EA – APPENDIX 2

FINAL FISH AND WILDLIFE COORDINATION ACT REPORT
HAINES SMALL BOAT HARBOR, ALASKA

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Juneau Fish & Wildlife Service Office
3000 Vintage Blvd., Suite 201
Juneau, Alaska 99801-7100
(907) 586-7240

June 21, 2002

[redacted]
District Engineer, Alaska District
Army Corps of Engineers
P.O. Box 898
Anchorage, Alaska 99506-0898

Re: Final Coordination Act Report for Haines Harbor Expansion Project

Attn: [redacted]

Dear [redacted]:

Enclosed is the final Fish and Wildlife Coordination Act Report for the Haines Harbor Expansion Project. We appreciate the opportunity to provide this assistance, and trust that you will find this report useful in designing a harbor that meets the intent of the project while minimizing adverse impacts to the important fish and wildlife resources in the vicinity of the proposed harbor expansion. If you have any questions, please contact Richard Enriquez at (907) 586-7021.

Sincerely,

[redacted]
Acting Field Supervisor

Enclosure: Final Coordination Act Report

cc: NMFS, (P.O. Box 21668, Juneau, AK 99802-1668)
ADF&G, (P.O. Box 240020, Douglas, AK 99824-0020)

Final
Fish and Wildlife Coordination Act Report
For
Haines Boat Harbor
Haines, Alaska

Marine Ecosystem Investigation
June 2002

INTRODUCTION

This report constitutes the U. S. Fish and Wildlife Service's (Service) Fish and Wildlife Final Coordination Act Report (report) on the U. S. Army Corps of Engineer's (Corps) interest in providing navigation improvements for meeting additional demand for vessel moorage at the existing Haines Small Boat Harbor in Haines, Alaska (Figure 1). This report describes project alternatives currently under consideration; discusses significant fish and wildlife resources likely to be affected by expansion of the boat harbor, moorage expansion, boat launch facilities, harbor parking, and pedestrian access facilities; define the fish and wildlife resource problems and opportunities that should be addressed during project planning; defines potentially significant impacts that could result from meeting other project purposes and objectives; highlight potentially significant direct and indirect impacts that could result; and recommends measures for mitigating impacts.

This report is prepared in accordance with the Fiscal Year 2001 Scope of Work and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended: 16 U.S.C. 661 et seq.). This document constitutes the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act.

The report is based on information provided by Corps' project biologist Lizette Boyer; a review of pertinent literature; discussions with local resource agency staff and residents; and several on-site evaluations.

AREA DESCRIPTION

The city of Haines is located in the northern portion of Southeast Alaska, the region of the state commonly referred to as "the panhandle" (Figure 1). Haines is approximately 80 air miles northwest of Juneau, the State Capital. City boundaries straddle a peninsula that separates the Chilkat River Valley from Chilkoot Inlet, an embayment near the northern end of Lynn Canal. Haines has developed as a marine, land, and air transportation hub for the northern part of the Haines Recording District encompassing eight square miles of land and seven square miles

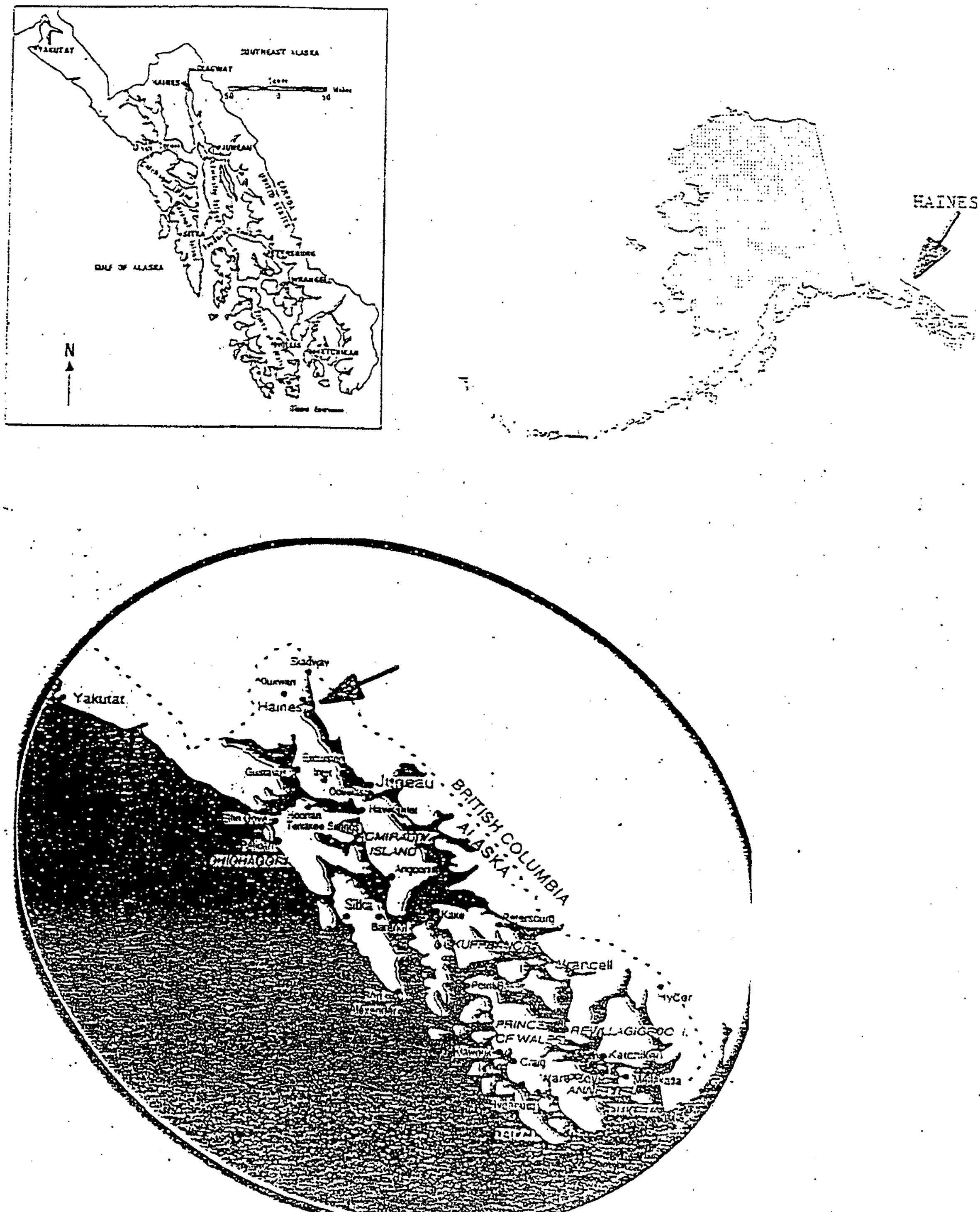

FIGURE 1. LOCATION AND VICINITY OF HAINES, ALASKA

of water. Haines is on the western shore of Lynn Canal between the Chilkoot and Chilkat Rivers. It is approximately 59 degrees 14' N Latitude, 135 degrees 26' W Longitude (Section 34, Township 30 S, Range 59 E, Copper River Meridian).

There are two docks and a small boat harbor in Portage Cove (adjacent to the downtown cove and Port Chilkoot). The city purchased the Port Chilkoot Dock in 1984. The dock is located on the shore of Portage Cove at the foot of Portage Street. This facility was built around 1905 by the U.S. Army to service Fort William H. Seward. Improvements to this dock were made in 1995 to allow the dock to serve as the primary moorage for cruise ships.

The City of Haines Small Boat Harbor is the primary local facility for the mooring of pleasure craft, commercial and charter fishing vessels, a water-taxi enterprise and transient vessels. It is owned by the State of Alaska and is operated and maintained by the City of Haines. The facility is located in Portage Cove at the foot of Main Street, and consists of a 274.3 meter (900-foot) breakwater enclosing a 182.9 meter X 274.3 meter (600-foot X 900-foot) harbor. It can accommodate approximately 150 boats, with berths for small boats between 7.3 and 12.2 meters (24 and 40 feet) in length, and float moorage for boats of up to 24.4 meters (80 feet) in length. With rafting of boats, up to 330 boats have been accommodated in the Small Boat Harbor. The boat harbor also contains, on its north side, a concrete launching ramp and a service grid for minor boat maintenance.

The Territory (later the State) of Alaska and the Alaska PublicWorks Agency constructed the original small boat harbor at Haines in 1958. The U.S. Army Corps of Engineers constructed the expanded harbor at Portage Cove in 1976. The project consisted of demolishing the seaward leg of the original breakwater and constructing a new longer breakwater farther offshore. Additional dredging was performed to provide an expanded mooring area and entrance channel. The mooring facilities constructed in subsequent years were put in with local funds provided by the State.

Alternative Sites Considered

A wide range of siting and structural alternatives (including floating break-waters) were considered for navigation improvements at Haines. A matrix of possible sites for consideration was developed in the initial phase of the study and included Letnikof Cove, Paradise Cove, Flat Bay, Lutak Inlet, and two sites in Portage Cove (USCOE Environmental Assessment April 2002). Site options were narrowed down to two: one at Letnikof Cove and one adjacent to the existing harbor at Portage Cove.

Letnikof Cove Site Investigation

An alternative site investigated by Service biologists included a site at Letnikof Cove. This site includes a floating breakwater, entrance, and moorage basin for providing additional moorage at

Letnikof Cove, near Haines. This cove is located on the west side of the Chilkat Peninsula, approximately five miles southwest of Haines.

On June 22, 2000, Service biologists conducted general habitat type mapping of the Letnikof Cove area (Figure 2). Species list for Letnikof Cove intertidal zones is found in Table 1. This cove was considered as an alternative site for providing protected moorage for transient commercial fishing vessels and pleasure boats.

Table 1. Species list for Letnikof Cove intertidal zones (Scientific name followed by common name).

LOWER INTERTIDAL ZONE (bedrock/boulder substrate)	
Fucus gardneri	Rockweed
Balanus glandula	Acorn Barnacle
Mytilus trossulus	Blue Mussel
Enteromorpha intestinalus	Sea Hair
Ulva/Monostroma spp	Sea Lettuce
Polysiphonia pacifica	Polly Pacific
MIDDLE INTERTIDAL ZONE	
Potentilla egedii grandis	Pacific Silverweed
Elymus arenarius mollis	Dune Wildrye
Glaux maritima	Sea Milkwort
Honkenya peploides	Sea Beach Sandwort
Plantago maritima juncoides	Goose-tongue
Achillea millefolium	Yarrow
UPPER INTERTIDAL ZONE	
Achillea millefolium	Yarrow
Elymus arenarius mollis	Dune Wildrye
Rubus parviflorus	Thimble Berry
Heracleum lanatum	Cow Parsnip
Equisetum arvense	Horsetail
Alnus crispa	Sitka Alder
Potentilla egedii grandis	Pacific Silverweed
Poa pratensis	Kentucky Bluegrass
Lathyrus japonicus	Beach Pea

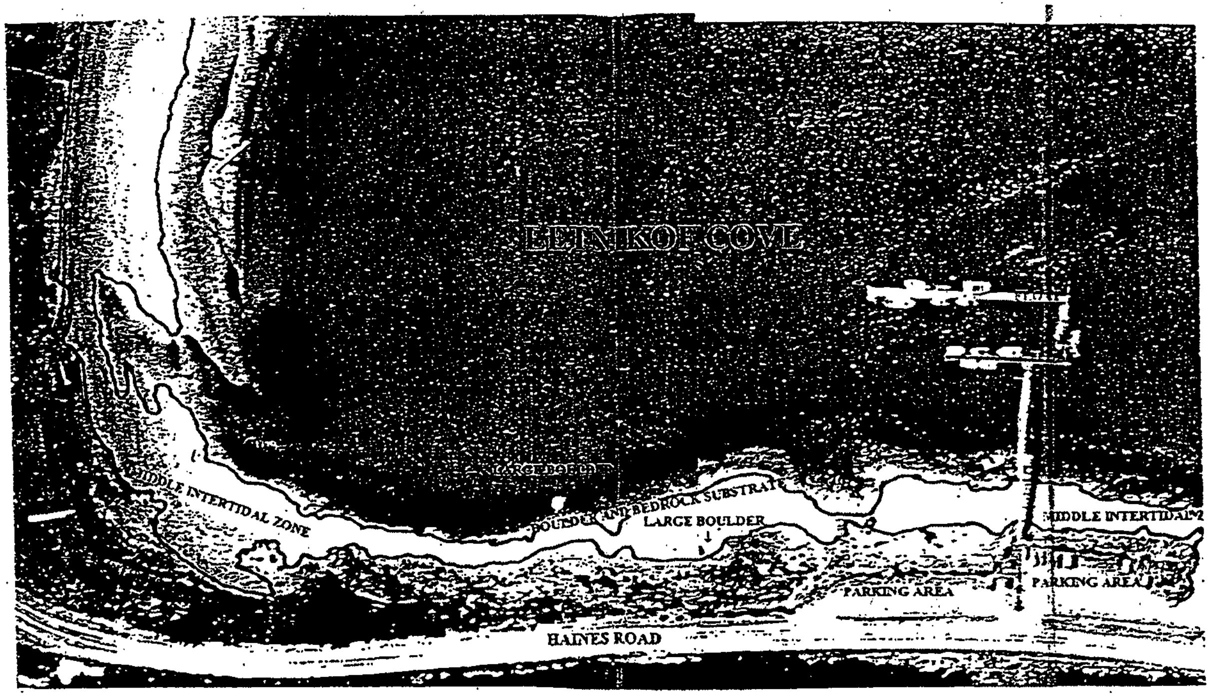

Figure 2. General habitat map of Letnikof Cove area.

The existing moorage facilities at Letnikof Cove consist of a pontoon supported floating breakwater and long finger floats in which vessels moor in parallel. The existing float system at Letnikof Cove float has been damaged by severe wind and ice in the past. The two 46-meter-long main floats can accommodate a small portion of the local fishing fleet. A launch ramp and small parking area are also located at the site.

Commercial and recreational vessels use the harbor during the summer fishing season due to its proximity to fishing grounds. Generally, however, the floats are not used during the winter months due to the extreme wind and ice conditions and the long distance from town. Water depths are typically in the 10 to 15-meter range, which can handle the larger commercial fishing vessels that frequent the area. Vessel moorage is limited to rafting along the floats and floating breakwater.

A cannery and private dock are located along the western shoreline of Letnikof Cove. The dock and haul-out are primarily used for transferring fish and loading and offloading fish products. Facilities for mooring vessels are limited and no permanent slips are available.

The Service does not recommend the expansion of the existing mooring facility at Letnikof Cove because of the impacts that would result from extensive dredging and filling of intertidal areas. In addition, Letnikof Cove does not lend itself to harbor expansion due to extreme depths of water, severe icing conditions during the winter months, and extremely high wind velocities from the Chilkoot River Valley.

Portage Cove Site Alternatives Considered in Detail

The four alternatives evaluated in this report are limited to one location because of limitations of alternative sites (new harbor sites located outside of the vicinity of the existing harbor at Portage Cove. The Portage Cove site is preferred because the environmental impacts (marine habitat values) are minimized at this site (Refer to Resource Description Section in Draft Fish and Wildlife Coordination Act Report), and the infrastructure for the harbor already exists at this site.

The Portage Cove site is immediately adjacent to the existing harbor east of the town of Haines and has natural bottom elevations ranging from +8 meters MLLW to –12 meters MLLW. Such depths in the area of the proposed harbor are for rubblemound breakwater construction. The wave climates for the various directions of exposure are also suitable for cost effective rubblemound breakwater construction. The southern limit of the site is constrained by the existing cruise ship dock. The northern limit of the site is constrained by several large tide pools that are considered very productive marine habitat. A rubblemound breakwater structure would be required for wave protection from the various directions and would make use of the relatively shallow depths offshore.

All four alternatives are designed for a 50-year wave protection and project life. They are laid out using breakwater alignments to protect the marine habitat, protect the proposed entrance channel, maneuvering area, and mooring basin. In order to accomplish the proposed harbor expansion, the relocation of the sewage outfall pipe is necessary for all of the alternatives. The outfall line needs to be moved prior to dredging and breakwater construction. The outfall line should be placed further south of its present location.

Constructing a boat harbor by placing breakwaters and dredging to specified depths or any other construction associated activity will disturb bottom sediments and impact bottom-dwelling aquatic organisms, remove submerged vegetation beds, drive away fish and other mobile organisms, and permanently alter the existing habitat. The resultant turbidity plume will affect fish gills and sediments could accrete down current of the project area. Ecosystem effects include the direct elimination of organisms, the reduction of primary and secondary production, and changes in hydrology and sedimentology within and adjacent to the harbor. Recolonization after dredging will depend on adjacent undisturbed communities providing a source of replacement organisms capable of recolonizing the site by adult migration or larval settlement, water quality, and substrate quality. Time frame and degree of habitat reclamation are unknown. The marine organisms may go through a successional process, with the more resilient organisms acting as the pioneer species. Breakwaters would provide attachment substrate for sessile organisms. This would change the sandy bottom habitat to more of a rocky reef habitat inhabited by different organisms. The degree to which the breakwaters will recolonize is variable with some harbor areas colonized more densely than others.

All of the harbor alternative designs will create uplands in the intertidal zone within the moorage area. Fill will be brought in for this purpose because the dredged material is unsuitable. The tidelands up to +1.75 meters will be permanently altered for harbor related uses. Land will be required for the harbor house, gangways, equipment storage and vehicle parking.

Alternative 1

This alternative, shown in Figure 3, incorporates the following rubblemound breakwaters: a 67-meter-long north spur breakwater, a 92-meter-long north breakwater, a 459- meter-long main breakwater, a 62.2-meter-long extension of the existing breakwater to the south, and a 49.9-meter-long south spur breakwater. The existing breakwater would be modified slightly by removing 46 meters of its length at its northern end, but the majority of its length would be unchanged. Two separate mooring basins would be created with this alternative. The 5.19-ha north basin could accommodate the larger range of vessels in the fleet with stalls oriented with the prevailing wind direction. The 2.25-ha south basin (existing) would remain unchanged in size and depth; however, additional wave protection would be provided and the existing float system would be removed and reoriented. Smaller vessels in the fleet would use the south harbor basin. The north harbor entrance would be oriented with an approach around the end of the main breakwater and into the maneuvering area. The local sponsor preferred this entrance channel configuration. Marker pilings would be placed along the outside of the dredged channel limits to guide mariners into the harbor. The entrance channel into the south basin would be dredged and oriented similar to the existing south entrance channel.

Figure 3. Alternative 1. Rubblemound breakwaters: 67-meter-long north spur; 92-meter-long north breakwater; 459-meter-long main breakwater; 62.2-meter-long extension of the existing breakwater to the south; and 49.9-meter-long south spur breakwater.

<u>North Harbor Basin</u>. The north harbor basin would be step dredged to depths of –4.9 meters and –4.3 meters MLLW (USCOE Environmental Assessment, April 2002). The deeper portion of the mooring basin would be located nearest the entrance channel. The shallower portion would be located farther into the harbor away from the entrance channel. The maneuvering area just inside the basin would be dredged to -4.9 meters MLLW. A total combined maneuvering and mooring basin area of approximately 5.19 ha would be available in

the north basin for Alternative 1.

South Harbor Basin. The south harbor basin would remain unchanged with respect to area and depth. Currently, the basin has depths of –3.7 meters and –4.3 meters MLLW. The deeper portion of the mooring basin would be located nearest the entrance channel. A total combined maneuvering and mooring basin area of approximately 2.25 ha would be available in the south basin for this alternative.

Wave Heights. This alternative would meet the wave criteria established in the Hydraulic Design appendix (USCOE Environmental Assessment, April 2002) for the floats inside both harbor basins. Breakwaters were positioned to reduce to acceptable levels incident wave heights from the various directions of exposure. The maximum wave heights in the mooring areas, based on the 50-year design incident wave, were calculated to be 0.29 meters and less. Progressively smaller wave heights would occur farther into the harbor mooring areas. All directions of wave exposure were taken into account in determining the highest wave heights in the mooring area.

Circulation. Circulation in the harbor basins would be driven primarily by tidal action and by wind-driven surface water currents that contribute to mixing in the water column. Tides would drive circulation gyres in both basins. This alternative would incorporate basin geometries that would provide for adequate water circulation based on established criteria. Flushing of the water from the basin with outside waters can be evaluated by calculating a ration of water exchange. A tidal prism ratio is based on the difference in the volume of water in the proposed basin between Mean Higher High Water (MHHW) and MLLW water compared to the volume of MHHW. Values greater than 0.30 is considered adequate. The north and south basins would have tidal prism ratios of 0.53 and 0.55 respectively. The corners (15 percent of the basin's volume) of the north basin were checked as worst-case possible zones of stagnation. The northeast corner had the lowest value tidal prism ratio of 0.46.

Another criterion for water quality and circulation is the aspect ratio of the basin. This value is a measure of the length divided by the width of the basin. Generally, aspect ratios of greater than 0.3 and less than 3.0 are desirable. The length to width or aspect ratios of the north and south basins were calculated to be 1.42 and 1.30 respectively. Such geometry will minimize possible zones of stagnation and short-circuiting of circulation cells within the basin. Sufficient aspect ratios range for good water quality and circulation are expected in both harbor basins for Alternative 1.

Shoaling. Shoaling of both entrance channels would not be expected since there is little evidence of significant long-shore transport of sediments at the site. There are no significant sources of sediment such as major rivers or creeks in the area. A small fillet of sandy material is present along the north side of the existing stub breakwater indicating some accumulation of material from the north. The proposed north stub breakwater would likely see a similar accumulation of material but it would not reach the basin or proposed entrance channel.

Similarly, the existing entrance channel has not required maintenance dredging and would not be expected to with this alternative.

Construction Dredging. Dredging quantities and material characteristics were estimated from the hydrographic survey performed in August of 2000 and the geotechnical investigation done in September of 2000 (USCOE Environmental Assessment, April 2002). The dredged material would consist of clay, sand, gravel, cobbles, and boulders to the project limits. Dredging a total of 205,100 cubic meters (m^3) of clay, 5,600 m^3 of harder clay (diamictom), and 2,500 m^3 of boulders would be required for Alternative 1. Dredged materials, with the exception of the boulders, would be disposed of in a designated area approximately 1.2 km offshore and east of the harbor.

Dredging work inside the harbor could be accomplished with a large clamshell dredge since clay, sand, and gravel would be encountered. The boulders would likely be removed at low tide with an excavator or dozer. According to the September 2000 geotechnical investigation in appendix C, there would be areas of dredging where hard clay material would be encountered near the existing harbor entrance channel. It is not anticipated that this material would require blasting; however, heavy equipment and extra effort would likely be necessary to remove this material. Dredging equipment and methods would be left as an option for the contractor.

Side slopes for the basin would be dredged to 1vertical (V):1.5 horizontal (H) and would require rock slope protection. The entrance channels side slopes would be dredged to 1V:3H and would not require slope protection.

A small channel would be dredged to accommodate fish passage along the shoreward end of the south stub breakwater. This channel would be 5 meters wide by 51 meters long and be dredged to a depth of +1.75 meters MLLW (replicating the existing fish passage at the northern limit of the existing harbor). This would allow half tide access for fish through the harbor system.

Maintenance Dredging. Maintenance dredging would be expected to be minimal. Dredging has not been required in the existing harbor since its previous expansion. Littoral transport of sediments appears generally to be from north to south. Some deposition is indicated on the north side of the existing breakwater. After construction, sediment would be expected to be deposited in a similar manner north of the north stub breakwater. Maintenance dredging of the new harbor basin would be minimal during the project life. It would depend on storm conditions over the years, but would be very infrequent if necessary at all.

Dredged Material Disposal. The dredged material would be disposed of in a deep-water area approximately 1.2 km east of the basin offshore from the existing harbor, figure EA-3, USCOE Environmental Assessment, April 2002. A total of 210,700 m^3 of dredged material—mostly clay, sand, and gravel—would be deposited in the disposal area. The material could be excavated and transported efficiently a very short distance to the disposal area.

Breakwaters. The positioning of the breakwaters would create entrance channel alignments allowing access from the east to both basins. Maximum depths of water are –6.25 meters MLLW along the alignment of the breakwater. Foundation materials would be clay, sand, and gravel, which would serve as a suitable base for the rubblemound structures. The north stub and north breakwaters were separated by a 11.5 meter-wide gap for fish passage. The gap was sized to replicate the existing width and elevation of the existing fish passage at the existing harbor.

Rubblemound Breakwater Design. A stone specific gravity of 2.89 was used in the calculations, assuming the local quarry in Haines would be the rock source. Armor stone ("A" rock) with a range of sizes from 1,136 kilograms (kg) maximum to 682 kg minimum would be used on the face of the breakwaters. Secondary stone would range from 682 kg maximum to 68 kg minimum. Core material would range from 68 kg maximum to 0.5 kg minimum. Armor stone thickness would be 1.52 meters, and secondary stone thickness would be 0.76 meters.

A total of 46,600 m^3 of "A" rock, 29,900 m^3 of "B" rock, and 114,300 m^3 of "core" rock would be required for construction of the breakwaters. Approximately 10,600 m^3 of rock from the existing breakwater would be removed and used as additional "core" rock in the new breakwaters.

Staging Areas. Lands for Alternative 1 would be created by filling in tidelands along the shoreline in the new north harbor basin, in the existing basin, and south of the existing basin. Fill material would be derived from waste rock during quarry operations and hauled to the site for placement. A total area of 3.06 ha would be created and available for use. There would be sufficient area associated with Alternative 1 to provide the needed facilities to support the harbor. The needed facilities are harbor house, gangway access, equipment storage and vehicle parking.

Alternative 2

This alternative (Figure 4) is very similar in configuration to Alternative 1. The difference between the two is mainly the size of the basin. The breakwaters are slightly farther offshore in deeper water and extend farther to the north on the north side. This alternative incorporates the following rubblemound breakwaters: a 72.9-meter long north spur breakwater, a 109.4-meter long north breakwater, a 489.1-meter long main breakwater, a 62.2-meter long extension of the existing breakwater to the south, and a 49.9 meter-long south spur breakwater. The existing breakwater would be modified slightly by removing 46 meters of its length at its northern end, but the majority of its length would be unchanged. Two separate mooring basins would be created with this alternative. The 6.57-ha north basin could accommodate the larger range of vessels in the fleet with stalls oriented with the prevailing wind direction. The 2.25-ha south basin (existing) would remain unchanged in size and depth; however, additional wave protection would be provided and the existing float system would be removed and reoriented. Smaller vessels in the fleet would use the south harbor basin. The north harbor entrance would be oriented with an approach around the end of the main breakwater and into the maneuvering area. The local sponsor again preferred this entrance channel configuration. Marker pilings would be placed along the outside of the dredged channel limits to guide mariners into the harbor. The entrance channel into the south basin would be dredged and oriented similar to the existing south entrance channel.

Figure 4. Alternative 2. Rubblemound breakwaters: 72.9-meter long north spur; 109.4-meter long north breakwater; 489.1-meter long main breakwater; 62.2-meter long extension of existing breakwater to the south; and 49.9-meter long south spur breakwater.

<u>North Harbor Basin</u>. The north harbor basin would be step dredged to depths of –4.9

meters and –4.3 meters MLLW (USCOE Environmental Assessment Appendix A, Hydraulic Design). The deeper portion of the mooring basin would be located nearest the entrance channel. The shallower portion would be located farther into the harbor away from the entrance channel. The maneuvering area just inside the basin would be dredged to –4.9 meters MLLW. A total combined maneuvering and mooring basin area of approximately 6.57 ha would be available in the north basin for Alternative 2.

South Harbor Basin. The south harbor basin would remain unchanged with respect to area and depth.

Circulation. The north and south basins would have tidal prism ratios of 0.44 and 0.55, respectively. The corners (15 percent of the basin's volume) of the north basin were checked for possible zones of stagnation. The northeast corner had the lowest value tidal prism ration of 0.46 (USCOE, April 2002).

The aspect ratios of the north and south basins were calculated to be 1.46 and 1.30, respectively. Good water quality and circulation are expected in both harbor basins for Alternative 2.

Shoaling. Shoaling at either entrance channel would not be expected since there is little evidence of significant long-shore transport of sediments at the site.

Construction Dredging. Dredging a total of 223,700 m^3 of clay, 5,600 m^3 of harder clay (diamictom), and 2,800 m^3 of boulders would be required for Alternative 2.

A small channel would be dredged to accommodate fish passage along the shoreward end of the south stub breakwater. This channel would be approximately 5 meters wide by 51meters long and be dredged to a depth of +1.75 meters MLLW (replicating the existing fish passage at the northern limit of the existing harbor). This would allow continuous uninterrupted migration of fish through the harbor system by not altering the existing condition with respect to elevation and width of passage.

Dredged Material Disposal. A total of 229,300 m^3 of dredged material—mostly clay, sand, and gravel—would be deposited in the disposal area.

Breakwaters. A total of 48,900 m^3 of "A" rock, 32,6 00 m^3 of "B" rock, and 135,000 m^3 of "core" rock would be required for construction of the breakwaters. Approximately 10,600 m^3 of rock from the existing breakwater would be removed and used as additional "core" rock in the new breakwaters.

Staging Areas. Areas for Alternative 2 would be created by filling in tidelands along the shoreline in the new north harbor basin, in the existing basin, and south of the existing basin. Fill material would be derived from waste rock during quarry operations and hauled to the site for placement. A total uplands area of 3.06 ha would be created and available for use.

Alternative 3

The local sponsor provided the layout for Alternative 3 in coordination with the Alaska Department of Transportation and Public Facilities (ADOT/PF). This alternative was designed to maximize the available mooring area within the north basin and to allow future use of the main breakwater for access to a future dock outside the harbor. The main breakwater is located farther offshore in deeper water and extends farther to the north on the north side than the previous two alternatives. The north spur and first portion of the main breakwater have a widened crest width to accommodate vehicle access for a future dock to be located at the turn-around. This alternative, shown in Figure 5, incorporates the following rubblemound breakwaters: a 103-meter-long north spur breakwater, a 191-meter-long first portion of the main breakwater, a turn-around portion of the main breakwater with a radius of 18.5 meters, a 325.9-meter-long second portion of the main breakwater, a 51.2-meter-long extension of the existing breakwater to the south, and a 33.3-meter-long south spur breakwater. The existing breakwater would be unchanged except for the extension of the head to the south and the creation of a new fish passage channel near its northern angle point. A concrete floating breakwater would be constructed and placed along the western edge of the new north entrance channel. Two separate mooring basins would be created with this alternative. The 7.02-ha north basin could accommodate the larger range of vessels in the fleet with stalls oriented with the prevailing wind direction. The 2.25-ha south basin (existing) would remain unchanged in size and depth; however, additional wave protection would be provided and the existing float system would be removed and reoriented. Smaller vessels in the fleet would use the south harbor basin. The north harbor entrance would be oriented with an approach around the end of the main breakwater and into the maneuvering area. This entrance channel configuration represents the preference of the local sponsor for this alternative. The entrance channel into the south basin would be dredged and oriented similar to the existing south entrance channel.

North Harbor Basin. The north harbor basin would be step dredged to depths of –4.3 meters and –4.9 meters MLLW, with the deeper portion of the basin in the northern half. These depths are based on the established criteria. The shallower portion of the mooring basin would be located nearest the entrance channel. The maneuvering area just inside the basin would be left un-dredged since natural depths are sufficient for maneuvering. A total combined maneuvering and mooring basin area of approximately 7.02 ha would be available in the north basin for alternative 3.

South Harbor Basin. The south harbor basin would remain unchanged with respect to area and depth.

Circulation. The north and south basins would have tidal prism ratios of 0.49 and 0.55, respectively. The corners (15 percent of the basin's volume) of the north basin were checked as worst-case possible zones of stagnation. The northeast corner had the lowest value tidal prism

Figure 5. Alternative 3. Rubblemound breakwaters: 103-meter long north spur; 191-meter long first portion of main breakwater; turn-around portion of main breakwater with radius of 18.5 meters; 325.9-meter long second portion of main breakwater; 51.2-meter long extension of existing breakwater to the south; and 33.3-meter long south spur breakwater.

ration of 0.46. The aspect ratios of the north and south basins were calculated to be 1.41 and 1.30, respectively. Good water quality and circulation are therefore expected in both harbor basins for Alternative 3.

<u>Construction Dredging</u>. Dredging a total of 142,600 m^3 of clay, 3,300 m^3 of harder clay (diamictom), and 2,200 m^3 of boulders would be required for Alternative 3.

A small channel would be excavated through the existing breakwater to accommodate fish passage from the north basin into the south basin and vice versa. This channel would be approximately 4 meters wide by 22 meters long and be excavated to a depth of +1.5 meters MLLW. Side slopes would be 1V:3H on the inside and 1V:1.5H on the outside. This would allow migration of fish through the harbor system since this alternative would close off the existing fish passage with upland fill.

Dredged Material Disposal. A total of 146,200 m^3 of dredged material—mostly clay, sand, and gravel—would be deposited in the disposal area.

Breakwaters. Similar breakwater design methodology described for Alternatives 1 and 2 was used for Alternative 3. This resulted in the same crest height, rock size and layer thicknesses, and toe configurations for the seaside. The crest width for the north spur and first portion of the main breakwater for Alternative 3 was widened to 13.8 meters. "A" rock would only extend up to the full crest height of +7.93 meters MLLW on the seaside. The crest itself would be "core" rock and presumably surfaced with sub-base and base course material in the future for vehicle access. The harbor side would have "B" rock only since no overtopping would be anticipated over the widened crest portions. The turn-around portion of the main breakwater would be widened further to a radius of 18.5 meters with a similar cross-section to the north spur and first portion of the main breakwater. The second portion of the main breakwater and south breakwater extensions and south spur breakwaters would use the same cross-section design as those for Alternatives 1 and 2.
A total of 43,600 m^3 of "A" rock, 44,700 m^3 of "B" rock, and 257,400 m^3 of "core" rock would be required for construction of the breakwaters. Approximately 2,600 m^3 of rock from the existing breakwater would be removed and used as additional "core" rock in the new breakwaters.

Floating Breakwater Design. ADOT/PF designed the floating breakwater for Alternative 3. The structure would reduce residual wave heights to acceptable levels inside the harbor by attenuation. Based on wave height reduction criteria in the SPM, the floating breakwater dimensions required were calculated to be 4.88 meters wide and 2.00 meters high (0.6 meter freeboard and 1.4-meter draft). The length of the structure would be 95.72 meters to provide adequate wave protection and allow for use as a mooring float for larger vessels. A concrete box-type design was selected for the structure. It would be supported by steel pilings driven into the existing bottom. This alternative requires the use of a longer floating breakwater within the entrance to protect the basin from waves generated from the south/southeast and the refracted wave from Lynn Canal.

Staging Areas. A total area of 2.66 ha of filled tidelands would be created and available for use.

Alternative 4

The layout for Alternative 4 was also provided by the local sponsor in coordination with the ADOT/PF (the local sponsor's technical advisor). This alternative is very similar to Alternative 3, however it incorporates a smaller mooring basin. It would allow future use of the main breakwater for access to a future dock outside the harbor similar to Alternative 3. The main breakwater, however, is located closer inshore and in shallower water. The north spur and first portion of the main breakwater have a widened crest to accommodate vehicle access for a future dock to be located at the turn-around. This alternative, shown in Figure 6, incorporates the following rubblemound breakwaters: a 103 meter long north spur breakwater, a 154 meter long first portion of the main breakwater, a turnaround portion of the main breakwater with a radius of 18.5 m, a 316 meter long second portion of the main breakwater, a 46.7 meter long stub breakwater attached to the existing breakwater, a 51.2 meter long extension of the existing breakwater to the south, and a 33.3 meter long south spur breakwater. The existing breakwater would be unchanged except for the extension of the head to the south and the creation of a new fish passage channel near its northern angle point. Two separate mooring basins would be created with this alternative. The 6.60-hectare north basin could accommodate the larger range of vessels in the fleet with stalls oriented with the prevailing wind direction. The 2.25-hectare south basin (existing) would remain unchanged in size and depth, however additional wave protection would be provided and the existing float system would be removed and reoriented. Smaller vessels in the fleet would use the south harbor basin. The north harbor entrance would be oriented with an approach around the end of the main breakwater and into the maneuvering area. This entrance channel configuration represents the preference of the local sponsor for this alternative. The entrance channel into the south basin would be dredged and oriented similar to the existing south entrance channel.

<u>North Harbor Basin</u>. The north harbor basin would be step dredged to depths of –4.3 m and –4.9 m MLLW with the deeper portion of the basin located in the northern half. These depths are based on criteria given in Section 5 of the hydraulics appendix. The shallower portion of the mooring basin would be located nearest the entrance channel. The maneuvering area just inside the basin would be left un-dredged since natural depths are sufficient for maneuvering. A total combined maneuvering and mooring basin area of approximately 6.60 hectares would be available in the north basin for Alternative 4.

<u>South Harbor Basin</u>. The south harbor basin would remain unchanged with respect to area and depth.

<u>Circulation</u>. The north and south basins would have tidal prism ratios of 0.53 and 0.55 respectively. The corners (15% of the basin's volume) of the north basin were checked as worst-case possible zones of stagnation. The northeast corner had the lowest value tidal prism ration of 0.45.

Figure 6. Alternative 4. Rubblemound breakwaters: 103-meter long north spur; 154-meter long first portion of main breakwater; turnaround portion of main breakwater with radius of 18.5 meters; 316-meter long second portion of main breakwater; 46.7-meter long stub breakwater attached to existing breakwater; 51.2-meter long extension of existing breakwater to the south; and 33.3-meter long south spur breakwater.

The aspect ratios of the north and south basins were calculated to be 1.67 and 1.30 respectively. Good water quality and circulation are therefore expected in both harbor basins for Alternative 4.

<u>Construction Dredging</u>. A total of 156,500 cubic meters (CM) of clay, 3,300 CM of harder clay (diamictom), and 1,900 CM of boulders dredging would be required for this alternative.

A small channel would be excavated through the existing breakwater to accommodate fish passage from the north basin into the south basin and vice versa. This channel would be similar to that for Alternative 3.

Dredged Material Disposal. A total of 163,200 CM of dredged material--mostly clay, sand, and gravel--would be deposited in the disposal area.

Breakwaters. Similar breakwater design methodology described for Alternatives 1, 2, and 3 was used for Alternative 4.

A total of 38,500 CM of "A" rock, 39,100 CM of "B" rock, and 191,100 CM of "Core" rock would be required for construction of the breakwaters. Approximately 2,600 CM of rock from the existing breakwater would be removed and used as additional core rock in the new breakwaters.

Staging Areas. Areas for Alternative 4 would be created by filling in tidelands along the shoreline in the new north harbor basin, in the existing basin, and south of the existing basin. The existing fish passage channel would be filled in as well. Fill material would be derived from waste rock during quarry operations and hauled to the site for placement. A total area of 2.66 Ha would be created and available for use.

Comparison of Alternatives

Alternative 1 is very similar to Alternative 2 except it provides for fewer vessels in the moorage basin. Alternative 4 is the locally preferred plan and the National Economic Development Plan and allows for future expansion by moving the main breakwater seaward. Alternative 3 is the larger version of Alternative 4. The seaward shift of Alternatives 3 and 4 moves the moorage basin into deeper water, thereby reducing dredging quantities. Alternatives 3 and 4 move the entrance channel to the north so that the main breakwater can be bridged for a causeway. The causeway would allow for future docking of larger vessels such as cruise ships or the fast ferry system. Staging area fill for Alternatives 1 and 2 are the same. The goal was to keep intertidal fill to a minimum for harbor related uses. The fill for Alternatives 3 and 4 is the same total amount but is concentrated in the new harbor area. Intertidal impacts from fill can be minimized by limiting the fill as much as possible to the upper tidal above approximately 2 meters MLLW. The diversity and abundance of biota is low. The fill is required to access the gangway to the floats and would require filling in the existing fish passage and creating another opening further out for fish passage.

Construction Scenarios. There are two general concepts for constructing the breakwaters, one is barge placement of rock, the other is truck hauling from the Haines quarry site. The Haines quarry site is approximately 5 km outside of town. To construct the breakwater from shore many truck-loads of rock from the quarry through town are required. The breakwater would be built continuously out from shore. The breaches in the breakwaters would be temporarily filled to accomplish this construction method. Fill for the staging areas also would be imported from a local quarry. The dredged material was determined unsuitable for use as fill (USCOE Environmental Assessment, April 2002).

Water Quality

Adequate flushing and circulation and best management practices by the users are vital for maintaining good water quality within a harbor. Several studies in the Pacific Northwest have been performed to determine boat harbor configuration with optimal circulation and flushing (Cardwell and Koons, 1981, and Neece, et al., 1979). The studies derived an optimum quantity for the exchange coefficient and harbor aspect ratio. The exchange coefficient measures the relative exchange of water within a harbor basin with ambient water due to tidal flushing of the basin. The coefficient indicates that fraction of water in a basin or segment of the basin that is removed (flushed out) and replaced with ambient water during each tidal cycle. Ideally, for adequate flushing, a gross exchange coefficient should be greater than 0.30. The exchange coefficient can be reliably estimated by the tidal prism ratio when a physical model is not used. The tidal prism ratio is calculated by subtracting the basin volume at MLLW from the basin volume at mean higher high water (MHHW) and then dividing the difference by the basin volume at MHHW. The harbor aspect ratio is the relationship between the length of the basin and its width. The ratio is calculated by dividing the basin length by its width. The aspect ratio affects the angular momentum, which allows the inflowing ambient water to sweep past a major portion of the basin's interior boundaries without losing its identity by diffusion. Factors that contribute to increased angular momentum improve overall flushing. This ratio should be greater than 0.33 and less than 3.0 for adequate flushing.

Overall, water quality within the alternative harbor designs is considered to be fairly good, primarily due to tidal exchange. Circulation in the new harbor configurations would be driven by a gyre set up in the basin by tidal action. The breaches at each end of the harbor would be expected to reduce the gyre effect slightly.

Dredging the basin and discharges associated with construction of the breakwater would temporarily increase turbidity near the project. Tidal current and action would cause any loosened fine-grained material to form a sediment plume. Suspended sediments would temporarily decrease light penetration, primary productivity, and dissolved oxygen levels. Sediment constituents would be released into the water column, where they are more readily available to organisms. Mixing and dilution in the overlying water would be expected to decrease turbidity levels. To reduce sedimentation and turbidity during dredging, we recommend sediment containment either by silt curtains or other means. If this can not be accomplished we recommend dredging from 1 July through March 31 to avoid sensitive fish migration periods.

Building the breakwaters in the summer before dredging the basin could be an effective containment solution. Deep-water disposal of dredged materials would increase turbidity and suspended particulate levels at the discharge site during periods of work. To the extent practicable, dredged materials would be discharged below the water surface to minimize wind driven dispersion. As with the dredging operations, the suspended plume associated with the disposal of the dredged material would be shortlived and localized.

Based on an analysis of long shore transport of sediment, shoaling, and historical information on conditions in the area, sedimentation would present no major problems. Maintenance dredging would be minimal during the life of the project. Impacts from maintenance dredging would be similar to those from original dredging activities.

Harbor operation and harbor-related activities typically degrade water quality. Incidental discharges of pollutants such as paints, fuel, oil, human refuse, fish wastes, and discarded debris contribute to poor water quality. While good circulation and flushing quickly disperses pollutants, preventing from accumulating locally, preventing pollution from entering the water is the ultimate goal. There are best management practices for managing harbors to prevent fuel spills and inhibit pollution compiled by the State of Alaska (Neil Ross Consultants, 1995). Another compilation of best management practices was put together (ABR, 2000) under contract to the Corps of Engineers. A harbor management plan for Haines instituting best management practices that are effective and enforceable would mitigate impacts to water quality and to the near shore habitat.

Terrestrial Resources

The harbor construction staging area would temporarily disturb uplands under all the harbor design alternatives. The uplands are adjacent to existing development and would have minimal impact on terrestrial resources. The uplands area would be used as a temporary staging area for construction equipment.

Marine Resources

Constructing a boat harbor by placing breakwaters and dredging to the required depths or any other construction associated activity would disturb bottom sediments and impact bottom-dwelling aquatic organisms, remove submerged vegetation beds, drive away fish and other mobile organisms, and permanently alter the existing habitat. The resultant turbidity plume could affect fish gills and sediments could accrete down-current of the project. Ecosystem effects include the direct elimination of organisms, the reduction of primary and secondary production, and changes in hydrology and sedimentology within and adjacent to the harbor. Recolonization after dredging would depend on adjacent undisturbed communities providing a source of replacement organisms capable of recolonizing the site by adult migration or larval settlement, water quality, and substrate quality. Time frame and degree of habitat reclamation are unknown. The marine organisms may go through a successional process, with the more resilient organisms acting as the pioneer species. Breakwaters would provide attachment substrate for sessile organisms. This would change the sandy bottom habitat to more of a rocky reef habitat inhabited by different organisms. The degree to which the breakwaters would recolonize is variable with some harbor areas colonized more densely than others.

All of the harbor designs would create uplands in the intertidal zone within the moorage area. Fill would be brought in for this purpose because the dredged material is unsuitable. The tidelands up to +1.75 meters would be permanently altered for harbor related uses. Land would be required for the harbor house, gangways, equipment storage and vehicle parking.

Alternative 1 would affect 12.71 ha of sea bottom, which includes the intertidal fill, dredging of the entrance channel and moorage basin, and breakwater placement. The biota in this area would be displaced or destroyed. As described in Section 3, the sandy intertidal is sparsely populated, blue mussels attach to the rocky habitat. In the deeper subtidal the substrate is predominately sand, moderately productive with starfish and algae growth. Similar habitat exists in the general Portage Cove area. No blasting would be required. The substrate after dredging would be similar, thus increasing the chance of recolonization. The protected water within the moorage basin would favor organisms adapted to low-energy conditions. The pilings and float system would colonize with sessile organisms. Breaches on either side of the breakwaters would provide a corridor for fish passage.

Alternative 2 is larger affecting 14.81 ha of sea bottom, but similar in layout as alternative 1. The plans occupy the same general area with similar physical and biological affects. However, plan 2 requires a larger volume (approximately 18,600 m^3) of dredging than alternative 1.

Alternative 3 would affect 12.31 ha of sea bottom. The moorage basin would be larger but in deeper water reducing the dredging quantity. This alternative includes the greater width of the breakwater to accommodate the causeway and the bulkhead fill. The additional fill would have incremental effects to the environment but provide the users with future expansion options.

Alternative 4 would affect 11.82 ha of sea bottom. This plan is a smaller version of alternative 3.

Alternative 4 is the proposed action.

All the harbor plans would use the deep-water (approximately 62 fathoms) disposal site, approximately 1.2 km east and offshore of the existing harbor in Portage Cove. The proposed action Alternative 4 would dispose up to 165,100 m^3 of dredged material consisting primarily of surficial silts, sands and organics underlain with thick deposits of clay. This is assumed to be typical unconsolidated material common in the bay, including the disposal site. This amount of material would cover approximately 2.37 ha of sea bottom. The variables include the amount of material and number of barge dumps, type of material, depth of the disposal site, and water currents and bathymetric conditions at the disposal site. The material would be deposited in a mound for the least impact on the sea bottom. The mound if dumped on continuously would be approximately 29 meters high with side slopes of approximately 1 vertical:2 horizontal to 1 vertical to 3 horizontal.

The mechanics of the behavior of dredged material placed at an open-water site by instantaneous discharge from a barge have been described and/or modeled by a number of investigators (Koh and Chang, 1973) and others. When dredged material is released from a barge, it descends through the water column as a dense fluid-like jet. Within this well-defined jet, there may be solid blocks or clods of very dense cohesive material. Large columns of site water are entrained in the jet. Depending on properties of the sediment and currents, some material is separated from the jet and remains at the upper portion of the water column. The descending jet collapses, usually as a result of impact on the bottom. The discharge that is not deposited when it impacts will move radially outward as a density/momentum-driven surge until sufficient energy is dissipated and the material begins to rapidly settle to the bottom. The suspended solids will form a turbidity plume. The short-term impacts resulting from suspended solids are confined to a well-defined layer near the bottom. A thickness above the bottom equal to 15 to 20 percent of the total water depth was observed in the majority of studies. Above this bottom layer, suspended concentrations are one to two orders of magnitude less, and the total amount of solids dispersed over long distances is 1 to 5 percent of the original material.

The major factor affecting the dispersion of the dredged material at the Haines site is the large percentage of clay material. The cohesive nature of the clay would cause large blocks of material to rapidly drop to the bottom reducing the suspended sediments. A relatively small quantity of fines including silts and sands, however, would be suspended and transported by prevailing currents I the form of a plume. Calculations on this plume size indicate that its maximum extent would be approximately 750 m to the south on an ebb tide and 465 m to the north on the flood tide. These extents assumed that the material is dumped during maximum tidal currents. If the material were dumped during days with lower tide ranges or at slack water, the extent of the plume would be considerably less. Some mixing could occur if wind velocities are high at the time of disposal, however, wind generated currents are relatively insignificant with depth in the water column.

The most apparent impact associated with dredged material disposal is the smothering and/or burying of aquatic organisms. This site is well below the photic zone, which avoids impacts to most aquatic vegetation. The smothering and destruction of organisms does not necessarily mean there is a loss or a change of habitat type. The disposal of uncontaminated material on a substrate of similar or equal grain size would recover in time and eventually with the same species. It is likely that the grain size in the deep-water area is similar to the dredged material. Samples in the disposal site indicated fine-grained material on the surface. A reduction in net primary and secondary production is likely at this site until recolonization can take place. Non-motile and slow moving organisms would be smothered by the dredged material. Most groundfish and other motile organisms would be expected to avoid the area during the disposal. Since the material is composed of cohesive clays, a significant sediment plume would not be created by the disposal. However, the water is clear in the bay and a plume during disposal would be noticed. The currents and tides would disperse the suspended material over a wide area. A bottom dump barge that holds about 2,294 m^3 would dispose of dredged material.

Fish Habitat

The harbor project would alter the near shore fairly shallow habitats into a deeper water protected embayment. The organic/sandy layer would be removed but may reestablish over time. The breakwaters would colonize with algae and sessile organisms providing food and cover for fish. The dredged material composed of silt/clay/ boulder material would cover approximately 2.37 ha of sea bottom at the disposal site. This deep-water disposal site is likely to have similar sized material and no vegetation.

Salmon

All five species of Pacific salmon are present in Lynn Canal. Juvenile salmon use shallow water corridors during spring migrations. Adult salmon are also near shore during the seasonal migration to spawn in their natal streams. The harbor operation may affect salmon. Construction activities causing water turbidity would have an impact. Construction timing to avoid fish migration periods reduces adverse effects.

Sablefish

Juveniles may be inshore but are not likely to use habitats in the harbor site area. Adults use deep-water habitats and may occur in the disposal site area. The disposal mound would cover some fish foraging habitat, however habitat adjacent to the project area exists in Portage Cove.

Pacific Cod

Spawning for this species takes place in the sublittoral-bathyal zone (40 to 290 meters) near bottom. The semi-adhesive eggs sink to the bottom after fertilization. Juveniles occur mostly over the inner continental shelf at depths of 60 to 150 meters. Adults occur in depths from shoreline to 500 meters. Mature fish concentrate on the outer continental shelf. Soft sediment, from mud and clay to sand, is the preferred substrate for all life levels except for the pelagic larvae form. Pacific cod probably occur at the harbor location and disposal site. The amount of proposed habitat disruption may not affect the species.

Sculpins spp.

Sculpins are found throughout the project area. They prefer a mud to sandy bottom. There would be a minor amount of habitat lost in the harbor and temporarily at the disposal site until recolonization could take place. The loss of habitat appears to be minor considering the variety of habitats the species uses.

Forage Fish

The forage fish (eulachon, capelin, and sand lance use habitat types found in the harbor site. A predominantly sand habitat would remain after dredging and may be used by these fish.

No Action Alternative

The no-action alternative would leave the site in its present condition. The identified purpose and need of the project would not be fulfilled. The harbor would continue to be used beyond its designed capacity. Vessels seeking to secure moorage in the harbor would have to continue to seek refuge at other ports.

EVALUATION METHODOLOGY

Objectives

Investigations were directed at achieving the following objectives:

1. Investigate intertidal and shallow subtidal habitats at the proposed Haines Harbor expansion sites to determine: a) the physical characteristics including depth, slope, substrate, and current patterns; and b) the biological characteristics (productivity and diversity).

2. Determine the biological suitability of these sites for harbor expansion or construction, and/or recommend alternatives or mitigative measures to minimize adverse effects to fish and wildlife resources.

On June 19-23, 2000, Service biologists visited two areas being considered for harbor expansion. The areas visited are Portage Cove and Letnikof Cove. The Service completed four shallow subtidal line transects in the Portage Cove area, two to the north of the existing harbor, one at the middle of the existing breakwater (location approximate), and one to the south of the existing harbor. In addition, three intertidal transects (Intertidal Transect South, Intertidal Transect Middle, and Intertidal Transect North) were also established north of the existing harbor (See RESOURCE DESCRIPTION Section for narrative discussion. Figure 7 shows the location of the four subtidal and three intertidal transect locations.

One or two, 100-meter long Keson fiberglass tapes (depending on the slope of the site) were placed or connected and set along the axis of the proposed harbor expansion sites from the approximate Mean High Water Line (MHWL), as evidenced by debris deposition, and ran seaward approximately perpendicular to the shoreline to the end of the tape(s). These transects ran through the areas considered for proposed harbor expansion in the Portage Cove area. Two Service biologists, using self contained underwater breathing apparatus (S.C.U.B.A.), gathered information along transect lines as well as in the general area of potential impact. All plant and animal species within 1-square meter plots and vicinity of transect line were recorded. One biologist recorded plants and animals observed within the 1-meter plots located at 5-meter

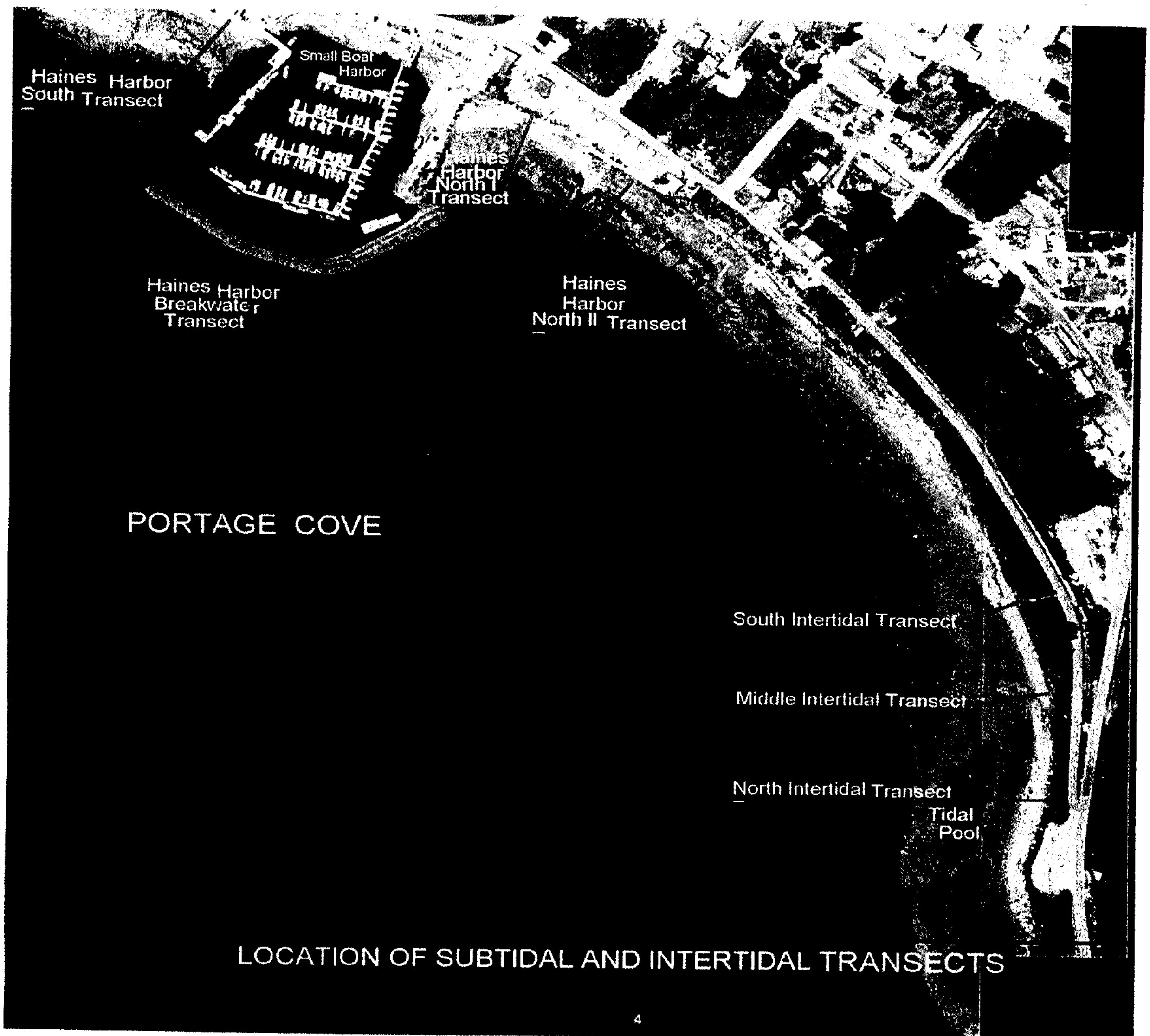

Figure 7. Subtidal and Intertidal Transect Locations.

intervals along the transect tape on waterproof paper. The other biologist recorded physical and biological information observed in the vicinity of the transect line.
Underwater video of each transect was recorded on an 8mm Sony camcorder inside a Stingray waterproof housing. Observations included water depth (measured with a US Divers Monitor 2 diving computer), substrate composition, plant species, animal species, and obvious changes in zonation. In addition, the general characteristics of the area, and the evidence of current flow patterns were noted subjectively.

A deep-water disposal area has been identified for dredge spoils. Sediment samples were taken using a dredge from three locations within the previously used deep-water disposal site where approximately 4587.6 cubic meters (6,000 cubic yards) of dredged material from the entrance channel were disposed. Dredged material sample sites are shown on Figure 8. Dredged samples were delivered to the Corps for analysis on June 26, 2000.

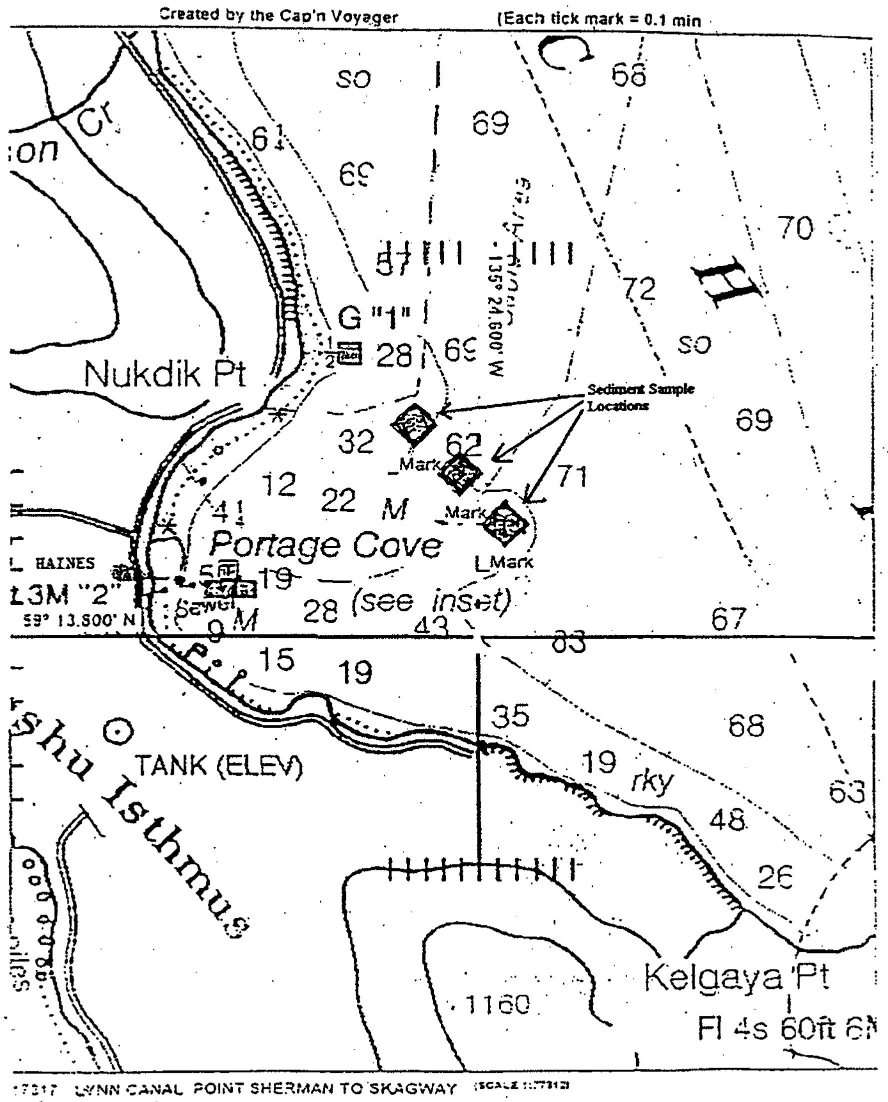

FIGURE 8. DREDGE MATERIAL GRAB SAMPLE SITES, HAINES, ALASKA

Habitat type mapping was done in the Letnikof Cove area. Habitat mapping covers an area from a point approximately 100 meters (328.1 feet) northwest of existing float dock (located on the east side of cove on west side of Chilkat Peninsula) to a point approximately 300 meters (984.2 feet) southeast of the same float dock. The transect is 400 meters long (1,312 feet) and its width is variable. The width of the mapped area extends approximately from an area below the road (located along the west side of Chilkat Peninsula), that parallels the cove and goes to the water's edge. A general habitat map of the Letnikof Cove area is shown in Figure 2 .

No quarry sites have been specifically identified for obtaining construction material. Fill material, regardless of which alternative is selected, would probably come from a privately owned quarry located northwest of town. The material would be hauled to a selected location on existing roads.

RESOURCE DESCRIPTION

For comparability, all data sets are presented in 100 meter increments with the exception of the strictly intertidal transects which ended at the waterline. Tables showing species distribution along each transect are in Appendix A. Depth profiles for each transect are in Appendix B.

Haines Harbor South: Latitude 59° 13.956' N, Longitude 135° 24.469' W. Compass Heading 108°T. Date: June 21, 2000. Time: 0805 hours. Tide level: 1.89 meters (Haines, Alaska). Aquatic species observed are listed in Appendix A, Tables 1, 2, and 3, and the bottom profile (adjusted to zero tide for this cycle) is shown in Appendix B. Length of transect: 200 meters.

The sea floor substrate from the MHWL to 55 meters along the transect consisted primarily of boulders. From 60 to 90 meters the substrate was primarily sand. From 95 to 200 meters the substrate was primarily silt. Little current was detected, and the primary change in zonation was the transition zone between the boulder and silt substrates.

The dominant aquatic plants recorded along the first 100 meters of the transect were the brown algae (Phylum Phaeophyta), and rockweed (*Fucus gardneri*); and the dominant aquatic invertebrate was the common acorn barnacle (*Balanus glandula*). Along the second 100 meters of the transect the dominant aquatic plant was sugar kelp (*Laminaria saccharina*); the dominant aquatic invertebrates were the six-armed star (*Leptasterias epichlora*), and common acorn barnacles (*Balanus glandula*); and the dominant fish were sole (Family Pleuronectidae), and snake pricklebacks (*Lumpenus sagitta*). We would subjectively characterize the plant community and animal component as typical, with few species. Abundance of individual species was low, with the exception of the six-armed star (*Leptasterias epichlora*) which was abundant.

Haines Harbor Breakwater: Latitude 59° 14.029' N, Longitude 135°26.271' W. Compass Heading 90°T. Date: June 21, 2000. Time: 1130 hours. Tide level: 0.8 meters (Haines, Alaska). Aquatic species observed are listed in Appendix A, Tables 4 and 5, and the bottom profile (adjusted to zero tide for this cycle) is shown in Appendix B. Length of transect: 100

meters.

The sea floor substrate from the MHWL to 30 meters along the transect consisted primarily of boulders (breakwater rock fill). From 35 to 40 meters the substrate was primarily cobble. From 45 to 100 meters the substrate was primarily silt. Little current was detected, and the primary change in zonation was the transition zone between the boulder/cobble and silt substrates.

Dominant aquatic plants were sugar kelp (*Laminaria saccharina*) and cup and saucer (*Constantinea rosa-marina*); dominant aquatic invertebrates the six-armed star (*Leptasterias epichlora*), and common acorn barnacles (*Balanus glandula*); and the dominant fish were sculpins (*Myoxocephalus spp*), gravel divers (*Scytalina cerdale*), and rock sole (*Lepidopsetta bilineata*). We would subjectively characterize the plant community and animal component as typical, with an average number of species. Abundance of individual species was average, with the exception of the six-armed star (*Leptasterias epichlora*) which was abundant.

Haines Harbor North I: Latitude 59° 14.138' N, Longitude 135° 26.459' W. Compass Heading 96°T. Date: June 22, 2000. Time: 1521 hours. Tide level: 1.4 meters (Haines, Alaska). Aquatic species observed are listed in Appendix A, Tables 6 and 7, and the bottom profile (adjusted to zero tide for this cycle) is shown in Appendix B. Length of transect: 200 meters.

The sea floor substrate from the MHWL to 105 meters along the transect was primarily a mixture of boulders, cobbles, and sand. From 110 to 155 meters along the transect the substrate was primarily sand. From 160 to 200 meters the substrate was primarily silt. Little current was detected, and the primary change in zonation was the transition zone between the boulder/cobble and sand/silt substrates.

Dominant aquatic plants along the first 100 meters of the transect were rockweed (*Fucus gardneri*), and sea lettuce (*Ulva/Monostroma spp*); and the dominant aquatic invertebrates were the common acorn barnacle (*Balanus glandula*), and blue mussels (*Mytilus trossulus*). Along the second 100 meters of the transect the dominant aquatic plants were sugar kelp (*Laminaria saccharina*), and witch's hair (*Desmarestia aculeata*); the dominant aquatic invertebrate was the common acorn barnacle (*Balanus glandula*); and the dominant fish were snake pricklebacks (*Lumpenus sagitta*), and sculpins (*Myoxocephalus spp*). We would subjectively characterize the plant community and animal component as typical, with few species. Abundance of individual species was low.

Haines Harbor North II: Latitude 59° 14.161' N, Longitude 135° 26.451' W. Compass Heading 100°T. Date: June 21, 2000. Time: 1620 hours. Tide level: 0.7 meters (Haines, Alaska). Aquatic species observed are listed in Appendix A, Tables 8 and 9, and the bottom profile (adjusted to zero tide for this cycle) is shown in Appendix B. Length of transect: 200 meters.

The sea floor substrate from the MHWL to 70 meters along the transect was primarily a mixture of cobbles, sand, and boulders. From 75 to 95 meters along the transect the substrate was primarily boulders. From 100 to 125 meters along the transect the substrate was primarily a mixture of boulders and sand. From 130 to 140 meters along the transect the substrate was primarily sand. From 145 to 200 meters along the transect the substrate was primarily a mixture of sand, mud, and silt. Little current, and no obvious changes in zonation were noted along the transect.

The dominant aquatic plants along the first 100 meters of the transect were rockweed *(Fucus gardneri)*, and sea hair (*Enteromorpha intestinalis*); and the dominant aquatic invertebrates were the common acorn barnacle (*Balanus glandula*), and blue mussels (*Mytilus trossulus*). Along the second 100 meters of the transect the dominant aquatic plants were sea lettuce (*Ulva/Monostroma spp*), and sugar kelp (*Laminaria saccharina*); the dominant aquatic invertebrates were common acorn barnacles *(Balanus glandula)*, and blue mussels (*Mytilus trossulus*); and the dominant fish were sole (Family Pleuronectidae). We would subjectively characterize the plant community and animal component as typical, with few species. Abundance of individual species was low.

Intertidal Transect South: Compass Heading 160°T. Date: June 20, 2000. Time: 0915 hours. Tide level: 0.5 meters (Haines, Alaska). Aquatic species observed are listed in Appendix A, Tables 10 and 11. Length of transect: 145 meters.

The sea floor substrate from the MHWL to 100 meters along the transect was primarily a mixture of sand, cobbles, and boulders. From 110 to 145 meters along the transect the substrate consisted primarily of boulders. No obvious changes in zonation were noted along the transect.

The dominant aquatic plants along the first 100 meters of the transect were sea hair (*Enteromorpha intestinalis*), and rockweed (*Fucus gardneri*); the dominant aquatic invertebrates were common acorn barnacles (*Balanus glandula*), and Sitka periwinkles (*Littorina sitkana*); and the dominant fish was the tidepool sculpin (*Oligocottus maculosus*). The dominant aquatic plant along the second 45 meters of the transect was rockweed (*Fucus gardneri*); and dominant aquatic invertebrates were common acorn barnacles (*Balanus glandula*), and blue mussels (*Mytilus trossulus*). We would subjectively characterize the plant community and animal component as typical, with few species. Abundance of individual species was average.

Intertidal Transect Middle: Compass Heading 160°T. Date: June 20, 2000. Time: 0915 hours. Tide level: 0.5 meters (Haines, Alaska). Aquatic species observed are listed in Tables 12 and 13. Length of transect: 150 meters.

The sea floor substrate from the MHWL to 45 meters along the transect was primarily a mixture of cobbles, sand, pebbles, and boulders. From 50 to 65 meters along the transect the substrate was primarily a mixture of sand, and cobbles. From 70 to 150 meters along the transect the substrate was primarily boulders with a mixture of sand, pebbles, and cobbles. No obvious changes in zonation were noted along the transect.

The dominant aquatic plants along the first 100 meters of the transect were rockweed *(Fucus gardneri)*, and sea hair (*Enteromorpha intestinalis*); and the dominant aquatic invertebrates were blue mussels (*Mytilus trossulus*), common acorn barnacles (*Balanus glandula*), Sitka periwinkles (*Littorina sitkana*), and puppet margarites (*Margarites pupillus*). The dominant aquatic plant along the second 50 meters of the transect was rockweed (*Fucus gardneri*); and the dominant aquatic invertebrates were common acorn barnacles (*Balanus glandula*), Sitka periwinkles (*Littorina sitkana*), and blue mussels (*Mytilus trossulus*). We would subjectively characterize the plant community and animal component as typical, with few species. Abundance of individual species was average.

<u>Intertidal Transect North</u>: Compass Heading 160°T. Date: June 20, 2000. Time: 0915 hours. Tide level: 0.5 meters (Haines, Alaska). Aquatic species observed are listed in Appendix A, Tables 14 and 15. Length of transect: 150 meters.

The sea floor substrate from the MHWL to 40 meters along the transect was primarily a mixture of sand, cobbles, and boulders. From 45 to 70 meters along the transect the substrate was primarily sand. From 75 to 95 meters along the transect the substrate was primarily a mixture of boulders, pebbles, and cobbles. From 100 to 150 meters along the transect the substrate was primarily boulders and cobbles. No obvious changes in zonation was noted along the transect.

The dominant aquatic plants along the first 100 meters of the transect were rockweed *(Fucus gardneri)*, and graceful green hair (*Cladophora sericea*); the dominant aquatic invertebrates were blue mussels (*Mytilus trossulus*), and common acorn barnacles (*Balanus glandula*); and the dominant fish were salmon smolts (genus *Oncorhynchus*). The dominant aquatic plant along the second 50 meters of the transect was rockweed (*Fucus gardneri*); the dominant aquatic invertebrates were common acorn barnacles (*Balanus glandula*), Sitka periwinkles *(Littorina sitkana)*, and blue mussels (*Mytilus trossulus*). We would subjectively characterize the plant community and animal component as typical, with few species. Abundance of individual species was average.

Bald eagles (*Haliaeetus leucocephalus*) are common to the area, but the Service has no record of eagle nests near the proposed project area.

Seabirds were noted during this investigation. Duck and seabird species using the area include oldsquaw (*Clangula hyemalis*), harlequin (*Histrionicus histrionicus*), scoters (*Melanitta* spp), marbled murrelet (*Brachyramphus marmoratum*), loons (*Gavia* spp), grebe (*Podiceps* spp), pelagic cormorant (*Phalcrocorax pelagicus*), great blue heron (*Ardea herodias*), Barrow's goldeneye (*Bucephala islandica*), bufflehead (*Bucephala albeola*), scaup (*Aythya* spp), herring gull (*Larus argentatus*), and glaucous-winged gull (*Larus glaucescens*).

No endangered or threatened species under our jurisdiction are known to reside in the immediate vicinity of the project area.

The National Marine Fisheries Service (NMFS) has responsibility for the federally-listed threatened Steller sea lion (*Eumetopias jubatus*), and the endangered humpback whale (*Megaptera novaeangliae*). The NMFS should be consulted on activities which may affect these species.

PROJECT EFFECTS

Impacts to fish and wildlife resources resulting from this proposed harbor expansion project can be described in three categories, i.e., construction, operation, and maintenance.

Filling to extend the existing breakwater or creation of a new breakwater and dredging of a moorage basin(s) will destroy intertidal and subtidal habitat. This will eliminate productive sediments, alga beds, and sessile aquatic invertebrates. A reduction in primary and secondary productivity will occur.

A decrease along shore littoral currents will result from breakwater construction. This decrease in water circulation coupled with an increase in vessel activity; the release of pollutants such as paints, fuel, grease, and oils from boats; and discarded sanitary debris could adversely influence or aggravate any existing poor water quality behind the breakwater(s). The degree of degradation will depend upon water exchange behind the breakwater and the future handling of sewage, refuse, wastes, and other pollutants. The degree f impact will also depend upon the quality of existing habitat. It is our assessment that Portage Cove is of lower value than Letnikof Cove.

MITIGATION

Mitigation has been defined by the President's Council on Environmental Quality to include (1) avoiding an impact by not taking an action or parts of an action, (2) minimizing impacts by limiting the degree or magnitude of the action, (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment, (4) reducing impact over time by preservation and maintenance operations, and (5) compensating for the impact by replacing or providing substitute resources or environments (40 CFR 1508.20). These elements are listed in priority order, representing a sequence of steps to be taken in the planning of a project. Thus, compensation is to be used only as a last resort after opportunities to avoid, minimize, rectify, and reduce impacts have been exhausted. Our discussion of mitigation opportunities will follow this sequence.

Avoiding Impacts

Impacts would be avoided if the small boat harbor would not be expanded. This would not meet the demand for additional moorage space for both commercial and recreational water craft and for better shelter from bad weather.

Intertidal and subtidal dredging and filling permanently destroys productive marine habitat. The use of floating breakwaters whenever possible, and selecting sites where the water is deep enough to preclude dredging would avoid direct impacts to sessile and mobile organisms.

Many harbors in Southeast Alaska include boat maintenance grids, which allow a boater to maneuver onto the grid at high tide, leaving the boat out of the water during low tide. Maintenance, such as bottom scraping, pressure washing, painting, engine and propeller work, etc. is performed, then the boat is floated off the grid at high tide. Boat grids are a chronic source of contaminants, which should be avoided at the Haines Harbor Expansion Project site. No grid is proposed at this time. Impacts would be avoided by building a marine rail or other haul-out system designed to collect wastes before they enter the environment, should maintenance facilities be desired.

The placement of fill in the water is regulated under the Clean Water Act and evaluated in Part 230.10 - Section 404 (b)(1) guidelines. Requirements in 230.10 (a) (3) states "Where the activity associated with a discharge which is proposed for a special aquatic site (as defined in subpart E) does not require access or proximity to or siting within the special aquatic site in question to fulfill its basic purpose (i.e., is not "water dependent") practicable alternatives that do not involve special aquatic sites are presumed to be available, unless clearly demonstrated otherwise." The fill for the breakwaters is water dependent. The fill for the harbor access such as the gangway and float system is water related. The other uses that have been proposed (harbor house, equipment storage facility, and vehicle parking area are not water-dependent. The loss of intertidal habitat resulting from extensive dredging and filling of intertidal areas would occur. We do not recommend the expansion of existing mooring facility at Letnikof Cove or the construction of non-water dependent activities (new harbor house, equipment storage facility, and vehicle parking area) by filling an intertidal zone. Use of a less productive practicable alternatives and previously impacted locations for construction of non-water dependent activities is recommended. Impacts to intertidal habitat would be avoided.

Minimizing Impacts

We offer the following recommendations to minimize the potential adverse impacts of the project on fish and wildlife resources and the habitats on which they depend. As stated previously, we recommend expansion in Portage Cove rather than Letnikof Cove because the value of the marine habitat is less in this area.

Limitations to the scope or magnitude of the project that could minimize impacts include the use of a floating breakwater rather than a rubble-mound breakwater. This would minimize burial of naturally existing sediments and associated flora and fauna, and will help maintain water currents and circulation. Some modification of currents is expected to accompany installation of a floating breakwater, but impacts would likely be less than with a rubble-mound breakwater.

Confining the proposed project to an area between the Haines Harbor South transect and Haines Harbor North II transect would minimize resource impacts. Selection of a location previously impacted by activities similar to the proposed project that has reduced biological productivity because of those activities would likely reduce adverse impacts to aquatic organisms resulting from the proposed project. Selection of a site which would minimize the area to be dredged or covered by a rubble-mound breakwater would also reduce resource impacts.

In-water construction activities should be restricted to the period of July 1 to March 31 (dates are subject to change after further consultation). This would avoid juvenile rearing/migratory anadromous fish species which use the near-shore area for rearing and as a migration corridor during the spring and summer months.

Use of metal grating as a surface for piers and ramps (equipment storage facility, vehicle parking area), rather than solid planking, will reduce shading and minimize impacts to aquatic plant life. This does not apply to the surface of floats where the floatation cells or logs would intercept any light passing through the surface grating. This will allow for increased light transmission to aquatic organisms.

The use of steel or concrete pilings for the construction of a harbor house, equipment storage facility, and vehicle parking area is recommended over placing fill in an intertidal area because it will minimize impacts to aquatic plant and animal life found in intertidal area. Steel and concrete pilings last long, have a great load capacity, and require minimal maintenance. These benefits may help offset the high initial cost of installing pilings.

We recommend that if blasting is required, an approved blasting plan be implemented to minimize disturbance to fish, seabirds, bald eagles, and marine mammals.

To minimize the impacts of dredging, we recommend that:

a. Techniques be used to minimize impacts to water quality during dredging operations in order to reduce impacts to local fish and wildlife populations. These techniques should be coordinated with Alaska Department of Fish and Game (ADF&G), and National Marine Fisheries Service (NMFS). Acceptable levels of sediment and turbidity should be determined pre-expansion and monitored during expansion to ensure specified threshold levels are not exceeded.

b. To the extent practicable and following consultation with NMFS and ADF&G, dredged material should be discharged below the water surface to minimize the spreading of suspended particles near the surface.

Rectifying Impacts

Harbor expansion activities would present the potential problem of introducing increased levels of petroleum hydrocarbons and other contaminants into the marine ecosystem through vessel moorings and operation and increased opportunities for fuel spills and other accidents. Impacts of such occurrences may be reduced by providing absorbent booms at dockside, with instructions, to immediately contain spills and remove oil. Those supplies could be monitored and replenished as necessary.

Use of the harbor by commercial and recreational users would be expected to result in increased accumulation of trash, including potentially hazardous plastic waste, (fishing line, bags, beverage holders, etc.), batteries, and metal debris (engine blocks, sewage pipe, etc.). Such impacts are best reduced by providing easily accessible trash receptacles. We suggest that dock carts for hauling trash should be provided as a courtesy to encourage proper disposal of trash at designated receptacles. Regular collection to keep trash receptacles from overflowing is important.

Discharge of holding tank wastewater is likely, and would increase suspended solids and nutrient loads in the water column, both of which will reduce light transmission. To reduce this impact, convenient pump-out facilities for waste holding tanks should be provided. If restroom facilities are provided, use of on-board heads, and the subsequent discharge of wastes, may be reduced.

It is also conceivable that some species could benefit from breakwater construction and colonization by algae.

Compensating for Impacts

The most desirable form of compensation mitigation is on-site and in-kind, followed by off-site, in-kind. Out-of-kind compensation should also be considered first at the site of impact before looking for off-site opportunities.

On-site, in-kind. The top foot of sediment should be stored for the shortest time possible, and kept wet with saltwater, to retain as much viability as possible. The material should not, however, be deposited in an intertidal area, as this would disturb additional habitat. We recommend that the sediments be held on a barge, and covered with tarps to retain moisture. If storage time exceeds a few days, it may be necessary to wet the sediment with pumped saltwater. To minimize storage time, the sediment should not be dredged until materials and equipment are ready for immediate construction of the breakwater.

The salvaged sediment should be deposited within the harbor basin, immediately upon completion of dredging or placement of riprap, from 0 to -3 meters. This should help ensure that the available sediments are not spread too thin outside place of origin, to compensate for the interim loss of habitat, and long-term losses to shading and physical impact within the harbor basin.

Off-site, in-kind Opportunities for off-site, in-kind mitigation (i.e., providing habitats similar to that impacted, away from the project site) appear to be limited. We know of no such opportunities outside of the project area.

There is, however, some non-hazardous debris (e.g. discarded engine block, and nonfunctional sewage outfall pipe) scattered along the shoreline, as discussed above, under "Rectifying Impacts". Removal of such debris in Haines small boat harbor and along the Portage Cove shoreline is an excellent form of in-kind, compensatory mitigation.

On-site, out-of-kind Opportunities to improve conditions in the small boat harbor for species other than those affected may exist, but are not recommended at this time.

Off-site, out-of-kind Removal of toxic or otherwise hazardous debris would eliminate contaminant sources and help in the restoration of natural habitats. Disturbance of such debris and sediments could result in mobilization of contaminants, so this must be undertaken with care. Removal of toxic or hazardous materials has been dropped from further consideration for this project. Off-site, out-of-kind mitigation in the Sawmill Creek watershed, as stated in the Mitigation Plan Opportunities section, is recommended.

MITIGATION PLAN OPPORTUNITIES

Despite efforts to avoid or minimize impacts to coastal resources, there may be substantial impacts that are unavoidable and must be compensated. If an alternative other than the No-Action Alternative is selected, the Corps, Service, NMFS, and ADF&G will need to develop and approve a mitigation plan to be incorporated into the project to mitigate losses to fish and wildlife resources and the habitats on which they depend. This mitigation plan should be approved in writing before expansion activities begin.

The nearshore habitat is used by anadromous salmon as feeding and rearing habitat and as a migration corridor. The harbor expansion project should provide breaches or piers to pass fish through the harbor. Migration through the harbor will likely cause potential impacts to salmon such as chronic water quality degradations resulting from harbor operation, vessel, and float related obstructions.

Harbor expansion plans may have adverse effects on the genus *Leptasterias* and other organisms in the proposed harbor expansion area because of the addition of fill into marine waters, and the need for dredging of bottom sediments. Harbors are also a concentrated source of pollutants. Although the six-armed star has no commercial value, it still serves an important role in the marine ecosystem, and it appears conditions at the described sites are optimum for this species. A possible form of compensatory mitigation for this proposed project might include funds to continue the genetic research that has been started for this species to better understand its distribution and biology in southeast Alaska.

The Corps could fund a study to assess the effectiveness of post-construction recolonization of breakwaters. This would allow the resource agencies to better assess the function of certain construction materials as suitable replacement habitats for mitigation purposes.

The community of Haines could develop and implement a waste oil recovery system at a site near the harbor. The waste oil could be burned with other oil collected within the community. This program would decrease the likelihood that vessel owners would discard waste oil into the marine environment.

The community of Haines could develop and implement a plastic/nylon mesh recovery system. Under this program, mesh nets would be periodically removed from nearby beaches through organized efforts. Removal of these materials would decrease the risk of bird or marine mammal entanglement.

The Corps could install eye bolts at entrance channels and breaches for rapid attachment of spill containment booms.

The Sawmill Creek watershed is the primary city drainage and flood control waterway for Haines. It is also a catalogued anadromous fish stream (ADF&G, 1983) that contains waterfowl and terrestrial mammal habitat. Its subsidiary ponds, tributaries, and depressions are the major drainage outflow system and flood plain for the western portion of the city. The Sawmill Creek area is identified on the City of Haines Flood Plain and Hazards Map. Development in close proximity to the Sawmill Creek wetlands has been ongoing for many years. Historically, spawning coho, cutthroat, and Dolly Varden have used the upper reaches of the stream. Currently it is used as rearing habitat by these species. In recent years, spawning has been eliminated because of barriers introduced by drainage ditch realignment and culvert installation.

Several nesting sites for blue heron have been identified, and several secluded ponds are used as a blue heron rookery. Marsh hawks, and a variety of duck species use these secluded ponds for feeding, mating, and nesting. Bald eagles also use these ponds and associated habitat for feeding and perching. Terrestrial mammals, mainly moose and muskrats, utilize these ponds as well.

To mitigate for the impacts to salmon and other aquatic species, we recommend that Sawmill Creek be restored to benefit salmon habitat by improving spawning and rearing habitat in the watershed. We recommend the replacement of several culverts, creation of splash pools, and stream bank revegetation to correct drainage, fish passage, and habitat deficiencies. In addition to the specific physical corrective mitigation measures identified below, we recommend streamside management prescriptions which include a minimum 50 foot wide riparian (streamside) management zone along Sawmill Creek for the purpose of maintaining water quality, protecting fish habitat, and controlling flood discharges. Purchasing conservation easements on private property along Sawmill Creek would be beneficial to the protection and improvement of anadromous fish habitat. Improvements to Sawmill Creek and related wetlands would serve to beautify the core of the city while expanding pond productivity and fish and wildlife habitat.

Recommended Off-site, Out-of-kind Mitigation:

1. Replace the culvert that traverses Union Street and 6th Avenue (#1, Figure 9). The action would include the replacement of the existing culvert with culvert(s) of sufficient diameter to handle peak flows, regrading to allow for daylighting cascading pools with a 2% grade, and ditching next to the road to control runoff (Figures 10 and 11).

2. Replace culvert at the Haines Highway/Eagle Nest Motel (#2, Figure 9) and conduct stream bank revegetation (willows, alders, shrubs and grasses) and trash removal activities (Figures 12, 13, 14, and 15).

3. Replace perched culverts at Comstock Road (#3 and #4, Figure 9) and create stepping pools.

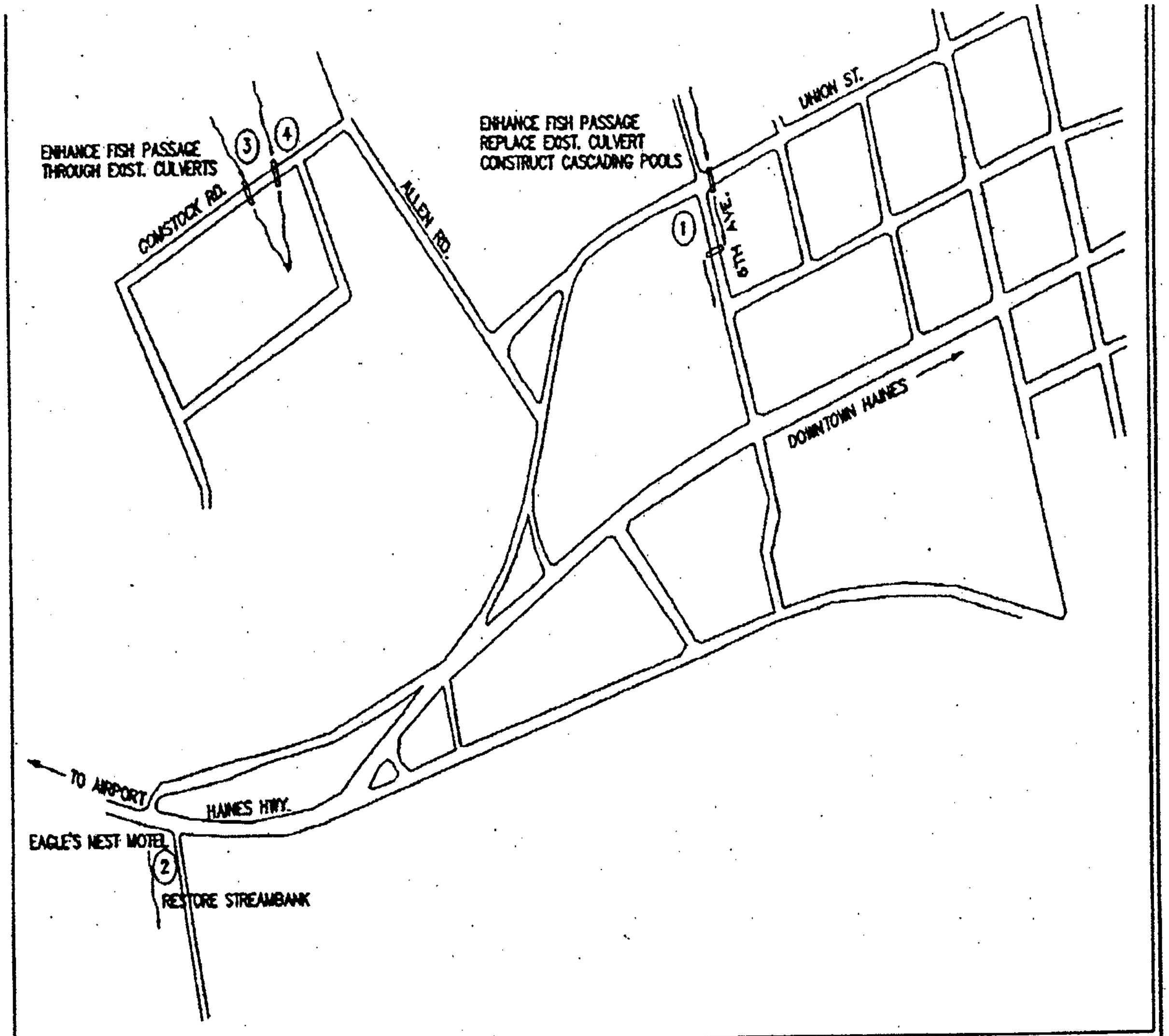

Figure 9. Mitigation Plan Opportunities Map

Figure 10. Union Street Culvert

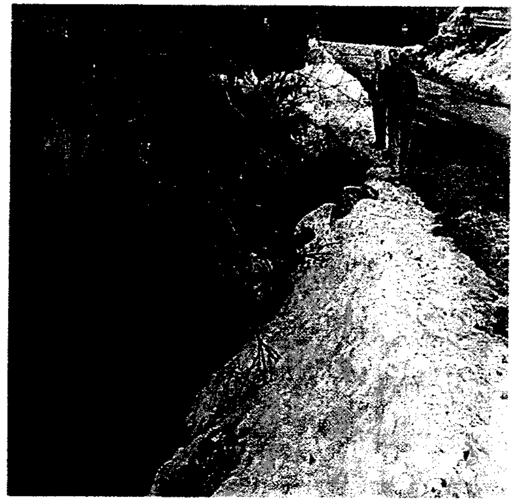

Figure 11. 6th Avenue Culvert

Figure 12. Culverts near Haines Highway/Eagle Nest Motel

Figure 13. Culverts at Haines Highway/Eagle Nest Motel

Figure 14. Streambank Below Haines Highway/Eagle Nest Motel

Figure 15. Streambank below Haines Highway/Eagle Nest Motel

ENVIRONMENTALLY PREFERRED PLAN

The Service does not have a preference regarding proposed harbor designs providing the following conditions are met:

1. Provide for fish passage (openings for nearshore fish passage - breaches in breakwaters or bridge/pier design).

2. Minimize impact to sea bottom biota by reducing the volume of dredge material deposition.

3. Minimize size of footprint of intertidal fill. Harbor house, equipment storage facility and vehicle parking area are not water dependent. It appears that practicable upland alternatives that do not involve placement of fill in intertidal zone could be obtained, utilized, expanded, and managed to provide an area for vehicle parking, harbor house, and equipment storage facility. Alternatives to no discharge of fill into intertidal is preferred. Impact on the intertidal ecosystem would be reduced.

In addition to the mitigation recommended above, the following elements should be incorporated into any selected alternative, to minimize impacts:

- Elimination or minimization of dredging required for a mooring basin;
- Minimize size of rubble-mound breakwater where floating breakwaters are not feasible;
- Convenient holding tank pump-out, restroom, and garbage collection facilities;
- Oil spill containment materials stored at dockside for immediate deployment when necessary;
- Removal of manufactured debris and abandoned pipe from the intertidal zone throughout the Haines Harbor area;
- No maintenance grid or fueling station.

We suggest the City of Haines complete harbor dredging in Portage Cove before building a new harbor. This will allow mooring space for several pleasure craft, commercial and charter fishing vessels in a protected harbor. The harbor expansion project will also provide:

- Reduced "hot berthing";

- Protection against vessel damage and losses caused by overcrowding;
- Reduced float maintenance;
- Increased recreation benefits.

We trust that our comments will assist you in developing a harbor system in Haines that meets the needs of harbor users and minimizes adverse affects on fish and wildlife resources. We appreciate the opportunity to provide these comments, and will remain available to assist in the evaluation of additional alternatives, or further development of a mitigation plan, if desired.

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Appendix A.

Table 1: Aquatic species observed along an underwater transect (0-100 meters; see Table 2 & 3 for 100-300m) at Haines Harbor South, June 21, 2000, Haines, Alaska.

Aquatic Plants Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Substrate*	b	b	b	b/c	b	b	b	b	b	b	b	b	s	s	s	s	s	s	s/sl	sl	sl
Laminaria saccharina sugar kelp	x																				
Fucus gardneri rockweed		x	x	x	x	x	x	x	x			x									
Neorhodomela larix black pine									x	x	x										
Cladophora sericea graceful green hair									x	x			x								
Ulva/Monostroma spp sea lettuce										x	x	x	x	x							
Enteromorpha linza green string lettuce										x											
Phylum Phaeophyta unid brown algae												x	x	x	x	x	x	x	x	x	x
Alaria marginata ribbon kelp												x									
Palmeria mollis red ribbon																			x		
Aquatic Invertebrates Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Balanus glandula common acorn barnacle	x	x	x	x	x	x	x	x	x	x	x	x	x	x					x		
Mytilus trossulus blue mussel			x	x	x	x		x	x	x	x	x									
Macoma balthica Baltic macoma					x	x															
Littorina sitkana Sitka periwinkle										x	x	x									
Pagurus spp hermit crab												x	x								

Appendix A.
(Table 1 Continued)

Fish Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Family Pleuronectidae unid.sole																			x		
Pholis laeta crescent gunnel													x								

* b = boulder, c = cobble, s = sand, sl = silt

Appendix A.

Table 2: Aquatic Plant and Invertebrate Species Observed an Along Underwater Transect (105-200 meters; see also Tables 1 & 3) at Haines Harbor South, June 21, 2000, Haines, Alaska.

Aquatic Plants Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Substrate*		sl	sl	sl	sl	sl	sl	sl/s	sl/s	sl	sl	sl	sl	sl	sl	sl	sl	sl	sl	sl	sl
Polysiphonia pacifica Polly Pacific			x																x		
Laminaria saccharina sugar kelp					x	x		x					x	x	x	x	x				
Phylum Phaeophyta unid brown epiphyte								x						x							
Agarum clathratum sieve kelp														x					x		
Constantinea rosa-marina cup and saucer															x						
Lithothamnion spp rock crust																		x			
Aquatic Invertebrates Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Fusitriton oregonensis Oregon triton			x														x				
Balanus glandula common acorn barnacle					x	x		x			x	x	x	x	x	x	x				
Leptasterias epichlora six-armed star					x	x		x	x	x			x	x		x	x	x		x	x
Laminaria saccharina sugar kelp					x	x		x					x	x	x	x	x				
Hyas lyratus lire crab											x										
Class Gastropoda unid. snail															x	x	x	x	x		
Tonicella lineata lined chiton															x			x			
Strongylocentrotus droebachiensis green sea urchin																x					
Flabellina verrucosa red fingered aeolis																x					
Eupentacta pseudoquinquesemita false white sea cucmber																	x				

Appendix A.
(Table 2 Continued)

Pagurus spp hermit crab																		x			
Lithothamnion spp rock crust																		x			

* sl = silt, s = sand

Appendix A.

Table 3: Fish Observed Along an Underwater Transect (105-200 meters; see also Tables 1 & 2) at Haines Harbor South, June 21, 2000, Haines, Alaska.

Fish Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Family Pleuronectidae unid.sole			x		x						x	x					x				
Lumpenus sagitta snake prickleback						x			x		x	x									
Pholis laeta crescent gunnel													x								
Limanda aspera yellowfin sole														x							

Appendix A.

Table 4: Aquatic plants observed along an underwater transect (also see Table 5) at Haines Harbor Breakwater, June 21, 2000, Haines, Alaska.

Aquatic Plants **Scientific Name** **Common Name**	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Substrate*	b	b	b	c	c	c	c	b	b	sl/p	sl	p	sl	sl	sl	b/sl	sl	sl	sl	sl	sl
Fucus gardneri rockweed	x	x																			
Cladophora sericea graceful green hair		x	x	x	x												x				
Desmarestia aculeata witch's hair		x	x	x																	
Ulva/Monostroma spp sea lettuce		x		x			x														
Acrosiphonia arcta Arctic sea moss		x																			
Hallosaccion glandiforme sea sacs		x																			
Palmeria callophylloides frilly red ribbon			x	x	x																
Laminaria bongardiana split kelp			x																		
Alaria marginata ribbon kelp			x																		
Constantinea rosa-marina cup and saucer				x	x	x	x	x	x	x		x		x		x	x		x		x
Laminaria saccharina sugar kelp				x	x	x	x	x	x		x	x	x	x	x	x	x	x	x		
Lithothamnion phymatodeum rock crust				x				x	x		x	x		x	x	x					x
Palmeria mollis red ribbon						x	x		x			x		x	x				x	x	x

Appendix A.
(Table 4 Continued)

Euthora cristata delicate northern sea fan						x	x				x	x		x							
Agarum clathratum sieve kelp								x	x	x	x	x		x	x	x			x	x	x

* b = boulder, c = cobble, sl = silt, p = pebble

Appendix A.

Table 5: Aquatic Invertebrate and Fish Species Observed Along an Underwater Transect (also see Table 4) at Haines Harbor Breakwater, June 21, 2000, Haines, Alaska.

Aquatic Invertebrates Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Balanus glandula common acorn barnacle	x	x	x	x	x	x	x	x		x		x	x	x	x						
Littorina sitkana Sitka periwinkle	x	x			x																
Family Lottiidae limpet		x						x													
Mytilus trossulus blue mussel		x	x	x																	
Microporina spp jointed bryozoan			x																		
Leptasterias epichlora six-armed sea star				x				x	x	x	x	x	x	x	x	x	x	x	x	x	x
Strongylocentrotus drnebachiensis green sea urchin				x				x	x	x	x	x	x			x					
Pagurus spp hermit crab						x															
Calliostoma spp topsnail								x	x	x	x	x									x
Ascidia paratropa warty sea bottle								x		x	x		x	x	x			x	x	x	
Tonicella lineata lined chiton									x	x						x					x
Elassochirus tenuimanus widehand hermit										x											
Cucumaria miniata orange sea cucumber																				x	
Dirona aurantia golden dirona																x					
Fish Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Myoxocephalus spp sculpin						x		x													x
Scytalina cerdale gravel diver								x						x							x

Appendix A.
(Table 5 Continued)

Lepidopsetta bilineata rock sole														x	x	x					
Limanda aspera yellowfin sole																				x	

Appendix A.

Table 6: Aquatic Species Observed Along an Underwater Transect (0-100 meters; see Table 7) at Haines Harbor North I, June 22, 2000, Haines, Alaska

Aquatic Plants Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Substrate*	b/c	c/b	c/p	c	s/p	p/s	b/c	c/b	b/c	c	s/c	s/b	s/c	s/b	b/s	s/c	s	s/b	s/b	s/b	s/b
Carex sitchensis Sitka sedge	x																				
Poa macrocalyx blue grass	x																				
Glaux maritima sea milk-wort		x																			
Fucus gardneri rockweed				x	x	x	x	x	x	x	x	x	x	x	x		x	x	x		
Entermorpha intestinalis sea hair				x	x	x	x							x							
Phylum Phaeophyta unid. brown				x	x	x															
Ulva/Monostroma spp sea lettuce					x				x				x	x		x		x	x	x	x
Polysiphonia pacifica Polly Pacific						x															
Hallosaccion glandiforme sea sacs															x						
Alaria marginata ribbon kelp																x		x	x	x	x
Cladophora sericea graceful green hair																		x	x	x	x
Phylum Rhodophyta unid. red alga																		x			
Aquatic Invertebrates Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Balanus glandula common acorn barnacle				x	x	x	x	x	x	x	x	x	x		x	x		x	x	x	x

Appendix A.
Table 6 (Continued)

Mytilus trossulus blue mussel				x	x	x	x	x	x	x		x	x	x	x	x					
Littorina sitkana Sitka periwinkle					x	x	x	x	x		x	x	x								
Margarites pupillus puppet margarite							x	x	x				x					x			

* b = boulder, c = cobble, p = pebble, s = sand

Appendix A.

Table 7: Aquatic species observed along an underwater transect (105-200 meters; see Table 6) at Haines Harbor North I, June 22, 2000.

Aquatic Plants Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Substrate*		s/b	s	s	s	s	s	s	s	s	s	s/b	c/sl	b/sl	sl	sl	sl	sl	sl	sl	sl
Cladophora sericea graceful green hair		x										x	x	x		x					
Ulva/Monostroma spp sea lettuce		x									x										
Alaria marginata ribbon kelp		x																			
Laminaria saccharina sugar kelp												x	x	x	x			x	x	x	x
Desmarestia aculeata witch's hair												x	x	x	x		x	x			
Aquatic Invertebrates Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Balanus glandula common acorn barnacle		x	x	x								x	x	x	x					x	
Mytilus trossulus blue mussel		x											x	x	x						
Anthopleura artemisia burrowing green anemone		x																			
Leptasterias epichlora six-armed sea star																			x		
Fish Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200

Appendix A.
Table 7 (Continued)

Lumpenus sagitta snake prickleback							x														
Family Cottidae sculpin																		x			

* s = sand, b = boulder, c = cobble, sl = silt

Appendix A.

Table 8: Aquatic Species Observed Along an Underwater Transect (0-100 meters; see Table 9) at Haines Harbor North II, June 21, 2000, Haines, Alaska.

Aquatic Plants Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Substrate*	c/p	c	c	s/b	c/p	s/c	s/b	s/b	s/b	b	b/s	s	c/sl	b/c	b/c	b	b	b	b	b	b/s
Elymus mollis dune wildrye		x																			
Fucus gardneri rockweed						x	x	x	x	x	x		x	x	x	x	x	x	x	x	x
Enteromorpha intestinalis sea hair						x		x	x		x	x				x					x
Phylum Phaeophyta unid. brown algae						x	x		x		x										
Cladophora sericea graceful green hair						x	x	x													
Desmarestia aculeata witch's hair								x									x		x		
Alaria marginata ribbon kelp										x											
Ulva/Monostroma spp sea lettuce																				x	x
Neorhodomela larix black pine																				x	
Aquatic Invertebrates Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Macoma balthica Baltic macoma			x		x		x														
Balanus glandula common acorn barnacle						x	x	x	x	x	x		x	x	x	x	x	x		x	x
Mytilus trossulus blue mussel										x	x		x	x	x	x	x	x	x	x	x
Littorina sitkana Sitka periwinkle											x		x	x	x	x	x	x	x	x	

Appendix A.
Table 8 (Continued)

Margarites pupillus puppet margarite													x	x	x	x					
Order Patellogastropoda unid. limpet																	x	x	x	x	

* c = cobble, p = pebble, s = sand, b = boulder, sl = silt

Appendix A.

Table 9: Aquatic species observed along an underwater transect (105-200 meters; see also Table 8) at Haines Harbor North II..

Aquatic Plants Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Substrate*		b/s	s/b	s	s/b	s/b	s	s	s	s/sl	m/sl	m/b	m	m	s/sl	s	sl/c	sl/c	s/c	s/c	s
Alaria marginata ribbon kelp		x	x						x												
Polysiphonia pacifica Polly Pacific		x	x																		
Ulva/Monostroma spp sea lettuce			x		x	x					x	x			x	x	x	x	x	x	x
Laminaria saccharina sugar kelp			x		x	x					x	x			x	x	x	x		x	x
Palmaria mollis red ribbon			x																	x	
Cladophora sericea graceful green hair										x	x	x	x	x	x	x	x	x		x	
Zostera marina eelgrass										x	x										
Fucus gardneri rockweed											x							x			
Desmarestia aculeata witch's hair												x					x	x	x	x	x
Neoptilota asplenioides red sea fern																	x				
Aquatic Invertebrates Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Balanus glandula common acorn barnacle		x	x	x	x	x				x	x	x			x	x	x	x	x	x	x
Mytilus trossulus blue mussel		x	x	x	x	x				x	x	x					x	x	x	x	x
Anthopleura artemisia burrowing green anemone		x																x			
Lacuna variegata variegated lacuna		x																	x		
Pagurus spp hermit crab					x													x			
Idotea wosnesenskii rockweed isopod											x										
Leptasterias epichlora six-armed sea star																	x				

Appendix A.
(Table 9 Continued)

Fish Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Family Pleuronectidae unid. sole				x		x	x									x					
Hexagrammos decagrammus kelp greenling																		x			

* b = boulder, s = sand, sl = silt, m = mud, c = cobble

Appendix A.

Table 10: Species Observed Along South Intertidal Transect (0-100 meters; see Table 11), June 20, 2000, Haines, Alaska.

Aquatic Plants Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Substrate*	s	s	c/s	s/b	s/c	b/s	s	s	s/b	c/b	b	b	b	s	s	s	b/s	s	s/b	s	b
Elymus mollis dune wildrye	x																				
Enteromorpha intestinalis sea hair			x	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	
Glaux maritima sea milk-wort			x																		
Honkenya peploides seabeach sandwort			x																		
Plantago maritima goose tongue			x																		
Poa macrocalyx blue grass			x																		
Fucus gardneri rockweed						x	x	x		x	x	x	x	x	x	x	x		x	x	x
Cladophora sericea graceful green hair							x	x													
Order Cladophorales unid. green alga														x							
Neorhodomela larix black pine															x		x			x	
Aquatic Invertebrates Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Order Amphipoda Unid. amphipods	x	x					x			x	x	x		x							
Balanus glandula common acorn barnacle					x	x		x	x	x	x	x		x		x	x	x	x	x	
Macoma spp clam					x											x	x				
Littorina sitkana Sitka periwinkle									x	x	x	x	x		x	x	x		x	x	x
Pagurus spp hermit crab												x	x								
Mytilus trossulus blue mussel													x			x	x		x	x	x
Macoma balthica Baltic macoma														x			x		x		

Appendix A.
(Table 10 Continued)

1																					
Fish Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Oligocottus maculosus tidepool sculpin																	x			x	

* s = sand, c = cobble, b = boulder

Appendix A.

Table 11: Species Observed Along South Intertidal Transect (105-145 meters; see Table 10), June 20, 2000, Haines, Alaska.

Aquatic Plants **Scientific Name** **Common Name**	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Substrate*	b	b	b	b	b	b	b	s/b	b											
Fucus gardneri rockweed	x	x	x	x	x	x	x	x												
Palmeria hecatensis stiff red ribbon					x															
Entermorpha linza green string lettuce						x	x	x												
Entermorpha intestinalis sea hair						x	x													
Laminaria saccharina sugar kelp						x		x												
Neorhodomela larix black pine							x	x												
Hallosaccion glandiforme sea sacs								x												
Aquatic Invertebrates **Scientific Name** **Common Name**	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Balanus glandula common acorn barnacle	x	x	x	x	x	x	x	x												
Mytilus trossulus blue mussel	x	x	x	x	x	x	x	x												
Littorina sitkana Sitka periwinkle	x	x	x	x	x	x														
Order Amphipoda Unid. amphipods	x		x	x	x															

* b = boulder, s = sand

Table 12: Species Observed Along Middle Intertidal Transect (0-100 meters; see Table 13), June 20, 2000, Haines, Alaska.

Aquatic Plants **Scientific Name** **Common Name**	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Substrate*	c/p	s/p	s	p/s	s/p	s/b	b/c	b/s	s/c	s	s/c	s/c	s/c	s/c	b/s	b/s	b/s	b/p	b	b/p	p/b
Elymus mollis dune wildrye		x	x	x																	
Entermorpha intestinalis sea hair							x	x	x				x	x	x	x				x	
Fucus gardneri rockweed								x	x		x		x	x	x	x	x	x	x	x	
Entermorpha linza green string lettuce									x			x			x	x					x
Alaria marginata ribbon kelp									x			x									
Desmarestia aculeata witch's hair												x									x
Cladophora sericea graceful green hair													x								
Order Ectocarpales Unid. brown alga																		x			
Aquatic Invertebrates **Scientific Name** **Common Name**	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Mytilus trossulus blue mussel								x	x		x	x	x	x	x	x	x		x	x	x
Balanus glandula common acorn barnacle								x							x	x	x	x	x	x	
Macoma spp clam										x				x	x						

Appendix A.
(Table 12 Continued)

Littorina sitkana Sitka periwinkle															x	x	x	x	x	x	x
Margarites pupillus puppet margarite															x	x	x	x	x	x	x
Maera danae pink beach hopper																	x				

* c = cobble, p = pebble, s = sand, b = boulder

Appendix A.

Table 13: Species Observed Along Middle Intertidal Transect (105-150 meters; see Table 12), June 20, 2000, Haines, Alaska.

Aquatic Plants **Scientific name** **common name**		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Substrate*		b/c	b/c	b/c	b	b/c	b/c	b/c	b	b	b/s										
Fucus gardneri rockweed		x	x	x	x	x	x	x	x	x	x										
Neorhodomela larix black pine		x																			
Hallosaccion glandiforme sea sacs								x		x	x										
Alaria marginata ribbon kelp									x	x	x										
Entermorpha linza green string lettuce									x	x	x										
Luminaria saccharina sugar kelp									x												
Leathesia difformis sea cauliflower									x												
Desmarestia liguta flattened acid kelp											x										
Aquatic Invertebrates **Scientific name** **common name**		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Balanus glandula common acorn barnacle		x	x	x	x	x	x	x	x	x	x										
Littorina sitkana Sitka periwinkle		x	x	x	x	x	x	x	x	x	x										

Appendix A.
(Table 13 Continued)

Mytilus trossulus blue mussel		x	x	x	x	x	x	x	x	x	x										
Margarites pupillus puppet margarite		x	x	x	x	x	x	x	x	x											

* b = boulder, c = cobble, s = sand

Appendix A.
(Table 13 Continued)

Mytilus trossulus blue mussel		x	x	x	x	x	x	x	x	x	x										
Margarites pupillus puppet margarite		x	x	x	x	x	x	x	x	x											

* b = boulder, c = cobble, s = sand

Appendix A.

Table 14: Species Observed Along North Intertidal Transect (0-100 meters; see Table 15), June 20, 2000, Haines, Alaska.

Aquatic Plants Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Substrate*	s	g	c	b	c/s	c/s	s/c	b/c	s/c	s	s	s	s	s	s	b/p	c/p	b/c	c	b/c	b
Elymus mollis dune wildrye			x																		
Enteromorpha linza green string lettuce				x	x	x	x	x	x	x				x		x					
Order Cladophorales Unid. green algae					x			x								x	x	x			
Glaux maritima sea milk-wort					x																
Fucus gardneri rockweed						x	x	x	x					x	x	x	x	x	x	x	x
Poa macrocalyx blue grass							x														
Cladophora sericea graceful green hair									x	x	x	x	x	x	x	x	x		x		
Zostera marina eelgrass														x		x					
Leathesia difformis sea cauliflower																		x			
Aquatic Invertebrates Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Mytilus trossulus blue mussel					x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Balanus glandula common acorn barnacle						x	x	x	x					x		x	x	x	x	x	x
Littorina sitkana Sitka periwinkle														x	x	x	x	x	x	x	x
Familly Lottiidae Limpet															x						
Pagurus spp hermit crab															x						
Fish Scientific Name Common Name	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

Appendix A.
(Table 14 Continued)

Genus *Oncorhynchus* salmon smolts										x	x	x	x	x	x	x	x	x	x		
Family Pleuronectidae righteye flounders													x								
Oligocottus maculosus tidepool sculpin													x								

* s = sand, g = gravel, c = cobble, b = boulder, p = pebble

Appendix A.

Table 15: Species Observed Along North Intertidal Transect (105-150 meters; see Table 14), June 20, 2000, Haines, Alaska.

Aquatic Plants Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Substrate*		b	c	c	c	b	b	b	b												
Fucus gardneri rockweed		x	x	x	x	x	x	x	x												
Desmarestia liguta flattened acid kelp				x	x	x															
Entermorpha linzu green string lettuce						x			x												
Leathesia difformis sea cauliflower						x															
Laminaria saccharina sugar kelp							x														
Alaria marginata ribbon kelp								x													
Aquatic Invertebrates Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Balanus glandula common acorn barnacle		x	x	x	x	x	x	x	x												
Littorina sitkana Sitka periwinkle		x	x	x	x	x	x	x	x												
Mytilus trossulus blue mussel		x	x	x	x	x	x	x	x												
Familly Lottiidae Limpet						x		x													

Appendix A.
(Table 15 Continued)

Fish Scientific Name Common Name		105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200
Oligocottus maculosus tidepool sculpin						x															

* b = boulder, c = cobble

Appendix B.

Figure 1. Depth profile along Haines Harbor South transect (relative to Mean High Water).

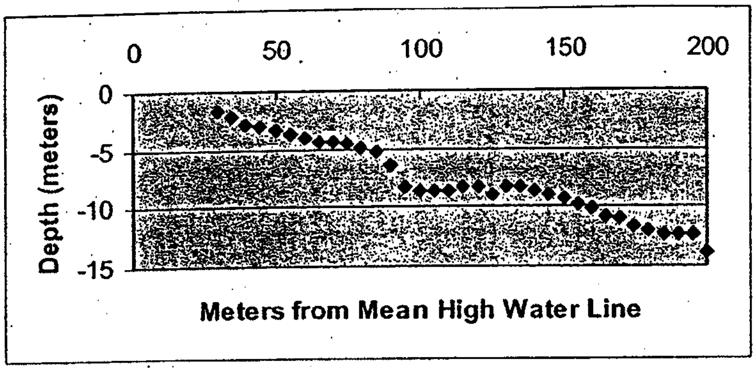
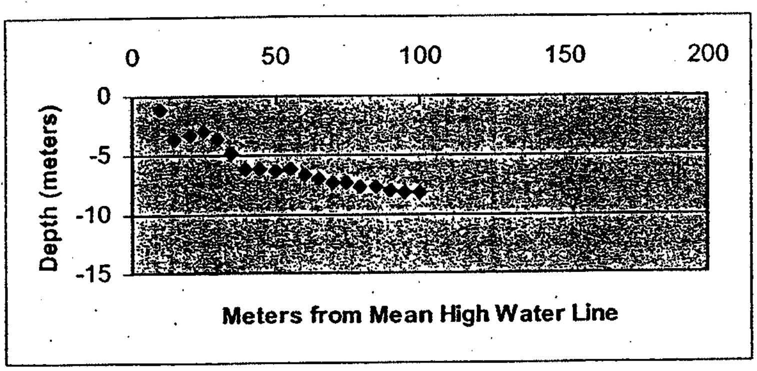


Figure 2 . Depth profile along Haines Harbor Breakwater transect.



Appendix B (Continued)

Figure 3. Depth profile along Haines Harbor North transect.

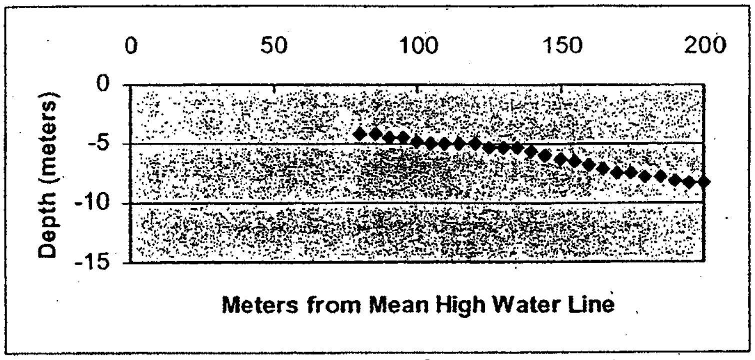


Figure 4. Depth profile along Haines Harbor North II transect.