corps of Engineers (Corps) is requesting consultation for the transport and disposal of dredged material at the eight PSDDA open water disposal sites for the five year period between 2010 and 2015. The disposal sites are located in Bellingham Bay, Rosario Strait, Port Townsend, Port Angeles, Port Gardner, Elliot Bay, Commencement Bay, and Anderson/Ketron Island. This informal consultation has been conducted in accordance with section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)(Act).

Background

The Dredged Material Management Program (DMMP) agencies[1] administer the DMMP Program. The DMMP has developed a process for determining where dredged materials should be disposed (e.g, upland, in water confined disposal areas or in open water disposal areas). This process utilizes standardized sampling and analysis procedures and existing benchmarks such as Sediment Management Standards to determine the suitability of materials for in water disposal. This process is described in detail below.

Suitability Determination

The DMMP has a process in place to evaluate the suitability of dredged material for open-water disposal and/or beneficial use. Material that is determined to not be suitable for open-water disposal must be disposed at an approved upland site or appropriate confined disposal site. The suitability determination is based on an evaluation of all testing data gathered to evaluate the dredged material. These data include conventional and chemical data on all chemicals of concern (COC) relative to DMMP chemical guidelines (e.g., screening levels, bioaccumulation triggers, maximum levels), and biological testing (e.g., toxicity testing, bioaccumulation testing) if required by exceedances of chemical guidelines. Toxicity testing is required if one or more chemicals exceed a screening level, and bioaccumulation testing is required if a bioaccumulation trigger is exceeded. The evaluation process assesses the level of chemical contamination in dredged material, which is documented in the suitability determination. This suitability analysis is used to determine if sediments to be dredged have the potential to adversely affect biological resources. If it is determined that the contaminants in sediments have the potential to adversely affect biological resources, the dredge material is considered unsuitable for open-water disposal and is disposed of elsewhere either upland or within a confined disposal area.

The suitability determination is based on a tiered approach:

1) Tier I: Review of existing sediment data and site history to determine if additional data are required.
2) Tier II: Additional testing of chemicals of concern and comparison to existing screening levels.
3) Tier III: Routine toxicity testing to measure toxicity in aquatic invertebrates and routine bioaccumulation testing.
4) Tier IV: DMMP discretionary non-routine analysis (e.g., special steady state/time-sequenced bioaccumulation testing or tissue analysis).

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[1] The DMMP consists of individuals from the Corps (Seattle District), the Environmental Protection Agency (EPA Region 10), the Washington Department of Natural Resources (DNR), and the Washington Department of Ecology (WDOE).

The Tiered Testing Decision Diagram (Corps 2010, pg. 11) presents the stepwise analysis used to determine dredge disposal options. In Tier I, a site is evaluated using existing data and historical site information. This information is compared to ranking guidelines (Table 1) and chemical guideline values. Using the available information (i.e., data and historical site use) the DMMP agencies use best professional judgment to determine the potential scale of risk for adverse effects to human health and aquatic species (primarily invertebrates).

Table 1. Dredge Material Ranking Guidelines. (Corps 2008, pg. 4-2)

Rank	Guidelines
Low	Few or no sources of chemicals of concern. Data are available to verify low chemical concentrations (below DMMP screening levels) and no significant response in biological tests.
Low-Moderate	Available information indicates a "low" rank, but there are insufficient data to confirm the ranking.
Moderate	Sources exist in the vicinity of the project, or there are present or historical uses of the project site, with the potential for producing chemical concentrations within a range associated historically with some potential for causing adverse biological impacts.
High	Many known chemical sources, high concentrations of chemicals of concern, and/or biological testing failures in one or both of the two most recent cycles of testing.

Frequently the site requires chemical testing (Tier II). The levels of COCs[2] in sediments measured in Tier II are compared to chemical guidelines including screening levels (SLs), maximum levels (MLs), and bioaccumulation triggers (BTs) (Corps 2008, pg. 6-2), defined as follows:

1) The SLs are the sediment concentrations intended to be protective of direct biological effects to benthic and aquatic organisms. Guidelines to identify chemical concentrations at or below which there is no reason to believe that dredged material disposal would result in unacceptable adverse biological impacts (Corps 2010, pg. 6; RSET 2009, pg. 6-1).
2) The MLs are the sediment concentrations derived for each COC, which represents the highest Apparent Effects Threshold[3].
3) The BTs are the sediment concentrations that constitute a "reason to believe" level that the chemical would accumulate in the tissues of target organisms (including fish). If a COC exceeds a BT, then bioaccumulation testing is required prior to determining the suitability for open-water disposal.

[2] These COCs have: 1) a demonstrated or suspected effect on ecology or human health (i.e., the focus of chemical concerns is on ultimate biological effects), 2) one or more present or historical sources of sufficient magnitude to be of concern (i.e., relatively widespread distribution and high concentration when compared to natural conditions), 3) a potential for remaining in a toxic form for long periods in the environment (persistence), and/or 4) a potential for entering the food web (bioavailability) (DMMP 2008, pg. 6-1, 6-2).

[3] Station where sediment chemistry and biological data are collected to determine which chemical is causing adverse effects.

The SLs and MLs are chemical-specific values developed from invertebrate toxicity tests and are designed to be protective of these receptor groups. These values do not take into consideration bioaccumulation or effects to higher trophic level species (i.e., salmonids). The sediment BTs are values used to determine if bioaccumulation testing is necessary. Bioaccumulation tests are usually conducted with a bivalve and polycheate. Currently, there are no BT's that address effects in fish. Target tissue levels (TTLs) are available for fish and other aquatic species, aquatic dependent species (i.e., bald eagle), and human health (fish tissue for consumption). BTs linking these TTLs to sediment concentrations for fish and aquatic dependent species have not yet been developed (RSET 2009, pg. 8-9). The need to develop BTs linking TTLs to sediments is well recognized and will no doubt be addressed in sediment criteria by WDOE in the near future. For now, the TTLs developed in the Sediment Evaluation Framework (RSET 2009, pg. 8-5) for the protection of human health are low and may be protective of fish as well. It is important to note that the U.S. Fish and Wildlife Service (Service) contributed to the development of the Sediment Evaluation Framework.

Using the guidelines above, the DMMP screens the sediments chemical data to determine its suitability for open-water disposal. The following procedures are followed to make the determination:

1) If chemicals are equal to or below their SLs, then no additional testing is required and the dredged material is considered suitable for unconfined, open-water disposal at any site and for all open-water beneficial uses.
2) If one or more chemicals are present at levels between the SLs and MLs, then standard biological testing (Tier III analysis) is necessary.
3) If one or more chemicals are present at levels above the MLs, then biological testing (invertebrate bioassays) may still be conducted, but it is highly likely that the dredged material will fail Tier III testing.
4) If one chemical is more than double the MLs concentration or if two or more chemicals exceed the MLs, then those sediments would require biological testing, which may include a Tier IV evaluation (e.g, bioaccumulation testing).

The decision as to whether dredged material may be disposed of at dispersive or nondispersive open-water site is based upon whether it meets Site Condition I or Site Condition II criteria. Site Condition I is defined as "no adverse effects on biological resources due to sediment chemicals;" sediment that meets Site Condition I can be disposed of at dispersive unconfined open-water sites. Site Condition II is defined as "minor adverse effects on the biological resources due to sediment chemicals;" sediment that meets Site Condition II must be disposed of at nondispersive unconfined open-water disposal sites. All other exceedances require the dredge material to be disposed of in a confined disposal facility or in an appropriate upland location.

Project Description[4]

The activities under consultation as described in the proposed action are 1) the transport of dredging material from a dredging site to a PSDDA disposal site, 2) the disposal of material at a PSDDA site, and 3) the return of equipment (tug and barge) to the dredging site. Specific dredging actions are not included in this consultation. They are consulted on individually as separate actions submitted by the Corps under Section 10 and Section 404 of the Clean Water Act. The term of the consultation is five years. The timing of dredging activities is generally regulated by in-water work windows established to protect out-migrating juvenile salmon and bull trout during sensitive life stages. In addition, three of the eight PSDDA sites have closure periods for the protection of other marine resources and fisheries. These sites include Port Townsend and Port Angeles (fall shrimp closure) and Bellingham Bay (crab/shrimp closure).

The selection of the disposal sites was based on, among other things, 1) current speed (greater or less than 25 cm/sec), 2) distance from shore (greater than 2,500 ft for non-dispersive and not less than 1.2 miles for dispersive sites), and 3) water depth (between 120 ft and 600 ft for non-dispersive sites and at least 180 ft for dispersive sites).

Dredged material is generally transported to the disposal site by a tugboat pulling a bottom-dump (split-hull) barge. The barges have the ability to transport between 1,200 cy and 2,000 cy of material each trip. The typical number of barge trips for a given site is two to five per day when projects are active. The distance traveled and the number of trips required varies depending on the location and extent of the dredging activity. The decision on where to dispose of the materials (dispersive or non-dispersive site) depends on the contaminant levels in the dredge material which is evaluated through a suitability determination process.

Disposal Site Description

Nondispersive Sites

Non-dispersive sites include Bellingham Bay, Port Gardner, Elliot Bay, Commencement Bay, and Anderson/Ketron Island. The following are characteristics of the specific non-dispersive disposal sites:

1) Commencement Bay is located 0.75 nautical mile off shore at a depth of 439 ft.
2) Elliott Bay is located 0.74 nautical mile from shore at a depth of 300 ft to 360 ft.
3) Port Gardner is located 2.0 nautical miles from shore at a depth of 420 ft.
4) Bellingham Bay is located 3.5 nautical miles from shore at a depth of 96 ft.
5) Anderson/Ketron Island is located 3.0 nautical miles from shore at a depth of 442 ft.

[4] This project description is based on the information provided to the Service by the Corps. Corps. 2010. Biological Evaluation: Continued Use of Puget Sound Dredged Disposal Analysis Program (PSDDA) Dredged Material Disposal Sites August, 2010. 102pp.

Disposal activities at these non-dispersive sites are conducted to maintain the dispersion of dredged material in the 600 ft radius target zone. Operators are required to report where the bottom-dump barge doors are opened and closed to ensure that all material is placed within the disposal site boundary. Additionally, the Department of Natural Resources (DNR) keeps records of all disposal track lines that each barge traveled during the dumping episode.

Dispersive Sites
Dispersive sites include Rosario Strait, Port Townsend, and Port Angeles. The following are characteristics of the specific dispersive disposal sites:

1) Rosario Strait is located 1 nautical mile from shore at a depth of 120 ft.
2) Port Townsend is located 12 nautical miles from shore at a depth of 361 ft.
3) Port Angeles is located 4 nautical miles from shore at a depth of 435 ft.

Dredged material is dumped from a bottom-dump barge as the barge is towed over the disposal site. The size of the disposal sites was based on the modeling assumptions that a barge is towed at an average speed of 3 knots and the load is completely dumped in 10 minutes. Dispersive site disposal zones were sized based on the predicated horizontal spread of a single dump of dredged material. Based on the predicted spread at the disposal sites, the lateral dimensions were set at 6,000 ft (1,829 m) for Rosario Strait and 7,000 ft (2,134 m) for the Port Townsend and Port Angeles sites.

Amount and Movement of Dredge Materials
Since 1989, the amount of material disposed of at the non-dispersive and dispersive sites is 16 million and 14 million cy, respectively. The average volume per year for non-dispersive and dispersive sites has been 641,000 cy and 737,000 cy, respectively. Elliott Bay and Rosario Strait are the most frequently used non-dispersive and dispersive disposal sites with 364,000 cy and 92,000 cy respectively, disposed of annually. Bellingham Bay and Port Angeles are the least frequently used. Over the past 21 years these sites have been used one time and three times for dredge disposal, respectively.

In order to ensure that the dredged material is behaving as expected based on site selection criteria, the Corps modeled the movement of dredged material during disposal at both non-dispersive and dispersive disposal sites. At non-dispersive sites the material must remain within the site boundary while at dispersive sites it is intended to move off site. For non-dispersive sites the models show that that the material settles to the bottom within the disposal site boundary within a 1,000 ft radius (305 m) (Corps 2010, pg. 17). Apparently, transit time is short, on the order of 30 sec in 400 ft (122 m) of water. Approximately 1 percent to 5 percent of the material is carried by currents from the plume as it descends the water column, and it takes approximately 1 hour for all of the material to settle out.

Using models to predict dredged material movement from dispersive sites the Corps, estimates that 90 percent of the material is deposited within a 1,500 ft (457 m) radius of the disposal location and the remaining 10 percent is carried by strong currents out of the disposal site boundary. At all three of the dispersive sites (Rosario Strait, Port Townsend, and Port Angeles) the net current speeds range from 10 cm/sec to 50 cm/sec with peak speeds of 75 cm/sec to 125 cm/sec. These current speeds are capable of transporting sediments up to 10 miles per day. Dredge materials generally move southward from Rosario Strait and east/west from Port Townsend and Port Angeles.

Conservation Measures

The DMMP has established conservation measures for this program to minimize the effects of the proposed action on listed species and important resources. These include:

1) Consolidation of dredged material disposal sites to minimize the area and locations affected by dredged material disposal.
2) Consideration of beneficial-use disposal sites for appropriate dredge material.
3) Timing of dredging and disposal events to avoid overlap with sensitive migration or life history periods of listed species.
4) Using dredged material testing protocols to ensure the suitability of materials for unconfined open-water discharge.
5) Sequencing of disposal (cleanest suitable material last) to manage sediment quality objectives.
6) Conducting site monitoring activities (physical, chemical, and biological) to determine if unacceptable impacts are occurring at disposal sites.
7) Performing annual review of monitoring results.
8) Adaptively managing sites based on monitoring results.
9) Implementing measures, including sideboards and loading practices, to minimize the loss of dredged material during transport (Corps 2010, pg. 35).
10) Closure of the Bellingham Bay disposal site to protect Dungeness crab, shrimp and Pacific herring (*Clupea pallasii*) during the holding period.

Effects Determination

Based on the information provided in your Biological Evaluation, and the additional information received via email communication on October 7, October 8, October 20, and November 4, 2010, we have concluded that effects to the federally listed murrelet, bull trout, and bull trout critical habitat would be insignificant or discountable. Therefore, we concur with your "may affect, not likely to adversely affect" determination for these species and critical habitat. Our conclusion is based on the following rationale.

Bull Trout

Bull trout use the nearshore marine waters of Puget Sound seasonally for foraging and migration. Based on research, bull trout generally leave the marine environment and enter freshwater systems from May to August (Goetz et al. 2004). The area between the mean higher high water line and minus 10 m mean lower low water line is considered the habitat most consistently used by bull trout in marine waters based on known use, forage fish availability, and ongoing migration studies and captures. This area contains essential foraging habitat and migration corridors such as estuaries, bays, inlets, shallow subtidal areas, and intertidal flats (75 FR 63898).

The activities associated with the proposed action include the transport to and disposal of the dredged material at the eight open-water disposal sites. The stressors associated with the dredged material include increased turbidity and contaminant loading.

The transport of the dredged materials via tug and barge is not considered a stressor for bull trout. These vessels utilize existing navigation channels (Dr. David Kendall, U.S. Army Corps of Engineers, Seattle District, Seattle, WA, *in Litt.* 2011) and would not be navigating in shallow water (< 30 m) where they would encounter bull trout.

The following sections describe the characteristics of the disposal sites including the juxtaposition between the dredged materials, bull trout, and its critical habitat as it relates to the potential for exposure.

Non-dispersive Sites

Material is deposited in such a way as to keep the material within the disposal area. Currents are low in these areas minimizing the transport of the material off-site. These sites are outside of areas expected to be used by bull trout, and the material is not transported to the nearshore where bull trout are likely to occur. The sites are monitored to ensure that the material remains in place and to test for effects of the benthic community within the disposal area.

Direct exposure of bull trout to dredged materials discharged at non-dispersive open-water disposal sites is not likely to occur due to the 1) distance from shore, 2) depth of discharge, and 3) fact that the material remains within the disposal area. Therefore, the potential for exposure of bull trout to dredged materials at non-dispersive open-water disposal sites is considered discountable.

Dispersive Sites

Exposure is only possible if the dredge materials move off site, which they do from the dispersive sites. The pathway by which bull trout could be exposed to dredged materials is through the transport of these materials to the nearshore.

The following sections describe how dredged materials could be expected to move from the dispersive disposal sites through the surrounding water.

Rosario Strait - This site is the most heavily used dispersive site, receiving approximately 2.0 million cy of material over the past 21 years. This site receives approximately 92,000 cy of material on an annual basis. The frequency of use is likely related to the proximity of this site to the Puget Sound main basin where the majority of dredging actions occur. Assuming the modeling predictions presented previously are accurate, then 9,200 cy of dredged material may drift from this disposal site on an annual basis.

To date there is no information on where the dredged materials are transported or to what degree the far field movement carries them to shore. According to the Biological Evaluation (Corps 2010, pg. 32), the prevailing currents at this site tend to disperse suspended material up to 10 miles per day in a southward direction from the Rosario Strait site along the west side of Whidbey Island (Figure 1). Figure 1 is an assumed approximation of how the material may move from the disposal site based on the assumptions that it can move up to 10 miles/day in a southward direction. The presumed movement of the dredged materials suggests that it encounters the shoreline at a number of locations, if the plume expands rather than travels in to the south in a narrow band.

Based on our knowledge of bull trout use of the marine waters in Puget Sound, their occurrence on the northwest side of Whidbey Island is extremely rare. Recent acoustic telemetry and fish sampling data shows that bull trout primarily use the shallower nearshore waters along the eastern shore of Whidbey Island and rarely cross deeper waters to access nearshore locations along the west side of Puget Sound. Bull trout have been documented on the east and north sides of Whidbey Island to the northwest point at Cornet Bay. Cornet Bay is the northwestern extent of identified area used by bull trout based on angler interviews, telemetry studies, and surveys (Curtis Kraemer, Biologist, Washington Department of Fish and Wildlife, Olympia, WA. *in Litt.* 2003). There are significant gaps in our current understanding of the level and frequency of bull trout use along the west and south Puget Sound shorelines and various island shorelines (e.g., Vashon, Whidbey, San Juan Islands) (USFWS 2004).

Bull trout are most commonly encountered around the mouth of large rivers during salmon out-migration (Curt Fresh, Biologist, NOAA Fisheries, *in Litt.* 2009). Bull trout use the marine environment seasonally for foraging and to migrate between river systems. There are no large rivers that drain into Puget Sound on the west side of Whidbey Island. The Wild Fish Conservancy conducted the West Whidbey Fish-Use Assessment (Wild Fish Conservancy 2007). This assessment was designed to determine the extent and distribution of juvenile fish use and migration in nearshore marine habitats along the western shore of Whidbey Island. The ten survey sites ranged from Cultus Bay in south Whidbey Island to Swantown. Bull trout were not encountered during any of the sampling events.

Because the action area is not a linkage corridor between rivers that support bull trout and it is extremely unlikely that bull trout would be present along the west shore of Whidbey Island, the likelihood of exposure of bull trout to the dredged materials originating from the Rosario Strait site is considered discountable.

Port Townsend - This site has only been used occasionally over the past 21 years with a collective total of 53,647 cy of dredged material deposited. The Port Townsend site is similar to the Rosario Site in that the current speeds are 30 cm/sec to 50 cm/sec with peak velocities of 75 cm/sec to 100 cm/sec. The direction of the current is based on tides with the material transported up to 10 miles per day in an east/west direction (Corps 2010, pg. 32).

The Port Townsend Disposal Site is located 12 nautical miles offshore. Bull trout use the nearshore, and would not likely be found 12 miles offshore where they would encounter the dredged materials. It is unlikely that tides would carry the material to shore based on what is known about the direction of the currents. Therefore, the likelihood of exposure of bull trout to the dredged materials originating from the Port Townsend site is considered discountable.

Port Angeles - This disposal site has only been used once in the last 21 years with a single project disposal of 22,344 cy in 1996 (Corps 2010, pg. 33). Unlike the other open-water dispersive disposal sites there is no information on current speed, but they are estimated to reach 125 cm/sec moving in an east/west trajectory (Corps 2010, pg. 32).

The Port Angeles disposal site is located 4 nautical miles from shore. Bull trout use the nearshore and would not likely be found 4 miles offshore where they would encounter the dredged materials. As the material travels west it could encounter the nearshore at some point (Figure 2). However, due to the distance from the disposal location it is unlikely that the plume would contain a measurable amount of contaminants. Therefore, the likelihood of exposure of bull trout to the dredged materials originating from the Port Angeles site is considered insignificant.

Summary

Exposure of bull trout to dredge materials discharged at dispersive open-water disposal sites is not likely to occur due to the 1) distance of the disposal sites from shore, 2) speed and trajectory of currents, 3) the presumed low amount of material that eventually reaches shore after being carried miles in the current, and 4) the low level of contamination in the dredge material, which must meet stringent Site Condition I criteria of "no adverse effects on biological resources due to sediment chemicals." Therefore the potential for exposure and effect to bull trout from dredged materials at dispersive open-water disposal sites is considered insignificant.

Bull Trout Critical Habitat

The Service designated critical habitat for the Coastal-Puget Sound bull trout on September 26, 2005 (70 FR 56212). On October 18, 2010, the Service revised the 2005 critical habitat designation (75 FR 63898) based on extensive review of the previous critical habitat proposals and designation, as well as new information received during the 2010 public review process. The final rule identified nine primary constituent elements (PCEs) essential for the conservation of bull trout.

For the marine nearshore areas, the inshore extent of critical habitat is the mean higher high water line, including tidally influenced freshwater heads of estuaries. The offshore extent of critical habitat for marine nearshore areas is based on the extent of the photic zone (depth to which sunlight can penetrate to permit photosynthesis), which is about 33 ft (10 m) relative to mean lower low water.

None of the disposal sites are within designated bull trout critical habitat, they are all too far from the shore and below the photic zone, two characteristics used to delineate bull trout critical habitat. We have included an analysis of potential effects to critical habitat based on the presumption that some of the dredged material disposed of at dispersive sites may be carried to the nearshore and into designated critical habitat.

Five of the nine PCEs of bull trout critical habitat are present in the marine environment.

- PCE #2: Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.

- PCE #3: An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

- PCE #4: Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.

- PCE #5: Water temperatures ranging from 2 °C to 15 °C (36 °F to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.

- PCE #8: Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.

The following is a description of the potential effect to bull trout critical habitat from the proposed action:

PCE #2: The proposed action is not expected to create any barriers or preclude movement of bull trout within the migratory corridor as an insignificant amount of dredged material is expected to reach the nearshore. Therefore, effects to PCE #2 are considered insignificant.

PCE #3: The proposed action is not expected to measurably affect the bull trout forage base as, with the exception of the Bellingham Bay unconfined open water non-dispersive disposal site, there is no overlap between disposal sites and forage fish holding and spawning areas. The Bellingham Bay non-dispersive disposal site is closed for use between November 1 and June 15 which encompasses the Pacific herring holding period (D. Kendall, *in Litt*, December 20, 2010a). Forage fish could be in the vicinity of the disposal activities at any of the sites; however, transit time of the material in the water column is short, on the order of 30 seconds in 400 ft (122 m) with all material settling out in approximately 1 hour. This duration significantly reduces exposure time of forage fish to elevated turbidity and potential contaminants in the dredged materials. The likelihood that dredged material from the non-dispersive disposal sites would reach the nearshore and bull trout critical habitat is unlikely. At the Port Angeles and Port Townsend disposal sites the currents carry material parallel to shore in an east-west direction (Figure 3). At the Rosario Strait disposal site the nearest critical habitat is 6.5 miles to 10 miles south of the site; any material that traveled that distance would likely have dissipated to an immeasurable level and would not adversely affect potential forage fish spawning habitat (there is very little documented habitat). Therefore, effects to PCE #3 are considered insignificant.

PCE #4: The proposed action is not expected to measurably affect the marine shoreline due to the limited amount of dredged material that may reach the nearshore. Therefore, the effects to PCE #4 are considered discountable.

PCE #5: The proposed action is not expected to result in any appreciable changes in existing water temperatures. Therefore, the effects to PCE #5 are considered discountable.

PCE #8: The proposed action is not expected to result in any appreciable changes in existing water quality outside of the disposal area. There is no direct overlap between the disposal sites and critical habitat. Dredged materials that are transported by current away from the disposal sites are not likely to measurably affect water quality in critical habitat due to 1) the distance of the disposal site from shore, 2) speed and trajectory of currents, 3) the presumed low amount of material that eventually reaches shore after being carried miles in the current, and 4) the low level of contamination in the dredge material which must meet stringent Site Condition I criteria of "no adverse effects on biological resources due to sediment chemicals." Therefore, the effects to this PCE are considered insignificant.

Marbled Murrelet

The marbled murrelet (murrelet) was federally listed as a threatened species in Washington, Oregon, and northern California effective September 28, 1992 (57 FR 45328). Critical habitat was designated on June 24, 1996 (61 FR 26256). The Service did not include the marine environment in the critical habitat designation because other regulations protect the quality of marine foraging habitat and prey species. While clean water and food in the marine environment were identified as essential to the conservation of the murrelet, the primary threats to these elements are pollution, toxic spills, and degradation of prey habitat.

Murrelet activity patterns and foraging locations are influenced by biological and physical processes that concentrate prey, such as weather, climate, time of day, season, light intensity, upwelling and tidal rips, and narrow passages between islands, shallow banks, and kelp (*Nereocystis spp.*) (Ainley et al. 1995; Strong et al. 1995; Burger 1995; Speckman 1996; Nelson 1997). Murrelets generally forage in shallow waters within 1.25 miles of shore (Strachan et al. 1995). Traditional feeding areas are used consistently on a daily and yearly basis (Carter and Sealy 1990).

Murrelets often cover great distances and make substantial changes in foraging sites, depending on prey availability, but routinely forage in the same general areas and at productive feeding areas, as evidenced by their repeated presence in certain geographic areas over a period of time throughout the breeding season (Carter and Sealy 1990; Whitworth et al. 2000; Becker 2001; Hull et al. 2001; Mason et al. 2002; Piatt et al. 2007).

In general, small schooling fish and large pelagic crustaceans are the main prey items. Pacific sand lance *(Ammodytes hexapterus)*, northern anchovy *(Engraulis mordax),* immature Pacific herring, capelin *(Mallotus villosus)*, and surf smelt (*Hypomesus pretiosus*) are the most common fish species taken and are eaten year round.

The activities associated with the proposed action include the transport and disposal of the dredged material at the eight open water disposal sites. The stressors associated with the dredged material include boat traffic (barge and tug), increased turbidity, and contaminant loading.

Murrelets during the breeding season are found most commonly in the nearshore waters of the San Juan Islands, Rosario Strait, the Strait of Juan de Fuca, Admiralty Inlet, and Hood Canal. They are more sparsely distributed elsewhere in Puget Sound, with smaller numbers observed at various seasons as far south as the Nisqually Reach, as well as in Possession Sound, Skagit Bay, Bellingham Bay, along the eastern shores of Georgia Strait, and the outer coastal areas of Washington. During the non-breeding season, murrelets typically disperse and are found farther from shore (Strachan et al. 1995). According to the results of the Bloxton and Raphael (2009) study, murrelets congregate in the San Juan Islands, along the south coast of Vancouver Island and the north east corner of the Olympic Peninsula from Port Townsend to Hood Canal. Birds also congregated along the southwest coast of Whidbey Island from Pt. Partridge to Admiralty Head (Bloxton and Raphael 2009, pg. 4).

Murrelet presence in the vicinity of the disposal sites is documented by several sources. The most precise information comes from boat surveys conducted by the U.S. Forest Service, Pacific Northwest Research Laboratory to determine population size and trends under the Northwest Forest Plan Murrelet Effectiveness Monitoring Program (Figure 3). The Washington Department of Fish and Wildlife, in cooperation with the Puget Sound Ambient Monitoring Program, also conducts aerial surveys for seabirds in Puget Sound.

Based on these data, there is significant overlap between murrelet detections and the Rosario Strait, Port Townsend, and Port Angeles dispersive open water disposal sites (Figure 3). The locations with the greatest potential overlap include the Rosario Strait and Port Angeles sites. Of these sites only the Rosario Strait site is used to any great degree for dredge material disposal. The Port Angeles and Port Townsend sites have only been used one time and six times, respectively, in the last 22 years. There was no overlap with the other non-dispersive open water disposal sites including Bellingham Bay, Port Gardner, Elliott Bay, Commencement Bay and Anderson/Ketron Island. Murrelets may occur at these locations, but the data indicate that they are uncommon in these areas.

As mentioned previously, the dispersive sites are located well offshore. Of the disposal sites where murrelets have been detected, only the Rosario Strait site is within the 1.25 mile range from shore that murrelets generally forage. This site is within 1 mile or 1.2 nautical miles from shore. Both Elliott Bay and Commencement Bay are within 1 mile of shore. These are highly urbanized areas, which likely contributes to the lack of murrelet detections in these locations.

The Rosario Strait site is located in a high tidal energy location. There are no kelp beds in the disposal area nor is there eelgrass or herring spawning or holding areas which would tend to attract murrelets. It is unlikely that murrelets would be foraging within the disposal area, but they could be foraging in locations influenced by the dredged material as it is transported off site (Figure 4).

The Port Townsend disposal site is located 12 miles offshore in 361 ft of water and in an area where currents move in an east west direction. These site characteristics reduce the potential of shoreward (south) transport of the dredged materials. It is unlikely that there would be overlap between marbled murrelet foraging or loafing areas and this disposal site due to its location. Indeed, the murrelet detection data do not reflect any overlap with the site itself. However, there is some potential overlap between the presumed movements of dredged materials to the east of and approximately 5 miles from the site (Figure 3). However, at this location the dredged materials would be dispersed to the point of being immeasurable and therefore no cause for concern.

The Port Angeles disposal site is also in an area with high currents. It is evident, however, that there is significant overlap between the assumed transport pathway and murrelets based on the available data (Figure 2). The Port Angeles site is located 4 miles offshore in water 435 ft deep and is located away from forage fish spawning and holding areas. It is located farther off shore than murrelets generally forage. This site is rarely used with only one disposal event in the previous 21 years.

Effects Due to Boat Traffic

Depending on the amount of sediment to be removed, dredging a particular project area will require multiple trips to a disposal site. The barges are designed to hold between 1,200 cy and 2,000 cy of material per trip. The number of barge trips required can range from two to five trips per day. The number of days the dredging project is conducted depends on the size of the site.

Murrelet adults and juveniles will likely be on the water when the barges are transporting material to and from the disposal sites. The Bellingham Bay disposal site notwithstanding, the non-dispersive disposal sites are of less concern as they are located in areas with significant boat traffic (Port Gardner, Elliott Bay, and Commencement Bay) and in South Puget Sound (Anderson/Ketron Island) where murrelets are less prevalent. The dispersive disposal sites in the north (Rosario Strait, Port Townsend, and Port Angeles) coincide with the areas of highest murrelet use. While the Port Angeles and Port Townsend Sites are rarely used, the Rosario Strait site is used often. The Bellingham Bay non-dispersive disposal site is not currently being used, and when it is active can be used from June through October. This time period also coincides with the holding time for Pacific herring, an important murrelet prey species. It is possible that murrelets could be in the area when dredged materials are being disposed of at the Bellingham Bay disposal site, however, we don't anticipate adverse effects due to the following explanation of murrelets response to vessels.

Barges and tugs would be traveling in the commercial shipping lanes and could encounter murrelets on the water engaging in foraging and loafing activities. Foraging activities would include adults and juveniles foraging for prey fish to feed themselves and also adults foraging to feed chicks on nests in trees in the terrestrial environment. Disturbance to murrelets would be from the visual, sound, and physical presence of vessels. The movement of sediment transport vessels may displace murrelets and spatially redistribute individual murrelets that encounter these boats on the water. Murrelet response to tugs and barges could include diving, swimming away from a vessel, or relocating to a different foraging or loafing area.

Dredging projects are often constrained by in-water work windows for the protection of fish and other sensitive resources. These work windows coincide with the murrelet breeding season. Agness et al. (2008) investigated the potential effects of vessels on the nearshore density and behavior of Kittlitz's murrelets (*B. brevirostris*) in one summer (breeding) season at Glacier Bay, Alaska, with particular emphasis on the behavioral (response) differences between breeding and non-breeding adults and forage group size at three time scales: 1) instantaneous, 2) at 30 minute intervals, and 3) daily. In general, Kittlitz's murrelets were immediately displaced by vessel traffic, resulting in a 40 percent decrease in the nearshore density for up to 30 minutes. The density of Kittlitz's murrelets returned to or exceeded the pre-exposure density within the same day. The authors also noted that group size did not change at the 30 minutes or daily time scales and inferred that group dynamics (possibly of importance to foraging success) was unaffected on days with high vessel traffic (Agness et al. 2008, pg. 352).

Overall, the authors noted a three-fold increase in dive behavior on days with higher vessel traffic. However, this did not appear to be a direct response to an approaching vessel as no change in dive behavior was detected at the instantaneous and 30 minute time scales (Agness et al. 2008, pg. 352). Rather, the increase in dive behavior (presumably foraging) was probably in response to the 30 percent increase in flight behavior that placed an increased energetic demand on individuals and led to the observed higher frequency in diving and foraging behavior.

Non-breeding Kittlitz's murrelets were much more likely to flush in response to vessel traffic, and breeding murrelets (holding a fish for delivery to inland nestlings) were more likely to dive. Breeding adults seldom flew while holding a fish, probably because the combination of the added weight and effort of holding a fish made diving energetically more preferable (Agness et al. 2008, pg. 352). Dive behavior of murrelets with fish was also observed by Speckman et al. (2004, pg. 33) in response to research boats attempting to approach the birds. Fish-holding murrelets will sometimes fly when the vessels are larger and approaching at greater distances or at faster speeds (Bellefluer et al. 2009; Agness et al. 2008).

Speckman et al. (2004, pg. 33) also noted that fish-holding murrelets swallowed prey intended for nestlings after multiple dives to escape the approaching boat (within 40 m). Non-breeding murrelets probably have higher energy reserves than breeders, which could make them more prone to make the tradeoff of expending the higher energy associated with flying, in contrast to swimming away from approaching vessels as observed by Speckman et al. (2004).

Speckman et al. (1996) conducted a study of murrelet response to small boat traffic. They observed that most murrelets paddled away from the boats or dove to avoid the boats. Only a few birds flew away in reaction to the boats. However, they observed eight separate events where murrelets were holding fish in their bills and swallowed the fish when approached within 13 ft to 16 ft (4 m to 5 m) by the survey boats. This reaction to approaching boats is noteworthy in that murrelets observed on the water holding fish in their bills are thought to be waiting for the appropriate time of day (dusk or dawn) to deliver the fish to chicks on inland nests (Carter and Sealy 1987; Strachan et al. 1995). An adult breeding murrelet must catch an appropriate size and species of fish, possibly hold it in its bill until dawn or dusk, and then fly inland to a nest that may be up to 52 miles away in Washington (Evans-Mack et al. 2003). If the murrelet swallows the fish instead of delivering it to a chick on the nest, boat activity could result in a delayed feeding attempt. In addition to the above potential effects, murrelets undergo a flightless molt between approximately August and October. Any vessels that encounter murrelets between August and October could affect individual molting birds because they would be limited to paddling or diving away from vessels.

We assume the response of marbled murrelets to barges and tugs will be similar to the closely related Kittlitz's murrelet, as described above. The visual stimuli associated with these vessels are likely to induce either diving or flying behavior in affected murrelets. We expect this will have little or no effect on the foraging success of murrelets, but it is unclear what effect, if any, this response behavior has on breeding success or if the birds may exhibit become habituated to vessel traffic. The body of evidence presented above leads us to conclude that it is extremely unlikely that the breeding success of murrelets will be measurably affected by the barge and tug activity. Although these vessels are large, they will not be traveling at a high rate of speed, allowing the birds to move out of their path. The events described above where murrelets swallowed fish in response to approaching research boats differs in regard to the anticipated response to barges and tugs. The research boats were small fast-moving vessels and the researchers were moving towards the birds. Habituation to vessels, especially in the commercial shipping lanes, as commented on by Speckman et al. (2004), will likely reduce energy expenditures in response to dredge disposal vessels. Thus, we conclude murrelets are unlikely to experience any deleterious physiological effects that will reduce breeding success. Therefore, the disruptive effect to murrelets from the transport of dredge material to the disposal sites is expected to be insignificant and murrelets are expected to resume their loafing, breeding, and foraging behavior.

Effects due to Elevated Turbidity

If murrelets were foraging within the disposal area they would likely avoid the area where dredged materials is being deposited due to the turbidity and inability to see their prey. The avoidance would only be temporary as the transit time of the material in the water column is short, on the order of 30 seconds in 400 ft (122 m) with all material settling out in approximately 1 hour, so any effect on foraging behavior would be short-term.

Murrelets may also be foraging in the transport pathway of dredged material particularly associated with the Rosario Strait and Port Angeles disposal sites (Figures 2 and 4). However, given the transit time and current speed, the dredged materials should be significantly distributed to the level where turbidity would no longer be detrimental to feeding behavior. Therefore, effects to murrelets due to elevated turbidity during disposal are considered insignificant.

Effects due to Contaminants in Dredged Materials

The level of contaminants in the dredge material should be low as the material must meet Site Condition I criteria of "no adverse effects on biological resources due to sediment chemicals".

There is the potential for transport of bioaccumulative contaminants to the nearshore; however, the contaminant levels should be sufficiently low, as according to Dr. David Kendall "... we have not seen any BT exceedances in the entire 22 years of DMMP implementation in projects seeking to use one of our three dispersive sites. It is rare that we would even see an SL exceedance (for non-BCOC[5] chemicals) within a project seeking to use one of our dispersive sites..." (D. Kendall, *in Litt*, December, 8 2010b).

Forage fish could be in the vicinity of the disposal activities at any of the sites; however, transit time of the material in the water column is short, on the order of 30 seconds in 400 ft (122 m) with all material settling out in approximately 1 hour. This duration significantly reduces exposure time of forage fish to bioaccumulative contaminants in the dredged materials. The likelihood that dredged material from the unconfined non-dispersive disposal sites would reach the nearshore is extremely low. At the Port Angeles and Port Townsend disposal sites the currents carry the material parallel to shore in an east-west direction (Figure 3). At the Rosario Strait disposal site the nearest documented forage fish spawning habitat is 1.8 miles. Any material that traveled that distance would likely have dissipated to an immeasurable level and would not adversely affect potential forage fish spawning habitat.

Because the level of contaminants in the dredged materials is very low and we do not anticipate much of the material to drift to the nearshore, effects to murrelets from indirect exposure to potential contaminants in dredged material is considered insignificant.

Summary

The likelihood of exposure of murrelets to dredge materials discharged at dispersive open water disposal sites is considered extremely low for the following reasons: 1) lack of habitat features that would attract murrelets to the disposal areas, 2) distance of the disposal sites from shore relative to where murrelets generally forage, 3) transit time, speed, and trajectory of currents which would significantly reduce turbidity, 4) the presumed low amount of material that eventually reaches shore after being carried miles in the current, 4) closure periods for protection of aquatic resources, and 5) the low level of contamination in the dredge material which must meet stringent Site Condition I criteria of "no adverse effects on biological resources due to sediment chemicals." Therefore, the potential for exposure and effects to murrelets from dredged materials at the open water disposal sites is considered insignificant.

This concludes informal consultation pursuant to the regulations implementing the Act (50 CFR 402.13). This project should be reanalyzed if new information reveals effects of the action that may affect listed species or critical habitat in a manner, or to an extent, not considered in this consultation. The project should also be reanalyzed if the action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this consultation, and/or a new species is listed or critical habitat is designated that may be affected by this project. Our review and concurrence with your effect determination is based on the implementation of the project as described. It is the responsibility of the Federal action agency to ensure that projects that they authorize or carry out are in compliance with the regulatory permit and/or the Act, respectively. If a permittee or the Federal action agency deviates from the

[5] BCOC : bioaccumulative chemicals of concern

measures outlined in a permit or project description, the Federal action agency has the obligation to reinitiate consultation and comply with section 7(d).

We are aware that the Corps recognizes the need to address bioaccumulation in the SMS as it relates to effects on aquatic species and not only human health. We encourage the signatory agencies to the DMMP to continue their work through the RSET process to develop bioaccumulation triggers for contaminants that accumulate and biomagnify in the aquatic food web of Puget Sound.

If you have any questions about this letter or our joint responsibilities under the Act, please contact Andrea LaTier at (360) 753-9593 or Martha Jensen at (360) 753-9000, of this office.

Sincerely,

Martha L. Jensen

for Ken S. Berg, Manager
Washington Fish and Wildlife Office

Enclosure(s)

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WDOE, Lacey, WA (L. Inouye)
NOAA, Seattle, WA (D. Tonnes)
NOAA, Seattle, WA (T. Mongillo)

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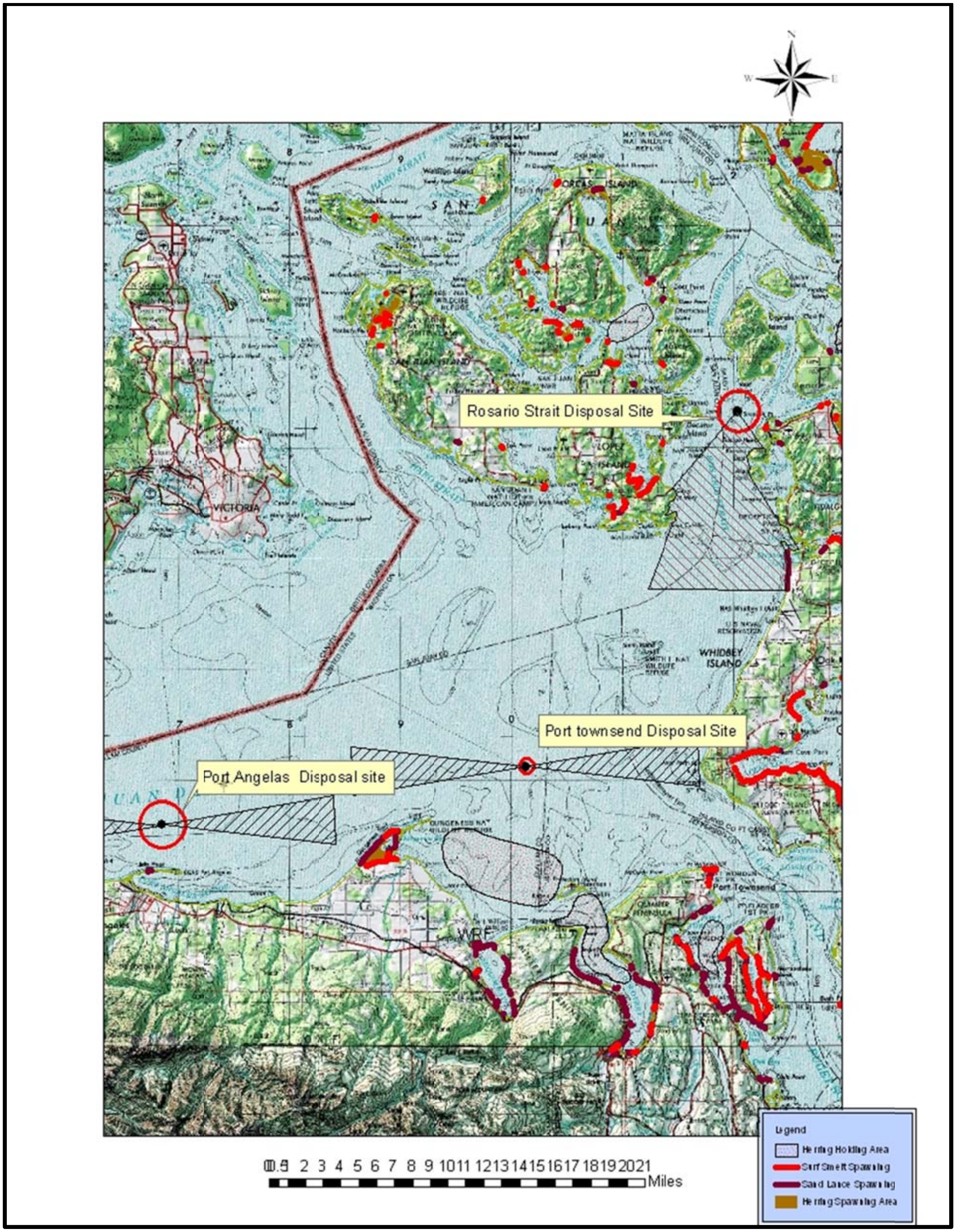

Figure 1. Assumed directional movement of the dredged material plume (hatched area) emanating from each of the three open-water dispersive dredged material disposal sites.

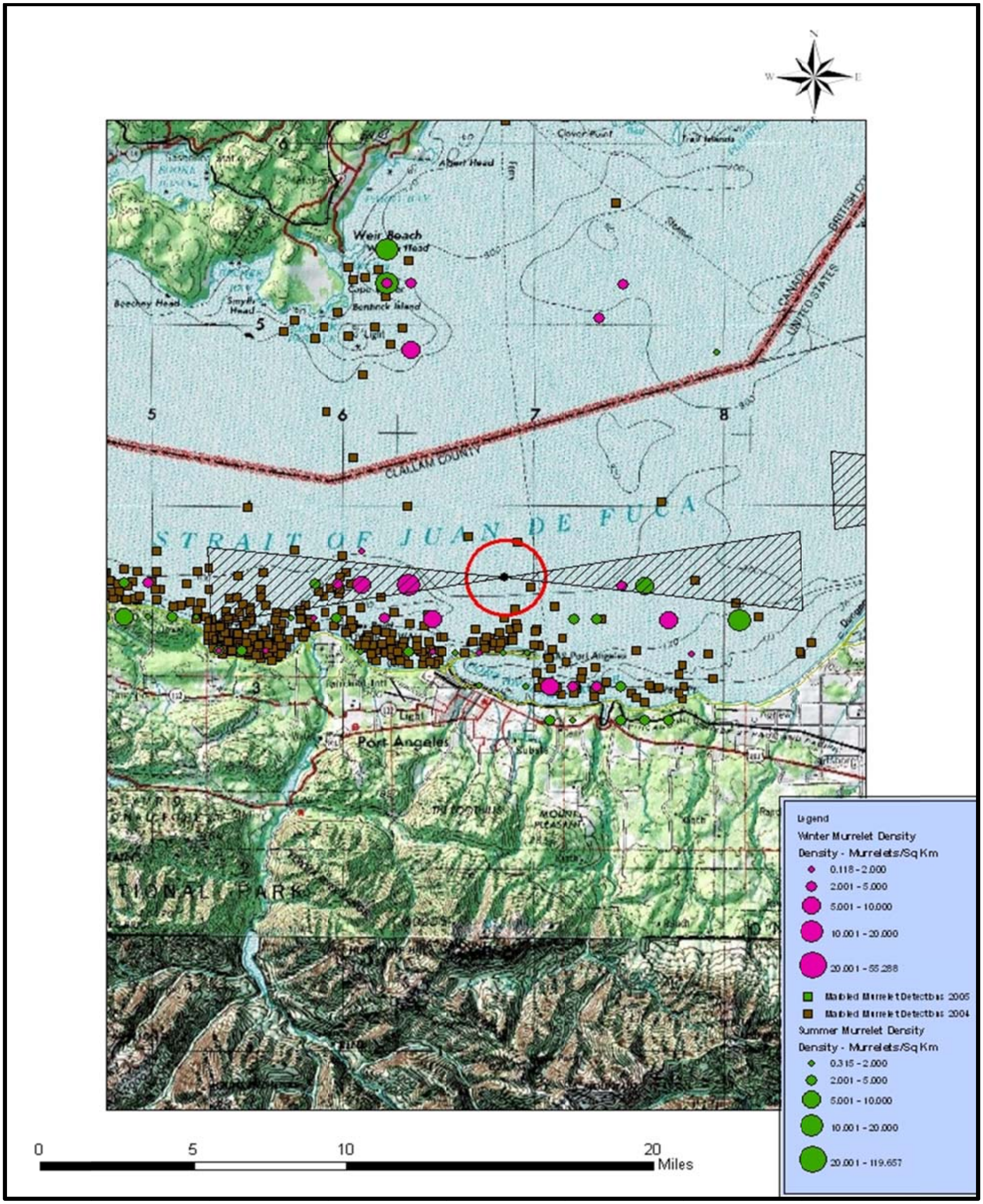

Figure 2. Marbled murrelet detections in relation to the potential dispersal plume of dredged material emanating from the Port Angeles disposal site.

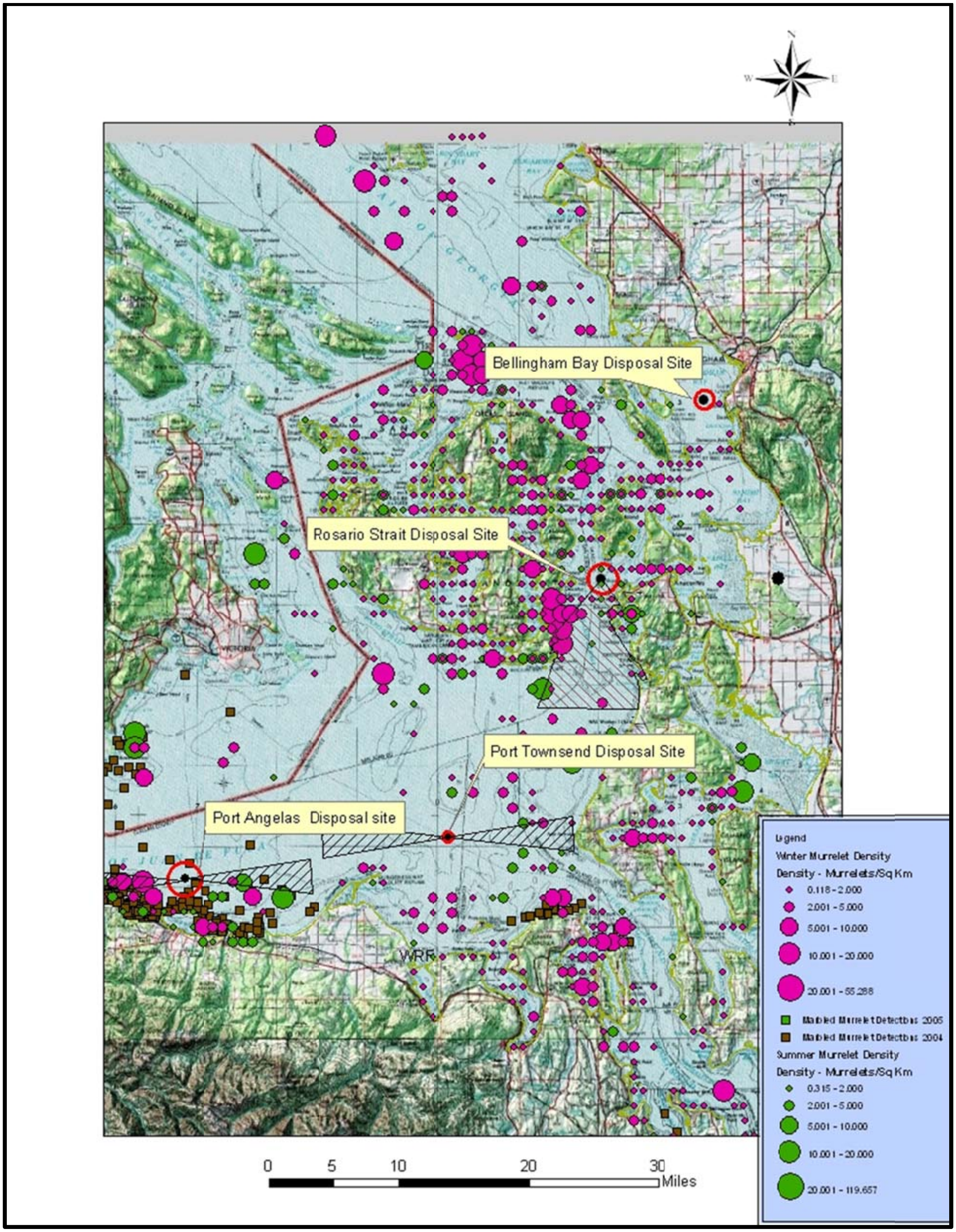

Figure 3. Overlap between marbled murrelets and northern open-water dredged material disposal sites and presumed material transport (hatched).

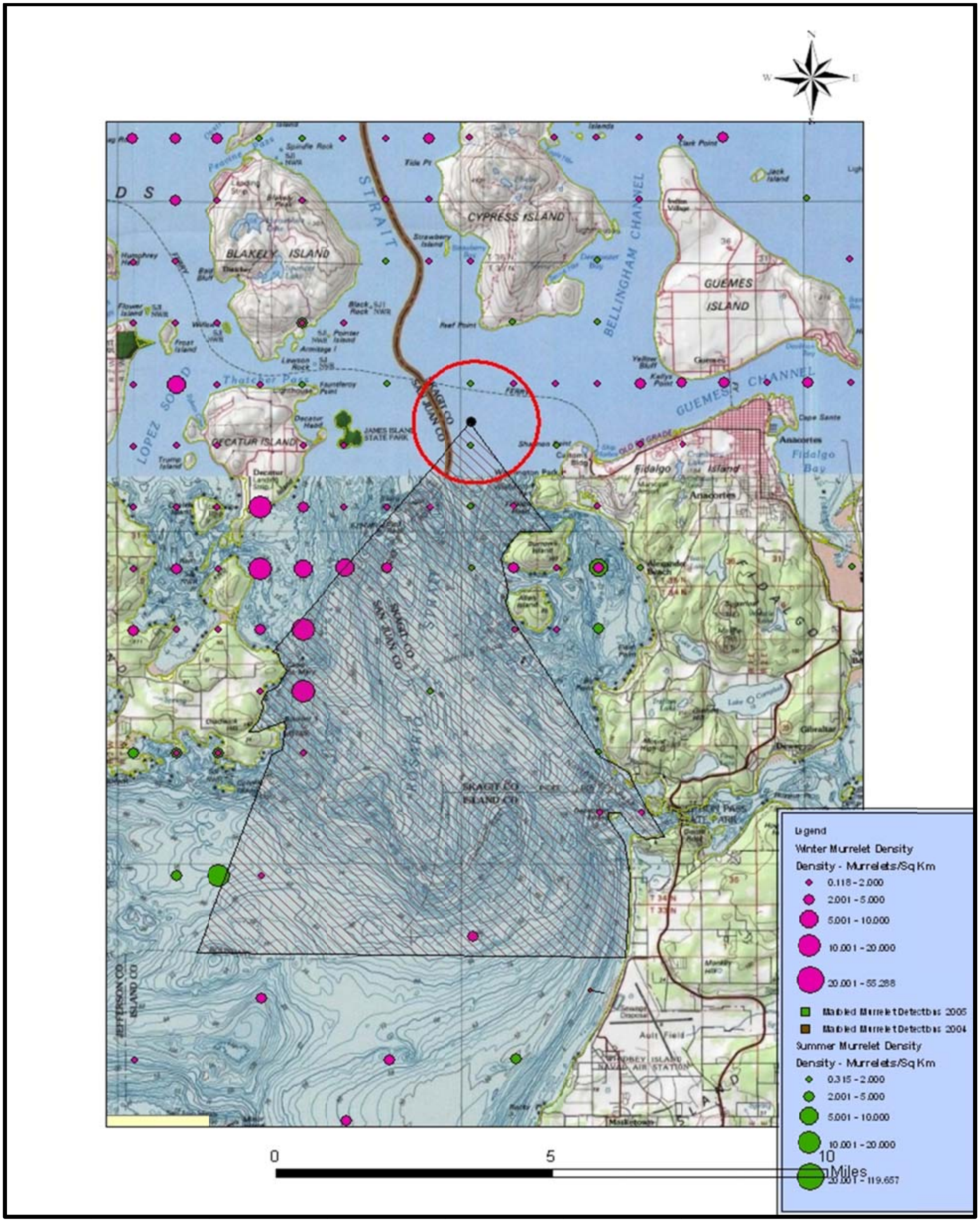

Figure 4. Marbled murrelet detections in the vicinity of the Rosario Strait disposal site and presumed material transport (hatched).