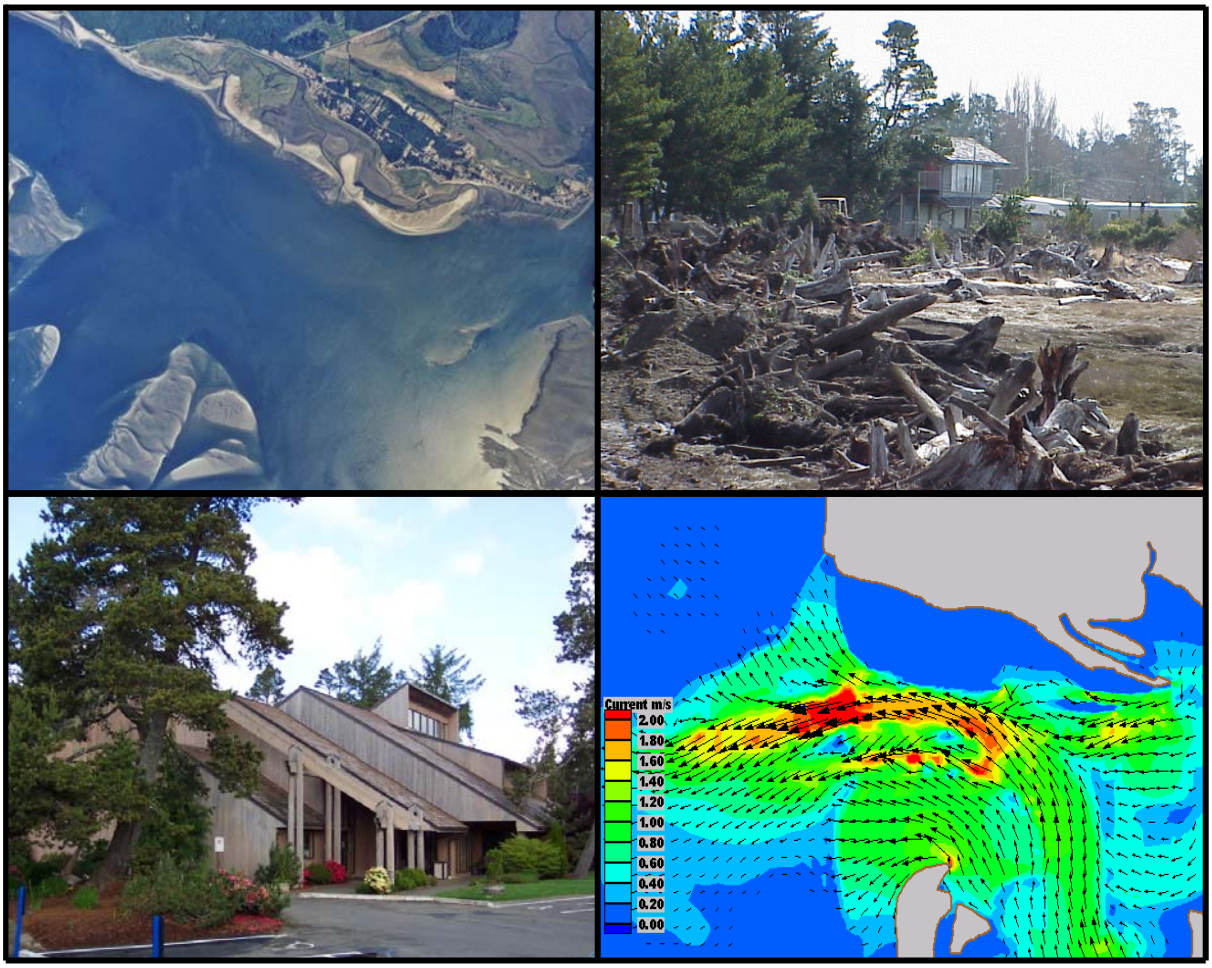
## FINAL ENVIRONMENTAL ASSESSMENT

# Shoalwater Bay Shoreline Erosion, Washington
# Pacific County, Washington

## FLOOD AND COASTAL STORM DAMAGE REDUCTION

# Shoalwater Bay Indian Reservation




US Army Corps
of Engineers®
Seattle District

July 2009

# Shoalwater Bay Shoreline Erosion, Washington
# Final Environmental Assessment
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**Responsible Agency:** The responsible agency for this flood and coastal storm damage reduction project is the U.S. Army Corps of Engineers, Seattle District.


## Abstract:

This Environmental Assessment (EA) evaluates the environmental effects of the proposed Shoalwater Bay Shoreline Erosion Project. The project area is located on the north side of the entrance to Willapa Bay, a large estuarine system located on the southwest Pacific Ocean coast of the State of Washington, in Pacific County. The project will be located on and adjacent to the Shoalwater Bay Indian Tribe's Reservation on the northern edge of Willapa Bay, between Cape Shoalwater/Washaway Beach and Toke Point. The Reservation was created by an Executive Order in 1866; is approximately one mile square in size, and has 2/3 of its area specifically set aside as intertidal and subtidal lands to support the Tribe's subsistence shellfish harvesting and other fishery related activities.

The Shoalwater Reservation has a recent history of flooding and storm damage. On March 3, 1999, a combined storm and high tide caused severe flooding of the Shoalwater Reservation shoreline and surrounding community. The Reservation also experienced severe flooding and debris damage from winter storms in February 2006 and December 2007. The flooding is believed to be a direct result of erosion and breaching of the barrier dune on Graveyard Spit that fronts the Tokeland Peninsula. With continued coastal erosion, the limited wave protection currently afforded by the eroded barrier dune will continue to decrease, and flooding of the Shoalwater Reservation and adjoining lands will occur at increasingly frequent intervals. Based on erosion rates calculated between 2000 and 2008, the Corps estimates the annual loss of sand from the dune (above +6 feet MLLW) at about 50,000 cy per year.

The proposed project consists of the restoration of the deteriorated barrier dune system to protect the Shoalwater Reservation. The proposed project will not constitute a major Federal action significantly affecting the quality of the human environment.

This document is also available online at: http://www.nws.usace.army.mil/ers/doc_table.cfm

Seattle District posted the EA for public review and comment between January 24, 2007 and February 28, 2007. In the interim since that comment period, the project scope was reduced. In order to ensure appropriate public participation, the Corps posted a notice of intent to prepare the final EA with a preferred alternative of reduced scope for public review and comment between October 31, 2007 and November 30, 2007. Several agencies and individuals provided comments.

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# 1. INTRODUCTION

Pursuant to the National Environmental Policy Act (NEPA; 40 CFR § 1500 et. seq.), this Environmental Assessment (EA) evaluates the impacts of a proposed project that would protect the Shoalwater Bay Indian Reservation[1] (Shoalwater Reservation) from coastal erosion. The U.S. Army Corps of Engineers (Corps) has prepared this EA according to its NEPA-implementing regulation (ER 200-2-2) and the guidance presented in the Corps Planning Guidance Notebook (ER 1105-2-100). The preferred alternative would restore the barrier dune offshore of the Shoalwater Reservation to forestall further coastal erosion and protect the reservation from flooding caused by high storm tides and wave overtopping.

## 1.1. PROJECT LOCATION

The project area is located on the north side of the entrance to Willapa Bay, a large estuarine system located on the southwest Pacific Ocean coast in Pacific County, Washington (Figure 1). Willapa Bay's entrance to the Pacific Ocean is approximately 28 miles north of the mouth of the Columbia River and 17 miles south of the Grays Harbor entrance. The Shoalwater Reservation is located on the northern shore of Willapa Bay in northwestern Pacific County, Washington (Figure 2). The proposed Shoalwater Bay Shoreline Erosion Project is located on and adjacent to the Shoalwater Reservation.

## 1.2. BACKGROUND

The Shoalwater Reservation has a recent history of flooding and storm damage. On March 3, 1999, a combined storm and high tide caused severe flooding of the Shoalwater Reservation shoreline and surrounding community. The Reservation also experienced severe flooding and debris damage from winter storms in February 2006 and December 2007. The flooding is believed to be a direct result of the erosion and breaching of the barrier dune on Empire Spit that fronts the Tokeland Peninsula. With continued coastal erosion, the limited wave protection currently afforded by the eroded barrier dune will continue to decrease, and flooding of the Shoalwater Reservation and adjoining lands will occur at increasingly frequent intervals.

Willapa Bay is one of the largest inlets on the coast of the continental United States[2]. At the mean maximum tidal flow of 2.5 knots, the primary Willapa channel closest to the Shoalwater Reservation transports about 400,000 cubic feet per second, or about twice the average annual discharge rate of the Columbia River at The Dalles (Richey et al., 1966).

The massive tidal flow at the bay's entrance, combined with energetic waves, has created one of most actively eroding coasts in the United States. The northern shoreline of Willapa Bay to the west of the project area has changed drastically since the Shoalwater Reservation was established in 1866 (Terich and Levensellar, 1986). Over the last century, portions of the Cape Shoalwater shoreline have retreated more than three miles. By the 1990's, the Shoalwater

[1] The Shoalwater Reservation was created by an Executive Order in 1866. It is approximately one square mile in size, and has 2/3 of its area specifically set aside as intertidal and subtidal lands to support the Tribe's subsistence shellfish harvesting and other fishery related activities.

[2] The spring diurnal range tidal prism of Willapa Bay is more than 10 billion cubic feet (Jarrett 1976).

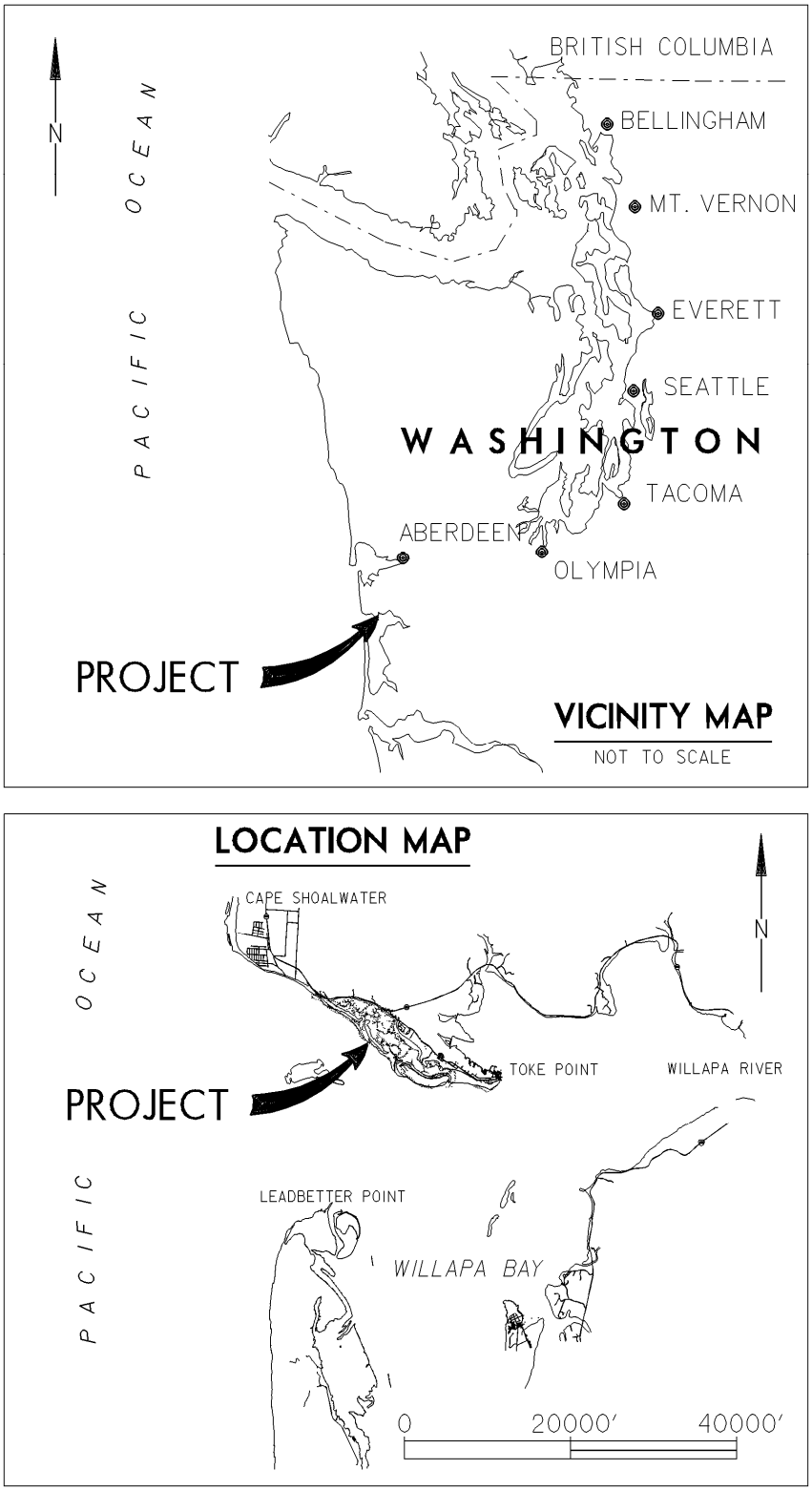



**Figure 1. Project vicinity and location maps.**

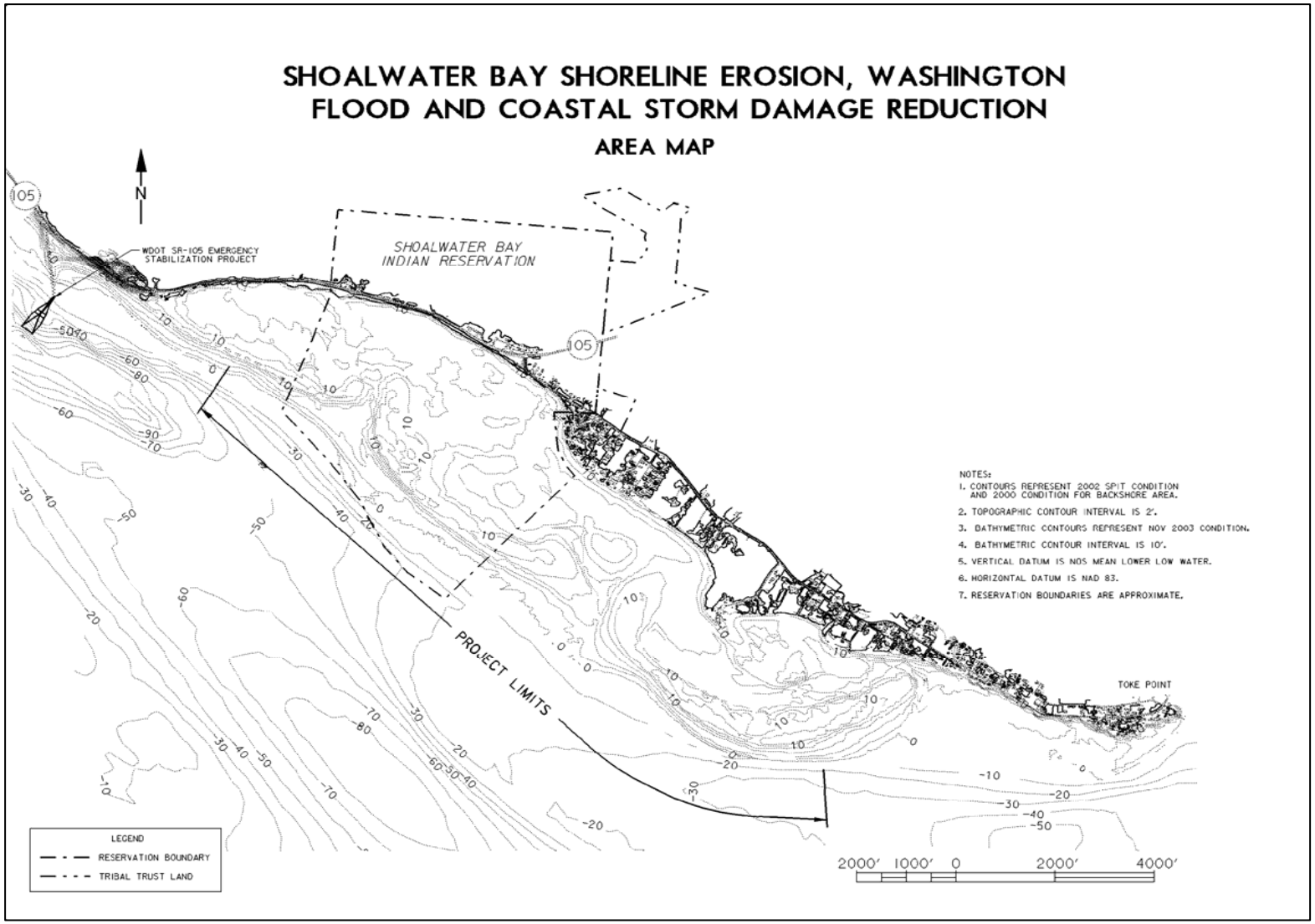



**Figure 2. Shoalwater Bay Tribe Reservation**

Reservation's only remaining protection from storm wave attack was a barrier dune that is located on Empire Spit and the islands fronting the Tokeland Peninsula. Tidal currents and storm waves continue to erode the dune (see Section 1.4.2), which consequently exposes the Tokeland Peninsula shoreline to increasing levels of flooding from wave overtopping during periods of high tides.

### 1.3. AUTHORITY

The Shoalwater Bay Shoreline Erosion Study was conducted in accordance with Section 545 of the Water Resources Development Act (WRDA) of 2000, Public Law 106-541, as amended by Section 5153 of WRDA 2007 (Public Law 110-114). Section 545 of WRDA 2000, as amended, authorized a study and authorized a project, subject to Secretarial approval, for coastal erosion protection and ecosystem restoration for the Tribal reservation of the Shoalwater Bay Indian Tribe. The complete text of Section 545 of WRDA 2000, as amended, is as follows:

> ***SEC. 545. WILLAPA BAY, WASHINGTON.***
>
> ***(a) STUDY. - The Secretary shall conduct a study to determine the feasibility of providing coastal erosion protection and ecosystem restoration for the tribal reservation of the Shoalwater Bay Tribe on Willapa Bay, Washington.***
>
> ***(b) PROJECT. -***
>
> ***(1) IN GENERAL. - Notwithstanding any other provision of law (including any requirement for economic justification), the Secretary shall construct and maintain a project to provide coastal erosion protection and ecosystem restoration for the tribal reservation of the Shoalwater Bay Tribe on Willapa Bay, Washington, at Federal expense, if the Secretary determines that the project -***
>
> ***(A) is a cost-effective means of providing erosion protection and ecosystem restoration;***
>
> ***(B) is environmentally acceptable and technically feasible; and***
>
> ***(C) will improve the economic and social conditions of the Shoalwater Bay Tribe.***
>
> ***(2) LANDS, EASEMENTS, AND RIGHTS-OF-WAY.- As a condition of the project, described in paragraph (1), the Shoalwater Bay Tribe shall provide lands, easements, rights-of-way, and dredged material disposal areas necessary for implementation of the project.***
>
> (NOTE: For purposes of this Act, the term Secretary means the Secretary of the Army)

This authorization was also amended by the FY 2002 Energy and Water Development Appropriations Act, Public Law 107-66. Title I, Construction General, provided "… That all studies for the project shall be cost shared in the same proportion as the construction implementation costs." (i.e., at 100 percent Federal cost).

## 1.4. PURPOSE AND NEED

### *1.4.1. Purpose*

The purpose of the project is to reduce coastal erosion and the resulting flooding and coastal storm damage to the Shoalwater Reservation and to the Shoalwater Bay Indian Tribe (Shoalwater Tribe) on Willapa Bay, Washington, in a manner that is cost-effective; environmentally acceptable and technically feasible; and that will improve the economic and social conditions of the Shoalwater Bay Tribe.[3] The Shoalwater Reservation includes a portion of the barrier dune along North Cove, intertidal areas in North Cove, and areas landward of the high tide line of North Cove.

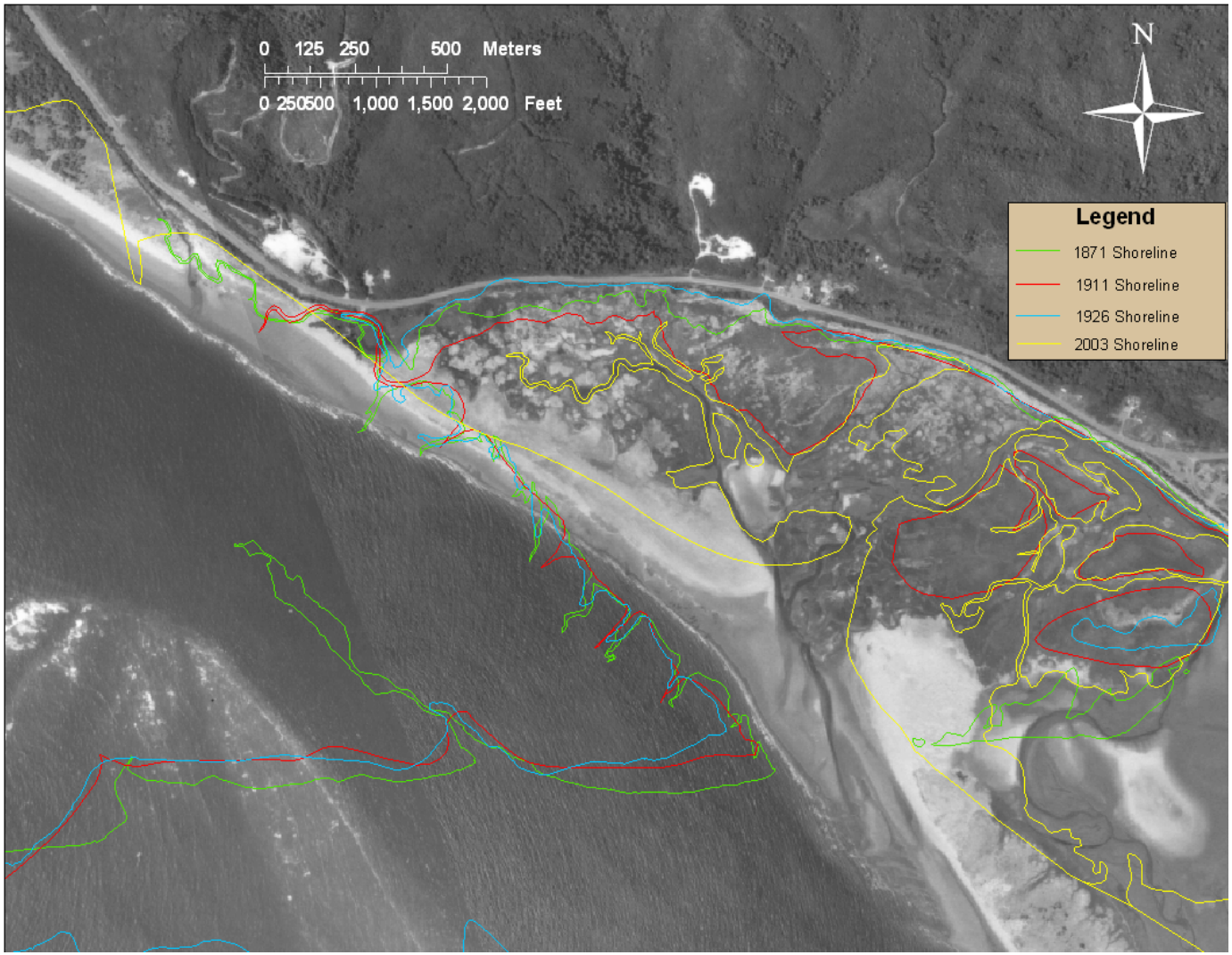
### *1.4.2. Need*

Historically, the Graveyard Spit and Empire Spit dune system protected the Shoalwater Reservation uplands from shoreline wave attack during extreme high tide storms. However, the barrier dune system in North Cove has eroded significantly (see Figure 3) and two breaches have developed through the barrier dune that comprises Empire Spit. The change in North Cove geomorphology between 1994 and 2003 is illustrated on Figure 4.

The Shoalwater Tribe is making significant investments in infrastructure and facilities to better serve the needs of its growing population. Tribal uplands, upon which development must take place, exist only as a narrow band of land along the shoreline, including State Route 105 which traverses the Reservation. Due to significantly diminished dune protection, the Shoalwater Reservation uplands, which total only 440 acres, are increasingly vulnerable to shoreline erosion and flooding associated with storm-generated ocean waves due to erosion of the barrier dune, particularly during periods of elevated water conditions. Erosion of the barrier dune also exposes the Shoalwater Reservation uplands to shoreline erosion due to storm overwash of the eroded dune and resultant wave run-up and overtopping of the low-lying Tribal uplands. Please see Figure 5 for a graphic that illustrates the extent of the flooding that can be expected during storm events during which the tide elevation exceeds approximately +13 feet mean lower low water (MLLW). What has until recently been only nuisance flooding (resulting in approximately one foot of water on roads, parking lots and yards) and deposition of logs and debris, is now predicted to be serious flooding with damage to Tribal facilities and potential for loss of life. With each winter storm, the eroded barrier dune offers diminishing wave protection to North Cove and the Shoalwater Reservation.

[3] Ecosystem restoration was not added as a project purpose until the original authorization contained in Section 545 of WRDA 2000 was amended by Section 5153 of WRDA 2007 on November 10, 2007. Due to the imminent danger to the continued existence of the Shoalwater Reservation from winter coastal storms, the current project purpose focuses on the component of the project authorization dealing with coastal erosion protection. There will be no irreversible commitment of resources in implementing the project for coastal erosion protection which would foreclose ecosystem restoration opportunities. Barrier dune restoration is, in fact, a prerequisite for consideration of ecosystem restoration opportunities in the Tribe's North Cove embayment. A separate effort will be conducted to formulate an ecosystem restoration plan, in accordance with applicable guidance and in compliance with relevant environmental laws and regulations.

In addition to the safety and flooding issues posed by erosion of the barrier dune, the productive subsistence shellfish growing and harvesting habitat of North Cove, representing 700 acres (61 percent) of the Shoalwater Reservation, is rapidly being lost to in-filling with sand due to storm waves overwashing the eroding barrier dune and depositing sand in the North Cove embayment. The degradation of the North Cove habitat also adversely affects the ability of the cove to support harvest of local native plant species traditionally used by Tribal members for Tribal crafts and for cultural and spiritual uses.




*Note the position of the 1985 shoreline is mostly landward of the old spit, occupying what was North Cove. Also note the breach through Graveyard Spit located landward of the old spit.*

**Figure 3. Map of North Cove showing historical shoreline positions of 1871, 1911, 1926, and 2003 on the 1985 aerial photo mosaic.**

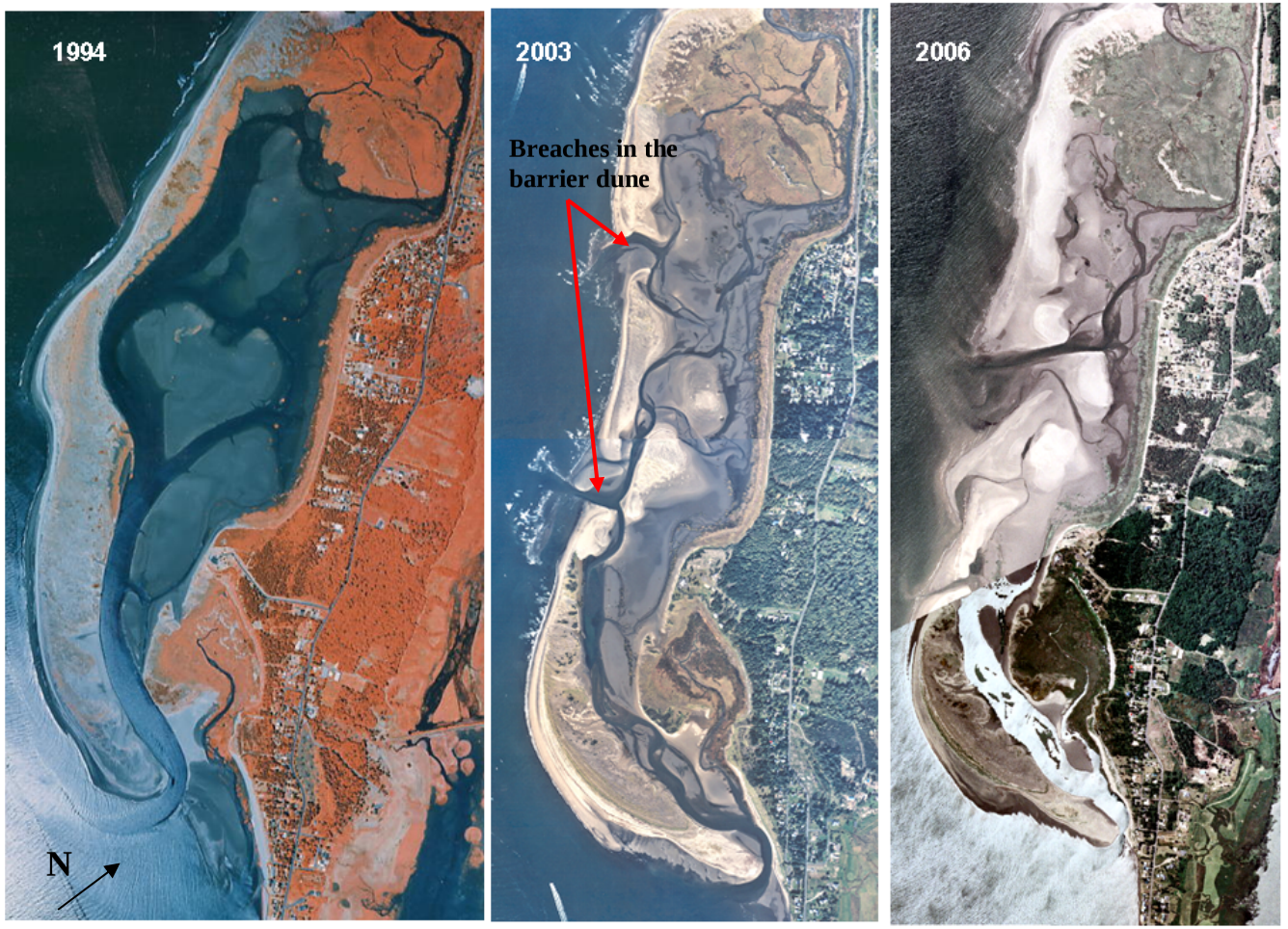



**Figure 4. Aerial photography illustrating changes in North Cove geomorphology between 1994, 2003, and 2006.**

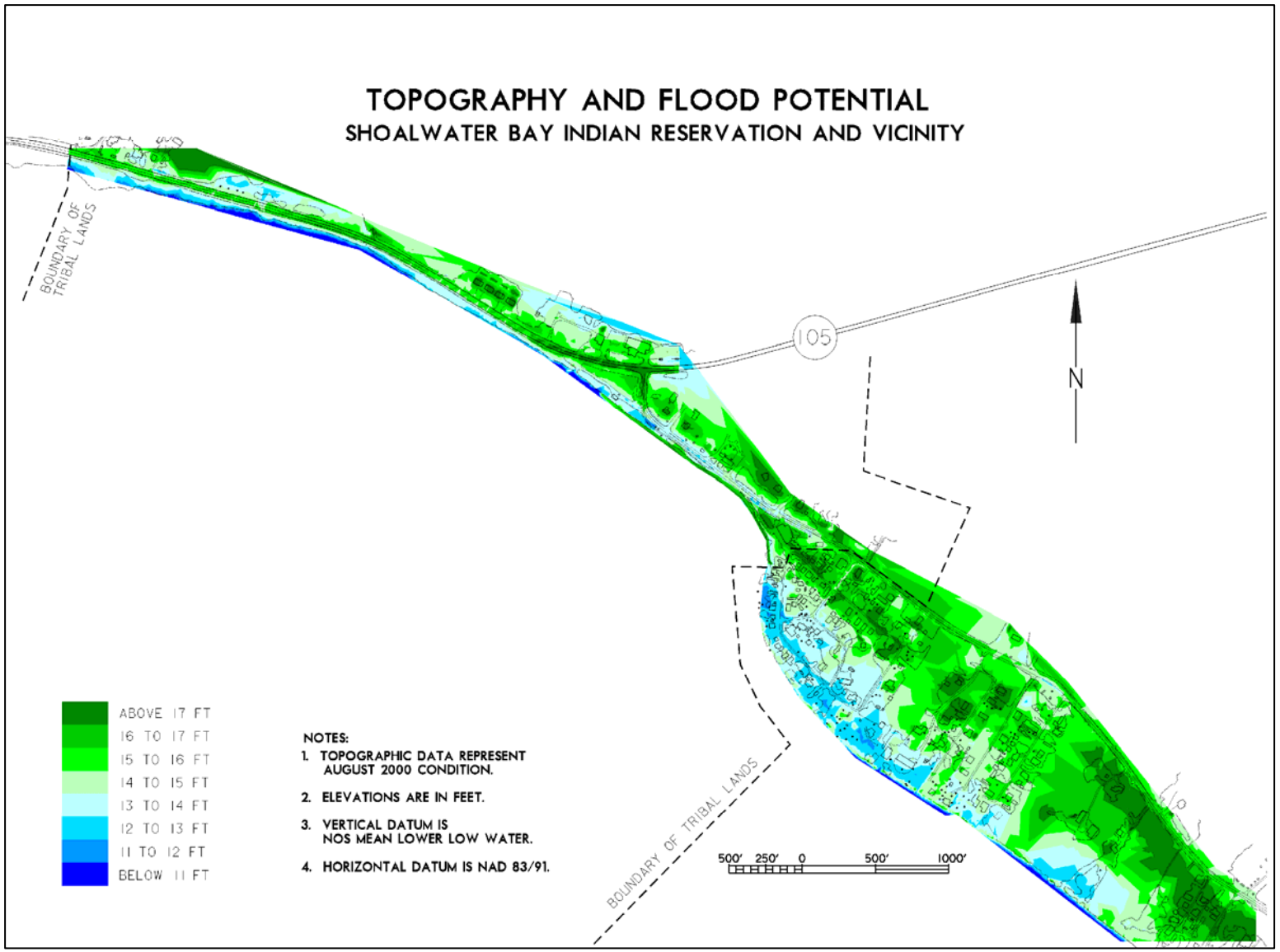



**Figure 5. Topography and flood potential of the Shoalwater Reservation and Vicinity.**

## 2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

### 2.1. NO ACTION [ALTERNATIVE 1]

The "No Action" alternative assumes that no measures will be undertaken to address the ongoing erosion of the barrier dune located in North Cove fronting the Tokeland Peninsula. This alternative also recognizes that, although the northern migration of the North Willapa Channel has halted seaward of the Shoalwater Reservation, tidal currents and – to a greater extent – storm waves will continue to erode the barrier dunes which have afforded protection to the Shoalwater Reservation and Tokeland Peninsula. Material that erodes from the dune will continue to be carried into the inter-tidal area behind the dunes, eventually filling and significantly altering the ecosystem in what remains of the North Cove embayment. Continued narrowing and lowering of the dune will expose the Shoalwater Reservation shoreline to increasing shoreline erosion (though not particularly significant) and increasing frequency of flooding of uplands due to storm-generated ocean wave overwash during periods of elevated water conditions. The "No Action" alternative would not meet the project need and purpose of reducing coastal erosion and is therefore not a feasible alternative; it is carried forward in the NEPA analysis as a benchmark to compare effects of the action alternatives.

### 2.2. BARRIER DUNE RESTORATION [PREFERRED ALTERNATIVE, ALTERNATIVE 6]

Narrowing and lowering of the barrier dune that extends southward on Empire Spit is exposing the Shoalwater Bay Indian Reservation and the Tokeland Peninsula shoreline to increased flooding due to storm wave run-up and overtopping of the shoreline during periods of extreme high tides. The barrier dune restoration alternative is intended to rebuild, and maintain the now deteriorated dune system with sand dredged from a nearby borrow source in Willapa Bay.

The potential borrow sites (for both construction and maintenance) are located southwest of the project, on either side of the northern Willapa Bay channel (Figure 6). A similar dredging site was used for the Washington State Department of Transportation in 1998 for the SR 105 Emergency Stabilization Project. For both initial construction and periodic nourishment, the sand will be pumped from a nearby borrow source in Willapa Bay by a large pipeline dredge.[4]

The restored dune would be 12,500-feet-long, with a top elevation of +25 feet MLLW, a top width of 20 feet, and a side slope of 1V on 5H. The dune footprint would be about 47 total acres. The dune restoration would be constructed along the crest of the now existing eroded barrier dune and will afford incidental protection to approximately 6,500 linear feet of adjacent shoreline located to the east of the Shoalwater Reservation. The initial dune restoration would require the placement of approximately 600,000 cubic yards (cy) of sand dredged from the entrance to Willapa Bay. The dredged sand would be graded and, on the dune crest and North Cove side, planted with native dune grass. The ocean side of the restored dune would remain unplanted to provide habitat for Western snowy plover, a threatened bird species.

[4] The Corps investigated the possibility of dredging the overwash sediments in North Cove and determined this option to be operationally inefficient and disruptive to the biological community due to the large areal footprint required to obtain the required volume of sand free of fine-grained sediment.

Figure 7 shows the proposed alignment of the restored barrier dune as based on a 2006 aerial photo and 2003 topography. The Corps plans to conduct a survey to obtain updated topography data just prior to construction in order to adjust the alignment of the restored dune to account for changes in landform that have occurred since 2003. Adjustments to the dune alignment would be done so as to avoid impacting high salt marsh or other wetlands to the maximum practicable extent.

#### *2.2.1. Maintenance Requirements*

Although the migration of the Willapa channel appears to have halted, other littoral process will not be altered. Erosion by storm waves and currents will continue, and the restored barrier dune will require maintenance on a regular basis. Maintenance requirements for the dune restoration were estimated by using topographic surveys of the dune to compute the sand loss that occurred between 2000 and 2002. Based on the 2000-2002 erosion rates, the Corps estimates the annual loss of sand from the dune (above +6 feet MLLW) at about 50,000 cy per year.

Under this alternative, maintaining the dune to its design dimensions would be critical, and the dune could not be allowed to deteriorate to a point that waves could overtop the structure and place the Shoalwater Reservation at renewed risk of erosion and flooding due to wave run-up and overtopping of the shoreline. To replace sand lost to coastal erosion and maintain the barrier dune width and height necessary to protect the Shoalwater Reservation from coastal flooding and erosion, the Corps would maintain the barrier dune approximately every five years by dredging approximately 250,000 cy from the Willapa Bay channel and placing the dredged material on the restored dune. The dune alignment on the spit can be readjusted to the most effective alignment on Graveyard Spit each time periodic nourishment is required. To the extent possible, the renourishment placement would be located to avoid covering areas planted with dune grass through locating the new sand toward the waterward side of the barrier dune. In the event that planted areas cannot be avoided, the Corps would salvage dune grass and replant it on the North Cove side following sand placement. The program of grading and planting for the initial sand placement would be repeated with each periodic nourishment cycle for the barrier dune.

Barrier dune restoration will protect Tribal uplands from storm-related coastal erosion and flooding. It is a cost-effective means of providing coastal erosion protection and storm damage reduction, is environmentally acceptable, and is technically feasible.

### 2.3. DUNE RESTORATION WITH FLOOD BERM EXTENSION [ALTERNATIVE 7]

The dune restoration with flood berm extension alternative combines restoration of the now deteriorated barrier dune system with an extension of a shoreline flood berm that the Corps constructed in 2001 and 2007 to protect the Shoalwater Reservation. The restored barrier dune would provide primary protection from storm waves, but the presence of the flood berm allows for an additional level of flood protection and lengthens the intervals between required maintenance actions on the barrier dune.

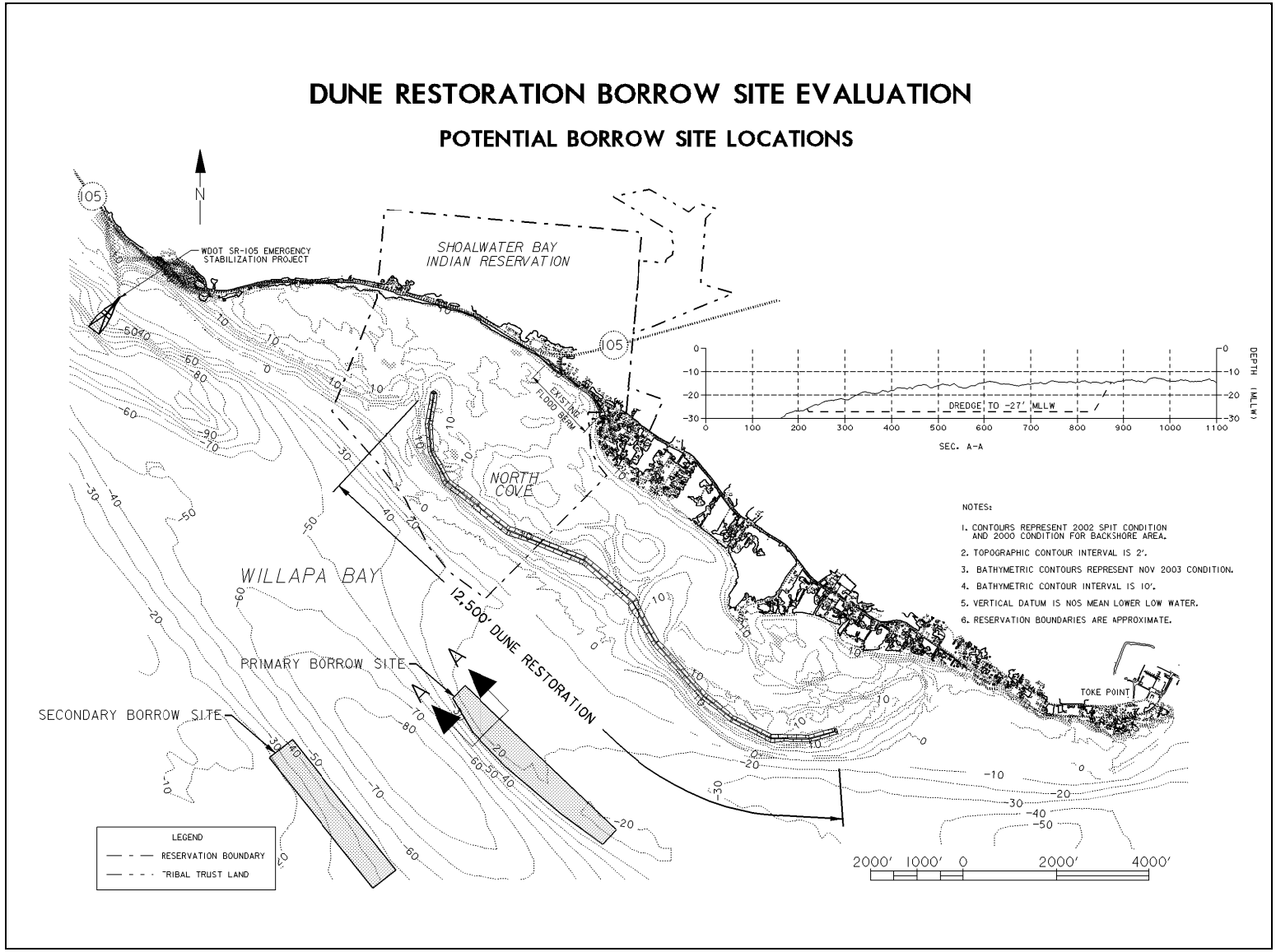



**Figure 6: Alternative 6, Barrier Dune Restoration and Potential Borrow Sites**

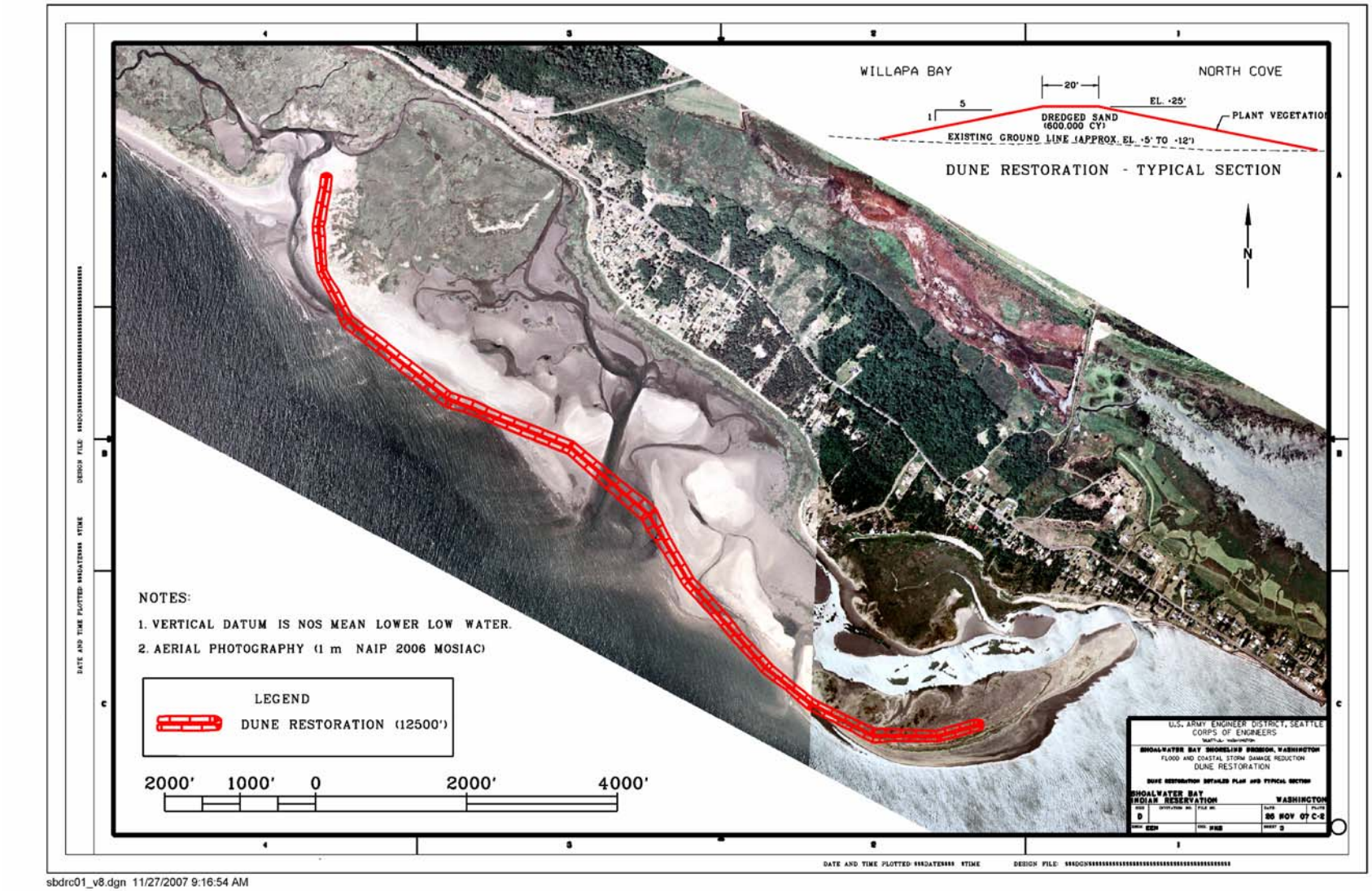



**Figure 7: Proposed Barrier Dune Restoration Alignment**

### *2.3.1. Dune Restoration*

Under this alternative, the dune would be restored in a similar fashion to the dune restoration alone. The restored dune dimensions, the material quantities, and the construction methods would be the same as described in Section 2.2.

### *2.3.2. Flood Berm Extension*

In addition to barrier dune restoration, the 2001/2007 flood berm would be extended along the shoreline northward 4,000 feet and southward 2,770 feet. When the 4,000-foot-long north flood berm extension and 2,770-foot-long south flood berm extension are combined with the existing flood berm, a continuous shoreline protective structure with a total length of 8,470 feet is formed (see Figure 8). In protecting the Shoalwater Reservation, this alternative would also provide incidental protection to approximately 6,500 linear feet of adjacent shoreline located to the east of the Shoalwater Reservation.

The flood berm extension would utilize a design that is similar to the existing flood berm. The flood berm would be porous by design, allowing water to filter through the structure after the wave energy is dissipated. The flood berm would not be intended, nor required, to be a levee that keeps elevated water levels from flooding interior lowlands. Nor would the structure be subjected to continuous or even frequent wave attack. Wave attack, when it occurred, would be over a 3-4 hour period, perhaps once or twice annually, and only if the barrier dune was severely eroded prior to renourishment. It would be constructed of graded riprap with a top elevation of +17 feet MLLW, a top width of 16 feet, and a side slope of 1V on 1.5H. All construction materials for the flood berm extension would be brought to the construction site by truck, and access to the site would be along the structure itself.

The north extension of the flood berm would require approximately 35,000 tons of graded riprap and 14,000 tons of core material. Approximately 15,000 cy of sediment would be excavated to make way for the north extension core material. The south extension of the flood berm would require approximately 25,000 tons of graded riprap and 15,000 tons of core material. Approximately 10,000 cy of sediment would be excavated to make way for the south extension core material. Excavated sediment would be re-graded over the flood berm and planted with native vegetation.

The footprint of the northern flood berm would be 4.66 acres, including 4.5 acres of estuarine marsh. The footprint of the southern flood berm would be 3.42, including 2.51 acres of estuarine marsh. The total planned area of material placed below Mean Higher High Water (MHHW) is approximately 350 square feet (150 square feet on reservation land for the north flood berm extension and 200 square feet on non-reservation land for the south flood berm extension). Required compensation for unavoidable wetland impacts would require substantial wetland creation, enhancement, restoration, and/or protection at an undetermined location.

A portion of the flood berm extension would extend along the shoreline, beyond the Shoalwater Reservation boundary, requiring the Tribe to acquire a perpetual easement from affected Dexter-by-the-Sea property owners. If the easement could not be acquired from Dexter-by-the-Sea

property owners, the project would likely proceed with a limited flood berm design only on Reservation lands.

### *2.3.3. Maintenance Requirements*

The maintenance requirements for this alternative are assumed to be placement of 500,000 cy of sand at 10-year-intervals for dune maintenance, replacement of 25 percent of the flood berm riprap at 25-year intervals, and replacement of 5,000 cy of the sand covering the seaward face of the flood berm at 25-year-intervals. However, the "backup" protection provided by the flood berm would allow considerable flexibility in the maintenance schedule for the dune restoration, allowing the maintenance interval to increase to at least 10 years versus every five years for the dune restoration only alternative. This flexibility alleviates some of the concerns regarding availability and timing of funding for dune maintenance, and scheduling of relatively scarce dredging equipment, and the short four-month-long dredging "window" within which dredging equipment can safely operate in the severe wave climate at Willapa Bay.

Although this alternative would also protect Tribal uplands from storm-related coastal erosion and flooding and is cost-effective and technically feasible, it has considerable environmental impacts associated with it. Specifically, the construction of the flood berm would impact approximately 7 acres of estuarine wetland. Refer to sections 3.2.3 and 4.1.3 for additional information. At this time, the Corps is not actively pursuing this alternative due to the existence of another practicable, less environmentally damaging alternative (i.e. dune restoration only).

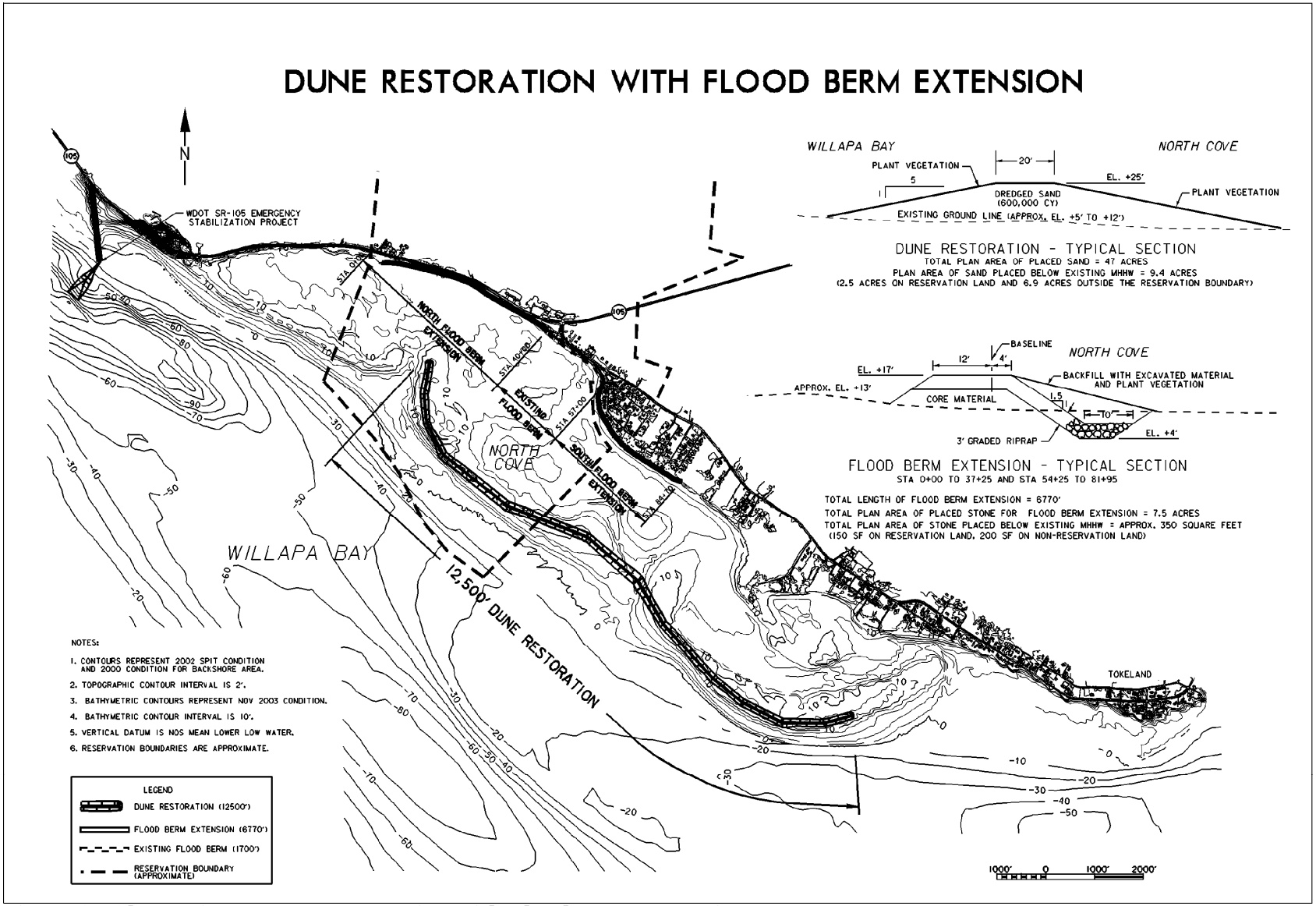



**Figure 8. Alternative 7, Dune Restoration with Flood Berm Extension**

## 2.4. ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

### *2.4.1. Sea Dike [Alternative 4, 4a]*

This alternative would construct a sea dike, which would be a 12,500-foot-long rock structure that is intended to replace the wave protection that was once afforded by the now deteriorated dune system. The structure would have a top elevation of +20 feet MLLW, a top width of 14 feet, and a side slope of 1V on 2H. The dike would require approximately 213,000 tons of underlayer and quarry stone, and 203,000 tons of armor stone, and would be constructed along the crest of the deteriorated dune. Approximately 200,000 CY of sand would be excavated to make way for the dike stone. Alternative 4a is a variation of Alternative 4 that was reconfigured to minimize the degree of incidental coastal erosion and related storm damage reduction to the adjacent Tokeland Peninsula shoreline to the east of the Shoalwater Reservation. Alternative 4a would be a 7,000-foot-long structure and would require approximately 120,000 tons of underlayer rock and quarry stone and 114,000 tones of armor stone. Approximately 112,000 CY of sand would be excavated for Alternative 4a to make way for the dike stone. The excavated sand would be re-graded over the sea dikes, and planted with native dune grass. While the sea dike itself would be designed to resist erosion by waves and currents, the sand covering the rock on the seaward side of the dike probably would be eroded, and would require maintenance on a regular basis.

The dike stone would be brought to the construction site by truck. Access to the site would require construction of a one mile haul road from SR 105. The haul road would be removed at the completion of construction. The maintenance requirement for the sand covering the seaward face of the dike is assumed to be 100,000 cy at two-year-intervals (50,000 cy for Alternative 4a). Replacement of 50 percent of the dike armor stone would likely be required at 25-year intervals.

*Potential Impacts of the Sea Dike Alternative*

The sea dike alternative was eliminated from further evaluation because it is not environmentally acceptable to resource and regulatory agencies, based on feedback during the plan formulation phase of the project development. This alternative was also not supported by the Shoalwater Bay Indian Tribe. The sea dike would transform a natural sand dune feature to a rock structure, eliminating shellfish habitat as well as habitat of other organisms dependant on the sand dune habitat. The sea dike alternative assumes that the northward migration of the Willapa channel has halted seaward of the Shoalwater Reservation. Since the dike would not be intended to address the channel migration, further channel encroachment could undermine and destroy the dike. Another major disadvantage of this alternative is that the dike alignment would be fixed at the time of construction, and could not easily accommodate even a minor change in the channel location without a major reconstruction effort.

### *2.4.2. Hydraulic Modification [Alternatives 3a,b,c,d]*

When evaluating this alternative, four representative flow diversion structures, or training dikes, were modeled at the Corps' Coastal and Hydraulics Laboratory, using the ADCIRC hydrodynamic model. The dimensions and orientation of the structures were adjusted until an obvious change in the flow regime of the channel occurred. The results of the model

investigation found that extremely massive structures would be required to make a significant change in the flow regime of the Willapa channel. Estimated initial construction volumes for individual structures varied from 640,000 to 1,800,000 tons. Assuming an "in place" unit cost of $50/ton, the initial construction costs probably would range from $32 million to $90 million. The drawback of the high construction cost was compounded by high maintenance costs and the risk for unanticipated, and potentially adverse, consequences to the hydrodynamics and ecology of Willapa Bay.

*Potential Impacts of Flow Diversion Structures*

This alternative was eliminated from further consideration because it did not appear to be either cost effective or environmentally acceptable, or verifiable as to the beneficial effect in reducing the flood and coastal storm damage threat to the Shoalwater Bay Indian Reservation.

### *2.4.3. Dune Restoration, Flood Berm Extension, and Channel Relocation [Alternative 7]*

With this alternative, dune restoration and extension of the flood berm would be the same as described in Section 2.3. This alternative would also re-align the southeastern channel that exits North Cove toward the southeast.

Over the last ten years, coastal processes have profoundly affected the channel that flows into North Cove. Figure 4 shows that, in 1994, the dune formed a continuous barrier separating North Cove from Willapa Bay and a single, well-defined channel entered the southern end of the cove. The tidal flow in this channel was likely strong enough to scour away sand that was being carried southward on the ocean side of the spit. In 1995 erosion of the dune resulted in the formation of a breach. This additional entrance and exit for tidal flows, combined with the reduction in the cove volume due to infilling, resulted in a diminished flow through the channel. The flow through the North Cove channel was no longer strong enough to resist the southward encroachment of the spit, and the channel began migrating to the southeast. In 2003, a second breach developed in the spit decreasing the channel flow even further. The 2003 and 2006 aerial photographs (Figure 4) clearly show that the migrating channel is now eroding the southern Tokeland Peninsula shoreline. Restoration of the barrier dune will close the breaches, which will result in an increase in the flow through the channel.

Tribal members have expressed concerns that the increased flow could exacerbate erosion along the Tokeland Peninsula shoreline. Under this alternative, this potential problem would be addressed by relocating the North Cove channel 1,000 feet westward, to the approximate location it occupied in 1994. Relocation of the channel would require excavating approximately 100,000 cy of sand. The excavated material will be relocated to the area presently occupied by the existing channel. The plan areas (below MHHW) for the relocated channel and for the fill would be adjusted to balance each other so that there will be no net change in intertidal area.

*Potential Impacts of Dune Restoration, Flood Berm Extension, and Channel Relocation*

This alternative was substantially similar to the dune restoration and flood berm extension alternative (Section 2.3) that the Corps carried forward for more detailed evaluation. The channel relocation component would involve activities well off the Shoalwater Reservation and

accordingly did not assist in meeting the project purpose of reducing coastal erosion and resulting flooding and storm damage to the reservation. Accordingly, this alternative was eliminated from further consideration.

#### *2.4.4. Shoreline Revetment [Alternative 5]*

The revetment alternative consists of constructing an 8,470-foot-long rock structure that would be intended to provide protection from coastal flooding due to wave overtopping during periods of high tides. The revetment would be designed for wave conditions that would result as the barrier dune continues to erode (i.e., is not restored) and lowers to the elevation of the surrounding inter-tidal area (approximately +8 feet MLLW). The revetment would have a top elevation of +21feet MLLW, a top width of 8 feet, and a side slope of 1V on 1.5H. Construction of the revetment would require placing approximately 55,000 tons of graded riprap and 64,000 tons of armor stone along the existing shoreline. The graded riprap and revetment stone would be brought to the construction site by truck, and access to the site would be along the structure itself. Approximately 24,000 cy of sediment would be excavated to make way for the revetment stone. The excavated sediment along with approximately 40,000 cy of imported sand would be re-graded to create a shoreline cover over the revetment. The sand cover would then be planted with native vegetation.

While the revetment itself would be designed to resist erosion by storm waves, some of the sand covering the rock on the seaward side of the revetment probably would be eroded during extreme tide events. Maintenance requirements for the revetment are assumed to be a replacement of 25,000 cy of sand covering the seaward face of the revetment every 10 years, and replacement of 25 percent of the revetment armor stone at 25-year intervals.

*Potential Impacts of a Shoreline Revetment*

The revetment alternative abandons any attempt to preserve the existing barrier dune structure and does not address potential loss of the remaining Shoalwater Reservation intertidal habitat within North Cove. This alternative protects only the small upland portion of the Shoalwater Reservation. It was screened out because, unlike other available solutions, it fails to fully meet the project purpose and the criteria specified in the project authorization. For these reasons, the shoreline revetment is also not acceptable to the Shoalwater Bay Indian Tribe.

#### *2.4.5. Non-Structural Measures*

##### *2.4.5.1. Floodplain Fill/Flood-proof Structures [Alternative 2a]*

This alternative would raise the elevation of low-lying Shoalwater Reservation uplands above flood elevation. This could be accomplished in combination with flood proofing of structures to raise the first floor above flood elevation and to avoid the effects of storm-generated wave energy as the shoreline is overtopped. This measure will not, however, address erosion of the barrier dune located on Graveyard Spit and its adverse impact on Tribal subsistence intertidal habitat in the 700 acre portion of the North Cove embayment located within the Shoalwater Reservation. Filling the floodplain would prevent upland flooding due to storm wave overtopping during periods of high tides. Fill material would be imported and all structures and infrastructure would be raised accordingly. The Shoalwater Reservation shoreline would require

armoring to prevent storm wave attack from eroding the fill material. The small upland portion of the Shoalwater Reservation would, in effect, become like an island, rising above the surrounding landscape. Flood proofing structures would raise ground floor elevations above predicted flood elevations, thereby reducing damages to structures and contents.

*Potential Impacts of Floodplain Fill/Flood-proof Structures*

Raising the elevation of Shoalwater Reservation uplands and/or structures would be only a partial solution to identified problems. A 400-acre floodplain fill would prevent flooding of Shoalwater Reservation uplands and structures due to storm-generated ocean waves that coincide with extreme high tides. Floodplain fill would encounter severe environmental obstacles related to filling of extensive wetlands found throughout the 400-acre Reservation uplands, and alteration of drainage patterns. Armoring the elevated shoreline would be required to prevent erosion of the fill material. This, too, would result in extensive wetland impacts.

Flood proofing structures alone would not address storm damage to Tribal uplands and transportation infrastructure. Issues of concern include velocity of flood waters resulting from wave attack, deposition of large woody debris, loss of access within the Reservation, and emergency response during and after a storm event.

This alternative would not be a complete solution to identified coastal erosion problems affecting the Shoalwater Reservation. Filling the floodplain and/or elevating structures and infrastructure would not address two-thirds of the small Reservation (i.e., the loss of 700 acres of Tribal shellfish and fish habitat in North Cove resulting from infilling with sand and debris). There would also be a significant potential for induced flooding and storm damage to adjoining non-reservation residential development resulting from filling the floodplain within Reservation boundaries. This alternative is not socially and culturally unacceptable to the Shoalwater Tribe. Accordingly, this alternative does not satisfy the criteria set forth in the project authorization and was not carried forward for further evaluation.

#### *2.4.5.2.Relocation of the Reservation [Alternative 2b]*

This alternative would include finding and acquiring suitable real estate and relocating the entire Shoalwater Bay Indian Reservation out of harms way. This alternative would also include relocating the Tribal cemetery, and a cultural resources recovery of a well documented village site that will otherwise be exposed to storm wave attack and flooding.

*Potential Impacts of Relocation of the Reservation*

Relocation of the tribe from their historic reservation land would be financially cost prohibitive, as it is roughly estimated to exceed 100 million dollars. More importantly, relocation of the reservation would have significant spiritual and cultural costs and impacts to the Shoalwater Tribe. To the Shoalwater Tribe, a vital part of being a Tribe is “place” and “place” has a vitally important meaning to the people of the Shoalwater Bay Indian Tribe --- it is their true identity. For them, “place” is this same coastal area that has been both their physical and spiritual home, and that of their ancestors, for as far back as their story goes. The Shoalwater Reservation was established by Presidential Executive Order in 1866, prior to Washington statehood. To the Shoalwater Tribe, their Reservation is rich with the souls and spirits of their ancestors, and

walking away from these souls is not an option. Relocation is foreign to the Shoalwater Tribe's idea of being a people (see also Tribal Council statement in Section 3.3.2.3 of the project decision document).

The comprehensive, interagency coastal engineering studies conducted for this project concluded that modest engineering solutions exist to address identified problems and opportunities related to coastal erosion and related coastal storm damage. Relocation of the tribe from their historic reservation land – if it were determined to be the only practicable alternative – would be very costly, as it is roughly estimated to exceed 100 million dollars. More importantly, relocation of the Shoalwater Reservation would have significant social, cultural, and spiritual costs and impacts to the Shoalwater Tribe. The Shoalwater Bay Tribal Council has strongly expressed their opposition to any attempts to relocate the reservation from their ancestral trust lands. Accordingly, this alternative was not carried forward for further evaluation.

# 3. AFFECTED ENVIRONMENT

## 3.1. INTRODUCTION/GENERAL SETTING/CLIMATE

The Shoalwater Reservation is located on the north shore of Willapa Bay in Pacific County, Washington. At one-mile square, the reservation is relatively small, with two-thirds lying at or below the intertidal zone. The Shoalwater Reservation includes a flat area along the shore, with lands extending north toward a Pleistocene rock ridge. This ridge generally runs east to west and, to just northwest of the reservation at Washaway Beach, comes to within 200 feet of the shore. Washington SR 105 runs east west though the Shoalwater Reservation, with Toke Point Road running southeast off SR 105.

Within the tidal portion of the Shoalwater Reservation (behind Empire Spit and including parts of North Cove) there are small bays, and extensive intertidal marsh communities. The marsh is a mix of native plants and invasive smooth cordgrass (*Spartina alterniflora*). This marsh is a Category 1 estuarine marsh based on the 2004 Wetland Rating System for Western Washington State (Hruby 2004; R. Mraz, pers. comm.).

Average water temperature of the Pacific Ocean adjacent to Willapa Bay is 48°F to 58°F, and water temperature in the Bay is likely similar to and influenced by ocean exchange. Average temperature ranges from 34.9°F to 72.4°F, and there is an annual total average of 86.9 inches of precipitation (NRCS, 1986).

## 3.2. ELEMENTS OF THE NATURAL ENVIRONMENT

### *3.2.1. Geology/Soils/Hydrology*

The area along the shore of northern Willapa Bay which contains the Shoalwater Reservation is classified generally as Ocosta Soils (NRCS, 1986). Three soil types dominate: Newskah Loam, Ocosta Silty Clay Loam, and Westport Fine Sand. The adjacent Dexter-by-the-Sea community is underlain with Yaquina loamy fine sand. Empire Spit has been described as Dunelands and Fluvaquents, with Ocosta Silty Clay Loam and Westport Fine Sands in the North Cove area.

Comprehensive geologic studies found that the erosion processes in the project area, driven by the channel migration, are undergoing a profound change. The northward migration of the Willapa Channel has stopped in the vicinity of the proposed project. Since the mid-1980s, the slope of the north bank of the main channel has been constant and has remained in a fixed position. This strongly indicates that the channel encountered hard strata that are resistant to erosion, sparing the last of the severely damaged dunes fronting the Shoalwater Reservation shoreline.

Empire Spit fronts Tokeland Peninsula and helps protect it from direct exposure to waves from the Pacific Ocean. Historically, this barrier island was fed by sand from the eroding beach plain to the northwest. This source of sand has been significantly compromised due to the extreme erosion that occurred with the migration of the Willapa Channel. As a consequence, the barrier dune is no longer accreting and in fact, continues to erode as a result of wave action and storm washover. This continued erosion is compromising the barrier dune's historical function as a wave/flood barrier for the Tokeland Peninsula (Corps, 2007). Although the portion of the Shoalwater Reservation that abuts North Cove lies within the 100 year floodplain and is documented as having additional hazards associated with high velocity wave action (FEMA, 1985), erosion of the barrier dune is exposing the Shoalwater Reservation uplands to increasing levels of flooding due to storm overwash of the eroded dune and resultant wave run-up and overtopping of the low-lying Tribal uplands.

In addition, a major breach formed through Empire Spit into North Cove in 1995, and a second, smaller breach developed in 2003. These breaches divide Empire Spit into three narrow islands. However, for the majority of the 20$^{th}$ century, Empire Spit was a continuous feature. The breaches allow more waves to enter North Cove during storm surges. The development of these breaches has also resulted in less tidal flow moving through the south channel of North Cove between the Tokeland Peninsula and the south end of Empire Spit (Corps, 2007). Currently water is conveyed through four inlets into North Cove, with the widest channel located between the Empire Spit Islands.

Immense volumes of sand are moved by tidal currents in the vicinity of the Willapa Bar and entrance. Data analyzed from bathymetric surveys collected between 1998 and 2003 indicate that the average annual rate of erosion in the accessible portions of the entrance channel was 23 million cy/yr, while the annual accretion volume exceeded 30 million cy/yr. Data analyzed between 2000 and 2003 indicate that the area immediately seaward of the dune restoration site in the channel was shoaling at a rate of greater than one million cy/yr, while on the south side of the North Channel, sediment was eroding at a rate of over 3.5 million cy/yr (Corps, 2007).

### *3.2.2. Surface Water*

Marine surface waters adjacent to the Reservation are regularly sampled by the Washington Department of Ecology (WDOE). There has been a sampling station adjacent to Toke Point since 1990. In 2000, the most recent data available, surface water temperature ranged between 7.91°C and 16.75°C; salinity was within the range for brackish water to seawater (19.15 ppt to 31.63 ppt); and dissolved oxygen was between 7.796 mg/L and 10.477 mg/L. The tidal range averages 6.78 feet, with a spring tide range of 8.85 feet.

The Naselle, North, and Willapa Rivers flow into Willapa Bay. Flow measurements from the U.S. Geological Survey show an average annual range for the Willapa River from 411 cubic feet per second (CFS) to 1,011 CFS; average annual flow in the Naselle is between 284 and 648 CFS. Modeling by the Corps shows an ebb tide flow of up to 500,000 CFS at the mouth of Willapa Bay.

In the immediate vicinity of the Shoalwater Reservation, the WDOE has three sites listed under Section 303 (d) of the Clean Water Act. North Cove has been designated a Class 4 water (Impaired by a Non-Pollutant) for invasive or exotic species (*Spartina alterniflora*), and the creek feeding the northwest portion of the Cove is also a Class 4 water for a fish passage barrier (WDOE, personal communication, 2004). WDOE has also designated several sites around North Cove, Graveyard Spit, and Toke Point as Waters of Concern (Class 2) for Carbaryl, a pesticide used in oyster aquaculture.

### *3.2.3. Plant Communities*

Marsh plants dominate the intertidal areas of North Cove. The North Cove wetlands extend into and past the log wrack line along the northern shoreline. Particularly in the western portion of the Shoalwater Reservation, freshwater wetlands, likely receiving drainage from hills above the reservation, fringe the North Cove marsh. Species present include beach grass, sedges, rushes, *Salicornia sp*., and the invasive exotic salt marsh grass *Spartina alternaflora*. Upland areas are composed of coastal woodlands and residential ornamental plants and grasses.

### *3.2.4. Fish and Aquatic Species*

Willapa Bay has historically been a major coastal fishing and shellfishing area for Washington. Commercially and recreationally important species include Pacific tom cod, lingcod, white and green sturgeon, Chinook, coho and chum salmon, steelhead and cutthroat trout. Bull trout are believed to forage in the Bay, but there are no known resident populations in Willapa Bay or its adjacent rivers. Commercial fisheries for Dungeness crab, razor clams, and oysters exist throughout the Bay. Forage fish, including Pacific herring, sandlance, surf smelt, and anchovy are all common in the Bay. Forage fish are an important part of the food chain for salmonids, many sea birds and other animals associated with the marine nearshore. Given their importance those species are provided regulatory protection in the form of construction restrictions during critical spawning periods. Sand lance and surf smelt spawn directly onto small gravel (pea gravel) and sandy substrates in the upper tidal zone, generally between +5 feet and MHHW.

Prior to 2008, anecdotal information from local crab fishermen indicates that adult crabs do not move into the North Channel until after the fall freshet has occurred (Mike Shipman and Doug Davis, personal communication, November 2007), which is typically in late October or November. A similar dredging action was conducted for the State Route 105 Emergency Stabilization Project in 1998. The borrow site for that project was located approximately one mile north of the Shoalwater Bay project site. Studies on crab densities were conducted just before and during dredging activities with the intent that mitigation requirements would be calculated from the catch data. Crab abundance was low and the impact was determined to be *de minimus*. No mitigation was required (PIE, 1998).

On a bi-weekly basis from mid-July through mid-October 2008, a Corps contractor conducted beam trawls to determine the presence and relative abundance of Dungeness crab and fin fishes in the proposed borrow areas (Hunt *et al*, 2009). The sampling protocols and methods used for this investigation were consistent with previous Corps studies in Grays Harbor.

Both crab and fish density appeared to show similar seasonality patterns of habitat use at the borrow sites. Juvenile crabs, age 0+ and 1+, were more prevalent at both sites in July and early August than in September or October. This seasonal crab density trend was only slightly more pronounced at the western borrow site than the eastern site. However, crab abundance numbers did show decreasing trends in density at both borrow sites beginning in late August and continuing this trend through October.

The mean and range of crab size between the two sites over the course of the survey was very similar. Although the mesh size of the beam trawl was not designed to capture newly settled crabs, less than 15 to 20 mm in carapace width, these crabs were detected at each sampling event during the course of the survey, suggesting recent larval crab settlement. Based on the findings of this study it appeared young-of-year Dungeness crab recruitment in this portion of Willapa Bay occurs over an extended period of time. In fact, Dungeness crab age class structure appeared to be more consistent with expectations for the Columbia River coastal nearshore and estuary and those described for near-bar portions of Grays Harbor instead of the interior waters of Grays Harbor.

Although adult female crabs occurred at both sites throughout the survey, gravid (egg bearing) female crabs were very rare. Only two gravid female crabs were captured in this survey, both in early October. The data from this study would indicate that this site is not heavily utilized by gravid crabs during summer and fall months.

During July and August, commercial (possibly Tribal) crab pots were deployed around and within the borrow sites. At both sites commercial-legal male crabs (greater than 159 mm carapace width) were relatively absent from the catch during this time. However, by September the number of pots were reduced, and by October they were completely absent from the area. As a result, older male crabs were slightly more prevalent in October catches, but these crabs were still relatively uncommon at both borrow sites.

Other crab species captured during this survey included a small number of red rock crabs (*Cancer productus*), a single hermit crab, and a single pea crab (Family Pinnotheridae). Other invertebrate by-catch included crangon shrimp, jellyfish, polychaetes, and mussels that were often empty shells accompanying eelgrass as flotsam. Crangon shrimp were observed in large numbers in almost every trawl at both the east and west borrow sites for all sampling events.

The most abundant class of fish captured during trawling was flatfish and a majority of these fish were juveniles. Juvenile flatfish, composed mostly of English sole, were nearly twice as abundant at the deeper western borrow site than at the eastern site; this was largely influenced by their peak abundance at this site in the first week of August. However, both sites showed a sharp

decline in flatfish prevalence in October. More flatfish tended to be captured at the western site, but there was no statistical difference in flatfish densities between the two sites, likely due to high variability of catch at the eastern site.

As a group, roundfish were found to be most abundant at both sites in July. Snake prickleback and Pacific staghorn sculpin were the most abundant roundfish species. There was no statistical difference in roundfish densities between the two borrow sites. Pacific sand lance were an order of magnitude less abundant that staghorn sculpin or snake prickleback, but previous studies (Dinnel *et al.*, 1986, 1987; Wainwright *et al.*, 1990) have indicated that sand lance may be able to avoid trawls, but are somewhat more vulnerable to hydraulic dredging (see Section 4.1.4). Juvenile lingcod were captured at both locations and were most abundant in July. Juvenile lingcod prevalence decreased in abundance in August, and these fish were relatively absent from the catch in September and October. Juvenile rockfish were even less prevalent, with only two captured over the course of this study.

### *3.2.5. Wildlife*

A query of the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species database indicates that the project site is designated as wood duck habitat, and a waterfowl concentration area. Marsh hawks (*Circus cyaneus*), osprey (*Pandion haliaetus*), and great blue herons (*Ardea herodias*) are commonly seen. The Willapa River estuary provides habitat for wintering and migrating shorebirds, which feed on mudflats and roost in marshes and pastures along the river. Dominant species are the Western sandpiper (*Calidris mauri*) and short-billed dowitcher (*Limnodromus griseus*) in the spring, and dunlin (*Calidris alpina*) during the winter (Cullinan 2001). Waterfowl utilize Washington's coastal bays primarily during migration. American wigeon (*Anas americana*) account for 80% of the waterfowl species migrating through Grays Harbor and Willapa Bay with fall counts peaking at approximately 30,000 birds. Northern pintails (*Anas acuta*) are the second most abundant with about 15,000 birds, and mallards (*Anas platyrhynchos*) are common during all times of the year.

Large numbers of green-winged teal (*Anas crecca*), common goldeneye (*Bucephala clangula*), bufflehead (*Bucephala albeola*), red-breasted merganser (*Mergus serrator*), and to a lesser extent, canvasback (*Aythya valisineria*), northern shoveler (*Anas clypeata*), ruddy duck (*Oxyura jamaicensis*), ring-necked duck (*Aythya collaris*) and gadwall (*Anas strepera*) will use the area during migration and wintering periods. Wood ducks (*Aix sponsa*) use the area as breeding habitat and during migration periods. About 90,000 scoters (*Melanitta sp*.) are counted annually during midwinter surveys by the USFWS with over half occurring in western Washington. Canada geese (*Branta canadensis*) are numerous along Willapa Bay, with a resident population of 900–1,000 birds. Willapa Bay is one of the most important wintering and spring staging areas for black brant (*Branta bernicla*) on the West Coast. Approximately 12,000 birds use the area as spring staging habitat, while 2,500 birds are present during the winter months.

Of the waterfowl that use Willapa Bay, green-winged teal prefer to forage on mudflats where they find seeds and small invertebrates. Wigeon feed more on vegetative parts of aquatic plants, compared to other dabbling ducks, and commonly feed on submerged aquatic vegetation such as eelgrass. Gadwall, pintail, and canvasbacks also use estuaries and feed on submerged aquatic

vegetation. Northern shovelers can be found in shallow water along the shores of estuaries, especially where freshwater enters the estuary. Their diet is heavily dominated by animal material. Scaup (*Aythya sp*.) forage primarily on animal material including small fish, mollusks, and snails. Buffleheads commonly feed on fish, amphipods, isopods, shrimp, and mollusks in estuarine environments during the winter.

### *3.2.6. Threatened and Endangered Species*

Nineteen species protected by the Endangered Species Act of 1973, as amended, and one candidate species are potentially found in the vicinity of Shoalwater Bay Erosion Project (see Table 1 below). In accordance with Section 7(a)(2) of the Act, Federally funded, constructed, permitted, or licensed projects must take into consideration impacts to Federally listed and proposed threatened or endangered species. In order to satisfy the requirements of the Act, the Corps prepared a biological evaluation (BE) (Corps, 2006a) to determine the effects of the project and propose conservation measures for species affected by the proposed action. See Section 4.1.6 for a summary of the outcome of Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS).

The relevant threatened and endangered species under the jurisdiction of the USFWS are brown pelican, coastal/Puget Sound bull trout, green sea turtle, olive Ridley sea turtle, marbled murrelet, northern spotted owl, short tailed albatross, Western snowy plover, streaked horned lark, and Oregon silverspot butterfly.

The relevant threatened and endangered species under the jurisdiction of the NMFS are green sturgeon, leatherback sea turtle, loggerhead sea turtle, Steller sea lion, sperm whale, sei whale, fin whale, humpback whale, blue whale, and killer whale.

**Table 1. Threatened, endangered, candidate and species and critical habitat potentially found in the project area**

| Species | Listing Status | Critical Habitat |
|---|---|---|
| Brown Pelican *Pelecanus occidentalis* | Endangered | None |
| Marbled Murrelet *Brachyramphus marmoratus* | Threatened | Designated (none in project area) |
| Western snowy plover *Charadrius alexandrinus nivosus* | Threatened | Designated (none in project area) |
| Northern spotted owl *Strix occidentalis caurina* | Threatened | Designated (none in project area) |
| Short-tailed albatross *Phoebastria albatrus* | Endangered | None |
| Streaked horned lark *Eremophilia alpestris strigata* | Candidate | N/A |
| Coastal-Puget Sound Bull Trout *Salvelinus confluentus* | Threatened | Designated (none in project area) |
| Green sturgeon *Acipenser medirostris* | Threatened | Proposed |
| Leatherback Sea Turtle *Dermochelys coriacea* | Endangered | Designated (none in project area) |
| Loggerhead Sea Turtle *Caretta caretta* | Threatened | None |
| Green Sea Turtle *Chelonia mydas* | Threatened | Designated (none in project area) |
| Olive Ridley Sea Turtle *Lepidochelys olivacea* | Threatened | None |
| Oregon silverspot butterfly *Speyeria zerene hippolyta* | Endangered | Designated (none in project area) |
| Steller sea lion *Eumetopias jubatus* | Threatened | Designated (none in project area) |
| Humpback whale *Megoptera novaeangliae* | Endangered | None |
| Sperm whale *Physeter catodon* | Endangered | None |
| Sei whale *Balaenoptera borealis* | Endangered | None |
| Fin whale *Balaenoptera physalus* | Endangered | None |
| Blue whale *Balaenoptera musculus* | Endangered | None |
| Southern resident killer whale *Orcinus orca* | Endangered | Designated (none in project area) |

## 3.3. ELEMENTS OF THE BUILT ENVIRONMENT

### *3.3.1. Land and Shoreline Use*

The Shoalwater Bay Indian Reservation (Shoalwater Reservation) is located on the north shore of Willapa Bay between Cape Shoalwater and Toke Point, bounded by steep natural hillsides to the east and north and Willapa Bay to the south. State Route (SR) 105 traverses the Shoalwater Reservation. Today, the Shoalwater Reservation is slightly greater than one-square mile in area and consists of 440 acres of uplands and 700 acres of marine salt marsh and tidal flat habitats. The original Reservation encompassed only 335 acres of uplands. In recent years, the Tribe has acquired an additional 105 acres of uplands which are to be held in trust.

Land use in the project vicinity includes Shoalwater Reservation infrastructure and operations, private residential housing (on and off Reservation), and minor commercial activity (fireworks sales, gasoline and convenience stores sales). Specific Tribal land uses include a multi-building Tribal Center, which includes Tribal meeting spaces, a Tribal Wellness Center and Tribal Police; the Shoalwater Bay Casino; and residential housing built by the Tribe. Tribal members reside in housing of various types both on and off the Reservation. In addition, there is private residential land use, and a hotel that is being converted to condominiums within the adjacent Dexter-by-the-Sea community.

The 440 acres of Reservation uplands consists of a narrow strip of low elevation land paralleling the shoreline, backed by a very steep forested hillside along the northeast edge. The narrow band of developable uplands along the shoreline is interspersed with wetlands, and is traversed by State Route (SR) 105 and Old Tokeland Road. Many of these upland freshwater wetlands were reportedly formed after the State of Washington constructed SR-105 in the 1950s. The forested hillside, upland wetlands, SR-105, and Old Tokeland Road combined represent approximately 170 acres, leaving approximately 270 acres upon which the entire Shoalwater Reservation's land use development is restricted.

Reservation land use consists of Tribal community, Tribal commercial, Tribal residential, and non-Tribal public infrastructure (see Table 2). The predominant land use category is that of Tribal community. The Tribal Community Center houses offices for administration of Tribal government and service for elders lunch program. The Tribal clinic and dental center/Tribal social and family services center (Wellness Center) serves three groupings of people: Shoalwater Bay Tribal members; other Native Americans, but not Shoalwater Bay Tribal members; and non-Native persons who have designated the Wellness Center for their medical care and who are served as third-party patients. Patient numbers for the Wellness Center include 2,500 medical patients, 2,000 dental patients, and 200+ mental health patients. The Tribal cemetery is considered to be the cultural center of the Shoalwater Reservation, and is located directly across Old Tokeland Road from the Tribal Community Center. New back-up generators, installed in 2008 following the December 2007 storm event, are located at the Tribal Education Center & Library, Tribal Wellness Center, and the Tribal community water pump plant.

There is very limited Tribal commercial land use on the Shoalwater Reservation. The Shoalwater Bay Casino is located on SR-105 at its intersection with Old Tokeland Road. The

casino is the Shoalwater Tribe's primary source of Tribal funding for operation of the Wellness Center, Tribal government, and social programs. The casino has about 25,000 visitors annually, and does not generate large revenues for the Tribe. An adjacent small recreational vehicle park for casino patrons was installed in 2006. Both are operated as Tribal commercial enterprises. In addition, there are 14 privately operated Tribal businesses located along SR-105, including a couple of small convenience stores/smoke shops, and a number of seasonal fireworks stands.

Tribal residential development is limited, and efforts are underway to provide additional housing. Presently, there are 36 multi-family dwellings, six duplex family dwellings, and four double-wide trailer dwellings. Two small parcels of land in Tokeland have recently been purchased by the Tribe for development of additional Tribal housing. Due to limited on-Reservation housing, some Tribal members reside outside the Reservation, particularly in the adjacent Dexter-by-the-Sea community.

Non-Tribal public infrastructure which traverses the Reservation includes SR-105 and Old Tokeland Road. SR-105 is maintained by the Washington Department of Transportation. Old Tokeland Road is maintained by Pacific County.

The Shoalwater Tribe has been extremely proactive in developing and implementing internal building codes, environmental ordinances, and emergency plans to address issues stemming from the challenges that their vulnerability to coastal storms and flooding have provided. The new Wellness Center was built to new standards and coordinated with Pacific County building officials. More than 30 Tribal and non-Native community members form an Emergency Management team in accordance with Community Emergency Response Team (CERT) Program standards, and have been trained to react to disaster relief issues. A community emergency evacuation center has been established out of harms way near the top of the steep hillside along the northeast Reservation boundary. It is accessible from SR-105 by a road cut through the hillside. The Reservation water supply tank is also located here, as well as one residential dwelling. Unfortunately, topography, wetlands, and acreage limitations seriously constrain opportunities for Reservation land use development that is out of the coastal storm and flood zone.

The Shoalwater Tribe recognizes that they must comprehensively address the serious and growing issue of loss of their Reservation lands and habitat to coastal erosion due to Pacific Ocean storms. In recent decades, they witnessed considerable coastal erosion, damage, and loss along the Washington coast, particularly in an area to the west of the Shoalwater Reservation known as Cape Shoalwater. Since the early 1990s, the Tribe has noticed erosion and lowering of the barrier dune on Graveyard Spit that has historically protected the Reservation from Pacific Ocean storms. The ongoing erosion has taken on a new importance for the Tribe in that the protective sand dunes and storm wave barrier that previously protected the Tribe's reservation lands have now been eroded, and there is less and less protection with each passing coastal storm event. Protecting their land and heritage is the quest the Tribe initiated in 1999 when they

**Table 2. Inventory of Affected Reservation Land Use and Infrastructure**

| STRUCTURE NAME | CLASSIFICATION | QUANTITY |
|---|---|---|
| **Land** | **Uplands** | **440 Acres** |
| **Marine** | **Intertidal** | **700 Acres** |
| Tribal Community Center/ Tribal Police | Tribal Community | 1 |
| Tribal Cemetery | Tribal Community | 1 |
| Tribal Court | Tribal Community | 1 |
| Tribal Education Center & Library | Tribal Community | 1 |
| Tribal Wellness Center (Medical/Dental/Mental Health) | Tribal Community | 1 |
| Tribal Social and Family Services | Tribal Community | 1 |
| Tribal Counseling / Interview Facility | Tribal Community | 1 |
| Tribal Cultural Repository Building | Tribal Community | 1 |
| Tribal Gymnasium and Assembly Hall | Tribal Community | 1 |
| Tribal Emergency & Backup Generators | Tribal Community | 4 |
| Tribal Water Storage Tank | Tribal Community | 1 |
| Tribal Water Treatment / Pump House | Tribal Community | 1 |
| Tribal Storage and Maintenance | Tribal Community | 2 |
| Emergency Evacuation Complex (under development) | Tribal Community | 1 |
| Tribal Environmental Complex | Tribal Community | 1 |
| > Office Buildings | | 2 |
| > Laboratory Buildings | | 2 |
| > Storage and Maintenance Building | | 1 |
| Tribal Casino Complex | Tribal Commercial | 1 |
| Tribal Recreational Vehicle Park | Tribal Commercial | 1 |
| Tribal Businesses (privately owned and operated) | Tribal Commercial | 14 |
| Single Family Residence (includes 6 outside Reservation) | Tribal Residential | 36 |
| Duplex Family Residence | Tribal Residential | 12 |
| Mobile Home Residence | Tribal Residential | 4 |
| State Highway 105 | Public / State | ---------- |
| Old Tokeland Road | Public / Pacific County | ---------- |

approached Congress and the Corps for assistance. The Tribe's objective has been to implement a long-term solution before a coastal storm event, or series of events, brings havoc and potential devastation to their small coastal Reservation.

### *3.3.2. Socioeconomics*

Pacific County's economy is natural resource based. Major industries in Pacific County include tourism, logging, lumber manufacturing, oyster harvesting, seafood canning, crabbing, commercial and sport fishing, dairy farming, and cranberry production. Local government; accommodation and food services; forestry, fishing, and related activities, and manufacturing were the largest employers in the county. Of these industries, forestry, fishing, and related activities are highly concentrated in Pacific County as compared to the United States as whole (PNREAP, 2007). Pacific County economic growth has lagged behind that of Washington State as a whole, with nonfarm employment growing at an annual rate of just 0.8% verses annual growth of 1.8% at the state level (Vleming, 2007).

Many farms along the Willapa Basin's river valleys raise beef and dairy cattle, with related production of hay, silage, and calves. During the 1990's, beef cattle production in Pacific County declined while numbers of dairy cattle slowly increased (Willapa Alliance, no date). Changing markets, the cyclical nature of worldwide beef prices, an oversupply of milk, waste management restrictions, and rising property prices have led to a consolidation of the number of cattle farms. In Pacific County, this trend has resulted in fewer farms with more head of cattle per farm, and operations that import more feed and silage than in the past (Willapa Alliance, no date).

Many of Willapa Bay's tidal flats are in private ownership and managed for oyster mariculture sites. Willapa Bay produces half of the oysters in Washington, and Pacific County has the largest shellfish culture industry on the West Coast. Demand for northwest oysters greatly increased as a result of the devastation in the Gulf Coast oyster beds from Hurricane Katrina, and the production of oysters in the Willapa Bay region increased by 30%. The increased production is anticipated to be sustained for several years to come. Nearly 50 million pounds of oysters and clams are produced each year, and the industry supports nearly 600 jobs, generating over $12 million in personal income (Pacific County, 2007).

Commercial fishing generates over $25 million dollars in personal income for residents of Pacific County. The commercial fishery lands greater than 21 million pounds of fish and shellfish annually with Dungeness crab, Pacific pink shrimp, albacore tuna, and bottom fish as the major components of the commercial fishery (Pacific County, 2007). A navigable channel between Willapa Bay and points north parallels the barrier dune.

### *3.3.3. Cultural Resources*

Leslie Spier (1936) cites Curtis (In North American Indian, IX) in stating that the villages on the north side of Willapa Bay were Salish or "Shoalwater Salish," and included: "H1ímŭmi" near North Cove, Mónĭlŭmsh" at Georgetown, and "Númoïĥa ' nhl" at Tokeland. Verne Ray (1938) lists village Number 30 as: "na·ˏmst'cat's" which was located between Tokeland and North Cove and was a village occupied principally during the winter and that at that time (in 1938) it

was called Georgetown. Hajda (1990) places the project area within the traditional territory of the Lower Chehalis, a subdivision of the Southwestern Coast Salish speaking people. Hajda states that in the early 1830's, a malaria epidemic (as cited by Boyd 1985) devastated the Lower Columbia River and adjacent area populations and resulted in changes of group compositions. The surviving Chinook and Lower Chehalis in Willapa Bay became a bilingual population (as cited by Swan 1857) that were known as Shoalwater Bay Indians. The Chinook were eventually totally replaced by Lower Chehalis (as cited by Ray 1938). A small reservation was established in 1866 for the Lower Chehalis, Chinooks, and others living in the area that came to be called the Georgetown Reservation and then later the Shoalwater Bay Indian Reservation.

### *3.3.4. Native American Issues*

The Shoalwater Bay Indian Tribe is the project sponsor and proponent. The Shoalwater Tribe has worked to secure Congressional funding and authorization for the project, and has been an active participant on the design and evaluation team. Tribal leadership and their consultants contributed to the development and assessment of alternatives. Tribal biological and cultural resources staff have supported field surveys and provided documentation in support of the analyses of environmental and cultural effects of the proposed action. The Shoalwater Tribe also maintains an active dialogue with the adjacent non-reservation community, hosts public meetings and forums on the project, and has conducted mailings to affected community members with regard to the project. Tribal members are also commercial fishermen within Willapa Bay, and make use of local native plant species for Tribal crafts and ceremonial use.

There are 700 acres of marine intertidal habitat, representing 61 percent of the entire Shoalwater Reservation, located in the North Cove embayment. This area, which includes approximately 5,000 linear feet of the barrier dune, was traditionally used by Tribal members for subsistence fishing and shellfish food gathering and as a source of native plants for religious and ceremonial use. Erosion and storm wave overwash of the barrier dune on Graveyard Spit has resulted in a near total loss of this traditional shellfish resource. This tideland portion of the Shoalwater Reservation, which previously provided rich harvests of shellfish, is virtually non-productive today. Infilling with sand and debris from storm overwash of the barrier dune has accelerated dramatically since the March 3, 1999 coastal storm which resulted in the WRDA 2000 project authorization. The dune elevation has decreased with each passing year, resulting in near complete loss of shellfish habitat in North Cove.

Culturally, the shellfish and fish in this intertidal region have been a source of traditional subsistence foods upon which Tribal members depend for their health and dietary welfare. The intertidal marine habitat provides the last of the culturally traditional foods the Tribe utilizes, which are healthy choices in light of the Tribal members' propensity for diabetes and other illnesses. Additionally, "sweetgrass" found in the intertidal wetlands is both culturally and spiritually important to the Tribe; it is used extensively in religious ceremonies, for basket weaving, mats, and other woven crafts, and for traditional clothing and hats. Today, marsh plants dominate much of the intertidal areas of North Cove. Species present include beach grass, sedges, rushes, *Salicornia sp.*, and the invasive exotic salt marsh grass *Spartina alterniflora*.

### *3.3.5. Recreation*

Fishing, bird watching, walking along the existing flood berm, and beach combing are major outdoor recreational activities conducted within the project area. Casino gaming is undertaken at the Tribe's casino, which is adjacent to the project site.

### *3.3.6. Noise*

There is little noise pollution on the Reservation or within the surrounding community as there is no industrial activity on the Reservation, in Dexter-by-the-Sea, or in Tokeland. Noise levels are thus considered equal to residential noises, and include noise from passing vehicles, lawn mowers, and similar low level noise sources. The only other major source of noise is that generated by traffic along State Highway 105.

### *3.3.7. Air Quality*

Pacific County has no designated non-attainment areas. Air quality is monitored by the Olympic Region Clean Air Agency, under authority from the U.S. Environmental Protection Agency (EPA).

### *3.3.8. Environmental Health/Hazardous and Toxic Waste*

The Corps performed an environmental evaluation for the presence of hazardous, toxic, and radioactive waste at lands located on and adjacent to the Shoalwater Reservation. This was completed under ER 1165-2-132, "Hazardous, Toxic and Radioactive Waste (HTRW) Guidance for Civil Works Projects", which provides guidance for considering issues associated with HTRW which may be located within project boundaries or may affect or be affected by Corps Civil Works projects. The specific goals for this evaluation were to identify any existence of, or potential for, HTRW contamination on lands, including structures and submerged lands in the project area, or external HTRW contamination which could impact, or be impacted by, the project.

A site visit was made by the Corps on March 23, 2005 to complete the site reconnaissance for the project. During the visit, personnel searched for evidence of HTRW in the form of soil staining, unusual odors, distressed vegetation, dead animals, landfills, sumps, disposal areas, above-ground and underground storage tanks, vats, containers of unidentified substances, water treatment and sewage treatment plants, ditches, abandoned buildings boat yards, harbors, and fueling stations. Several above ground storage tanks were identified but were not considered a potential problem because of their distance from the proposed project site. It is possible that some of the houses in Dexter-by-the-Sea southeast of the reservation may have septic systems and/or underground storage tanks (UST) for fuel oil buried in their back yards. No visual or olfactory signs of leaking septic systems and/or underground storage tanks were observed during the site visit.

A search of EPA and State of Washington databases was conducted to locate sites in the project vicinity that are known or suspected to be contaminated or could have contributed contamination to the project area. Out of over 200 sites in Pacific County, only one site of potential concern was identified in the project area. This site is the "Tokeland Cattle Dip Tank" that is located at 2406 Tokeland Road. Through discussions with the WDOE, it was determined this site was a

State Cleanup Site that had been contaminated with pesticides in the groundwater and petroleum and pesticides in the soil. However, the cleanup was completed and a No Further Action Letter was issued by WDOE in 1999. No other contaminated sites are known to exist in the project area.

The offshore dune restoration borrow areas have never been the sites of any construction, any recent ship wrecks or any other source of contamination. Therefore it is unlikely that they would contribute any contamination to the project site.

# 4. ENVIRONMENTAL CONSEQUENCES OF SELECTED ALTERNATIVES

## 4.1. ELEMENTS OF THE NATURAL ENVIRONMENT

### *4.1.1. Geology/ Soils*

*Alternative 1, No Action Alternative*

The no-action alternative would likely result in some continued erosion of the barrier dune. It appears that the northward migration of the Willapa Channel has ceased in the vicinity of the proposed project. Migration of the channel is believed to have encountered hard strata that are resistant to erosion, sparing the last of the severely damaged dunes fronting the Shoalwater Reservation shoreline. However, even as the overall shoreline erosion rate is reduced by reduction in the Willapa channel migration, waves will continue to act on the barrier spit during storm events (surge and southerly winds). Based on the 2000-2002 erosion rates, the Corps estimates the annual loss of sand from the dune (above +6 feet MLLW) at about 50,000 cy per year. This will result in continued overwash and loss of barrier dune elevation, and consequently, increased flooding and storm damages on the Shoalwater Reservation and in Dexter-by-the-Sea.

*Alternative 6, Barrier Dune Restoration*

Barrier Dune

This alternative would require an initial quantity of approximately 600,000 cy of sand to be placed on the existing dune. The source for this sand will be material dredged from the entrance to Willapa Bay and therefore, similar in character to the material currently comprising the barrier dune. Future dune nourishment actions will continue to utilize material dredged from the Willapa Bay region. The barrier dune will be restored to a height of approximately +25 feet MLLW, which approximates the elevation of the dune over the last several decades when the dune was still being fed by sand from the northwest (prior to the mid-1990s). Restoring the dune will also close the existing breaches through the barrier dune into North Cove, and will convert the segmented sand islands into one continuous feature. The inlet between Graveyard spit and the western most Empire Spit island will remain intact. Multiple breaches of Graveyard Spit and/or Empire Spit have been recorded since 1930, but for the majority of the 20$^{th}$ century, Empire Spit was a continuous feature. The system is very dynamic, and the breaches were historically short-lived. Restoring the dune to one continuous feature is not expected to have any major effects to the geology and soils in the area.

Borrow Sites

Existing subtidal habitat in the North Channel borrow site(s) would be dredged to a greater depth than that which currently exists. However, the area of the primary borrow site, just offshore of Empire Spit is currently shoaling at a rate of greater than one million cubic yards/year, or almost 20 times the rate required to provide a supply of sand for the dune construction and periodic nourishment. As long as the natural accretion of sand at this location rapidly replaces the material being removed for periodic nourishment of the dune, this area appears to be an excellent (primary) borrow site for the dune restoration alternative. The primary borrow site is located on the north side of the North Channel (see Figure 6). However, the shoaling patterns are extremely variable. Monitoring of the borrow site will be required to ensure that this is the optimum borrow site location over time, and that the volume of material being removed does not significantly alter the tidal flow patterns or change the general trend of the channel thalwag movement away from the North Cove area.

Material will not be removed from the primary site if bathymetric surveys indicate that the rate of natural accretion has decreased significantly. In the event that material cannot be obtained from the primary borrow site, an alternate (secondary) borrow site is located on the south side of the North Channel (see Figure 6). Sediment is now eroding from the vicinity of the secondary site at a rate of over 3.5 million cy/yr. Borrowing 250,000 cy every five years from this area is not expected to have any detectable effect on the ongoing sediment transport processes.

A similar procedure was accomplished very successfully in 1998 to construct a 350,000 cy beach fill for the State Route (SR) 105 Emergency Stabilization Project which is located to the west of Graveyard Spit. The SR-105 borrow site was located on the north side of the Willapa North Channel, and the sand was pumped approximately 7,000 feet. The SR-105 borrow site is located to the west of the proposed primary borrow site identified for the barrier dune restoration (see Figure 5.1). The SR-105 borrow site was originally located in water depths of 20 to 50 feet, and the volume of material that was dredged appears to be "background noise" compared to the natural bathymetric changes that have taken place.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Impacts from the dune restoration will be as previously described. The flood berm extensions to create a continuous protective structure of 8,470 feet will utilize similar materials to that composing the existing flood berm. Placed armor stone may prevent erosion of the soils and bank adjacent to Highway 105.

### *4.1.2. Surface Water*

*Alternative 1, No Action Alternative*

The level of wave protection currently provided by the eroded barrier dune was evaluated by the Corps' Coastal and Hydraulics Laboratory (CHL), the U.S. Geological Survey, and the Washington Department of Ecology. Since the extreme maximum tides are always associated with low atmospheric pressure events, storm extreme tides are almost always accompanied by

storm wave conditions[5]. A numerical model was used by CHL to evaluate wave heights along the Shoalwater Reservation/ Tokeland Peninsula shoreline for the "with" and "without" dune conditions for a storm and extreme +13.61 feet mean lower low water (MLLW) tide that occurred on March 3, 1999. The model results indicate that the 1999 storm probably generated waves at the shoreline that were approximately 1.5 feet high.

The numerical model was also used to simulate the same storm assuming that the barrier dune was eroded to the elevation of the surrounding land (+8 feet MLLW). Model results indicate that, without the protection of the dune, wave heights at the shoreline would more than double to as much as 3.3 feet. The March 3, 1999, storm caused severe flooding and resulted in the initiation of an "emergency flood protection planning process." As a consequence, in March 2001, the Corps constructed a riprap flood berm along 1,720 feet of the Shoalwater Reservation shoreline. The existing flood berm was extended an additional 450 feet in early December 2007 in response to an extreme storm event and associated, anticipated localized flooding. While this segment of flood berm provides flood protection for areas directly behind it, the structure fails to address flooding in adjacent shoreline areas that are not fronted by the dune. Portions of the shoreline that are not protected by the 1,720 foot-long revetment will continue to be overtopped, causing flooding of all the low lying backshore areas of the Shoalwater Reservation with elevations lower than approximately +15 feet MLLW. A topographic survey map illustrates the extent of flooding that can be expected during storm events during which the tide elevation exceeds approximately +13 feet MLLW (Figure 5). High tides exceeding about +13 feet occurred 11 times between 1970 and 2007, and tides at or above +13 feet occurred four times between the years 2002 and 2007. Even if the frequency of high tides remains constant, erosion and lowering of the dunes due to erosion will continue. The limited wave protection currently afforded by the eroded barrier dune will continue to decrease, and flooding of the Shoalwater Reservation and adjoining lands will occur at increasingly frequent intervals.

The no action alternative would also likely result in further in-filling of North Cove due to wave overwash of the barrier dune, decreasing the surface area covered by tidal fluctuation and flushing. The area of North Cove was approximately 550 acres in 2003; it has steadily declined since then (Corps, 2007). Less frequent flushing could result in increased water temperature in the cove, especially during summer months.

*Alternative 6, Barrier Dune Restoration*

Closing the breaches in the barrier dune (Empire Spit) will alter the flow of surface waters in North Cove. Potential impacts to North Cove hydraulics as a result of the breach fills were modeled by the Corps (2007) using the ADvanced CIRCulation (ADCIRC) numerical model. That analysis determined that the inlet between Graveyard Spit and the center Empire Spit Island was well developed and essential to circulation in the western portion of the embayment. Well defined inlets located at the eastern and western edges of the embayment will be left intact. Circulation in the intertidal area is not expected to be adversely affected.

[5] Tide records are available from a NOAA tide station located at nearby Toke Point.

The barrier dune nourishment will restore the dune similar to the 1994 configuration prior to the breaches through the Empire Spit islands. The configuration prior to 1994 resulted in a relatively stable and self maintaining inlet into North Cove. With this configuration, currents through the two North Cove inlets were large enough to scour the sediment supplied to the southeast via littoral drift. Following the breaches, tidal velocities through the eastern North Cove inlet became too weak to scour the sediment on the distal end of the eastern island. This caused sand to accumulate and forced the North Cove entrance channel to migrate toward the shoreline. The eastern inlet has shortened in width ever since the breaches developed in Empire Spit. Reduced current velocities are not capable of scouring newly deposited sands transported via littoral drift. When these breaches are filled, the conveyance and current velocity through the eastern inlet will increase. An existing revetted shoreline and pile dike structure on the Tokeland Peninsula side of the eastern inlet will likely cause the inlet to progress toward the Empire Spit side of the channel as the system re-equilibrates.

Impacts to water quality are not expected to result from the proposed project. Turbidity is not expected to increase substantially above ambient conditions due to the predominately sandy nature of the dredged material, and the large quantities of suspended sand currently transported via longshore drift in the project area.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Impacts from this alternative will be similar to those described for the dune restoration only alternative. The flood berm will be porous by design, but there is the potential that the berm could inhibit runoff from uplands and exacerbate rainfall-induced inundation of low-lying areas of the Tokeland Peninsula.

### *4.1.3. Plant Communities*

*Alternative 1, No-Action Alternative*

The no-action alternative would not have any major effects on plant communities. The continued erosion of the barrier dune might limit areas of vegetation. Non-native species may continue to flourish in the project area. However, WDFW has an established program to control the invasive exotic salt marsh grass *Spartina* in Willapa Bay. The established program is part of an ongoing multi-agency *Spartina* control effort in Willapa Bay that involves mechanical mowing and chemical treatment (DNR, 2007). There have also been recent efforts to establish a biological control program using the insect *Prokelisia marginata*, a natural enemy of *Spartina* from the Atlantic Coast. Currently, there are four regions of Willapa Bay where *P. marginata* populations are well established and expanding, including North Cove (Grevstad, 2005).

*Alternative 6, Barrier Dune Restoration*

Portions of the existing barrier dune are well vegetated with dune grass, primarily European dune grass (*Ammophila arenia)* but with some American dune grass (*Elymus mollis*) intermixed. The overwash area between the high portions of the dune is unvegetated. The barrier dune restoration will result in approximately 11 acres of sand placement above the OHWM; the majority of this area is vegetated as described above. The proposed dune restoration will bury any existing vegetation; however, the finished restored dune would be planted in selected areas

with the native [American] dune grass. Similar plantings of native dune grass at the South Jetty near Westport, WA have been very successful and robust and function to limit wind-driven erosion as well as provide increased wildlife habitat. Plantings would also be done as necessary to re-establish any vegetation on the North Cove side of the dune that is buried during periodic dune re-nourishment.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Impacts from the dune restoration will be as previously described. Extension of the flood berm both to the north and the south of the existing flood berm would result in extensive wetland impacts. In its current proposed alignment, the footprint of the flood berm would permanently impact 7.01 acres of estuarine wetlands, out of a total 8.08 acre footprint. There would also be temporary wetland impacts associated with the construction. If this alternative were pursued, alternative alignments and flood reduction/erosion protection options would be examined to avoid and minimize the extent of the wetland impacts to the greatest extent possible. Once avoidance and minimization has been demonstrated, the Corps would look to mitigate the remaining impacts. At this time, mitigation has not been identified because the Corps is not actively pursuing this alternative. If the restored barrier dune (the preferred alternative) fails to provide adequate protection to the Shoalwater Reservation, the Corps will reevaluate the situation and prepare a supplemental environmental assessment that would reevaluate this alternative, its impacts, and the potential for innovative mitigative actions.

### *4.1.4. Fish and Aquatic Species*

*Alternative 1, No-Action Alternative*

In the absence of a project, aquatic species that are dependant upon current habitat conditions would likely continue to be impacted by existing and future eroding conditions (USFWS 2006).

*Alternative 6, Barrier Dune Restoration*

Fish

During dredging and pumping activities, most fish would likely re-locate to other areas of Willapa Bay, with negligible impacts to their fitness or survival. The work would be done with a hydraulic dredge, and some fish are likely to be entrained, or suctioned into the dredge with the sediment slurry. In a review of ten years (1979-1989) of entrainment data from Grays Harbor, McGraw and Armstrong (1990) identified twenty-eight species of fish in entrainment samples. Pacific sand lance were entrained at the highest rate (between 1 and 594 fish per 1000 cy dredged), followed by Pacific staghorn sculpin (between 7 and 92 per 1000 cy) and Pacific sanddab (between 3 and 76 per 1000 cy).

Accordingly, dredging would likely entrain relatively large numbers of staghorn sculpin, flatfish, and sand lance. The rate of entrainment of other species would likely be lower based on their observed abundance (Hunt *et al.*, 2009) and vulnerability to entrainment in the hydraulic dredge. The maximum observed rate of entrainment of sand lance in Grays Harbor of 594 per 1000 cy would likely not be sustained throughout the entire dredging period, if it is met at all; a more typical entrainment rate would be less than 100 per 1000 cy. Entrainment rates for sand lance would be highest between dusk and dawn, as they burrow into sandy sea floor habitat at night to

hide from predators then emerge to feed during daylight (Hobson, 1986). McGraw and Armstrong (1990) found that sand lance entrainment rates in Grays Harbor display some seasonality, increasing during the summer months and declining in the fall and winter. An entrainment study on the Columbia River found that the average number of sand lance entrained was low in the month of May, increased in the summer months to a peak in August, then declined to near zero during October (Larson and Moehl, 1988). This seasonality is confirmed by the observed fish densities during the 2008 trawling, with the relatively high fish densities at the borrow sites from July through September (with peak densities in August) and lower densities in October.

Although no comprehensive biological studies of outer coast sand lance stocks have been undertaken to determine if the observed mortality rates have a significant effect on the population dynamics of sand lance in Willapa Bay, the Corps expects that cumulative impacts to the forage fish resource will be relatively minor given the temporary nature of the dredging and the limited geographic extent of the borrow sites. Furthermore, a 2004 study in the Fraser River found no consistent sand lance catch rate differences between control and dredge sites before and after dredging activities, indicating that population effects are short term, with rapid recruitment into the dredged sites after disturbance (Fraser River Estuary Management Program, 2006). Impacts to other fish species are expected to be similarly negligible in terms of population dynamics.

Conditions for most forage fish species may be temporarily degraded by turbidity associated with dredging and disposal operations, but will likely return to baseline conditions upon completion of the dredging work.

The placement of sand for the barrier dune restoration is not expected to impact forage fish spawning. Surf smelt and sand lance spawning has not been documented on Empire Spit. The closest documented herring spawning grounds in Willapa Bay are located on the east side of the Long Beach peninsula and approximately 7 miles south of North Cove (Bargmann 1998). Finally, no net change to the quality or quantity of available spawning habitat is expected as a result of the sand placement. Dredged sand placed on the beach will be similar to sand that currently comprises the beach. Although greater than 9 acres of area below MHHW will be covered as a result of the sand placement, the beach profile will simply be shifted further to the west. Wave action will quickly reshape the face of the dune to natural slopes.

To reduce entrainment and the generation of turbidity, the hydraulic dredge will only be operated with the intake at or below the surface of the material being removed, and the intake will only be raised a maximum of three feet above the bed for brief periods of purging or flushing of the intake system. The 2008 trawl data indicates that fish abundance and corresponding fish entrainment may be less at the East Borrow site. Until construction, the Corps will continue to evaluate sediment availability, dredging logistics, and biological impacts at either borrow site in an effort to optimize the benefits and minimize the impacts of the dredging for initial construction and subsequent maintenance events.

Crabs

The proposed dredging would occur between the July and October window. In 2008, the Corps completed trawling during the July-October dredging period to determine crab densities. Additional trawls may be conducted just prior to and/or concurrent with the proposed dredging action, including periodic nourishment, to obtain real-time data on the abundance and distribution of Dungeness crab within the project area at the time the work is performed.

Based on the 2008 data, crab abundance appears similar to what would be expected for coastal bar habitats at Grays Harbor and the Columbia River (in contrast to relatively lower crab abundance expected in inner harbor areas). The 2008 data indicate that various life stages from recently settled crab larvae through adults occur in the borrow areas throughout the proposed dredging window. The Corps is currently analyzing the crab abundance data to estimate loss to crab during proposed dredging activities. Until construction, the Corps will continue to evaluate sediment availability, dredging logistics, and biological impacts at either borrow site in an effort to optimize the benefits and minimize the impacts of the dredging for initial construction and subsequent maintenance events.

To the extent possible, the timing of dredging within the window will be adjusted to minimize impacts to Dungeness crab. Unavoidable impacts of the dredging on Dungeness crabs will be evaluated in coordination with Tribal, state, and Federal agencies to minimize impacts through adaptive management. Impact minimization and avoidance measures may include timing the dredging to occur during periods of least crab abundance, use of equipment or techniques that minimize potential crab entrainment during dredging, and actions intended to increase crab productivity in the area such as placing oyster shell on intertidal mud flats or estuarine restoration in Willapa Bay to improve survival of larval and juvenile crabs. This method is currently used by the Corps in Grays Harbor to compensate for the loss of crab from dredging activities in the Federal navigation channel in Grays Harbor (Corps 2006b). The Corps will also investigate the potential for minimizing or avoiding future impacts to crabs associated with periodic nourishment through potential placement of some dredged material near the shore in areas north of the project, which may provide a sediment source for the barrier dune system and thereby increase the interval between maintenance events.

Benthic Community

Given the magnitude of the sediment movement at the borrow sites, it is unlikely that a stable benthic community exists. The community is likely to be one that responds quickly to disturbance events. Based on the results of studies (McCauley *et al.* 1977, Swartz *et al.* 1980, Albright and Borithilette 1981, Romberg *et al.* 1995, Wilson and Romberg 1996, Jones and Stokes 1998, all in Pacific International Engineering and Pentec Environmental 1999), the subtidal benthic community within the dredge footprint is expected to recover within 1 to 3 years following dredging. The reproductive biology of this community provides for some spawning in all seasons. Re-colonization by some species will occur immediately following the dredging activity. Adjacent undisturbed habitat will provide a continuing source of organisms to colonize the newly disturbed subtidal substrate through migration and spawning (Pacific International Engineering and Pentec Environmental 1999).

Impacts from the dune restoration would likely include the initial burial of sessile or slow-moving epibenthic and infaunal organisms in the immediate placement areas. Re-colonization of these sites is expected to be relatively rapid (about 1-2 years) as they can be easily accessed and colonized by nearby species. Most of the organisms that exist on the face of the barrier dune should be acclimated to a high energy, sand-shifting environment, so that these species should quickly recolonize the new dune face. Finally, no net change to the quality or quantity of available habitat is expected as a result of the sand placement. Dredged sand placed on the intertidal beach will be similar in composition to sand that currently comprises the dune construction beach area. Although greater than 9 acres of area below MHHW will be covered as a result of the sand placement, the beach profile will simply be shifted further to the west as wave action reshapes the beach. Consequently a similar benthic community to that existing at present is expected to be present within 1-3 years following the initial dune construction.

At each re-nourishment, placement of new sand would likely bury some organisms in the intertidal zone, although the Corps expects acreage of intertidal affected by the re-nourishment to be substantially less than affected by the initial placement. Re-establishment of the benthic community following re-nourishment is expected to be substantially more rapid due to the smaller degree of disturbance of the benthic community. Given the dynamic nature of coastal sand beaches, the degree of benthic disturbance from re-nourishment would likely be comparable to that experienced during a larger coastal storm.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Impacts from the dune restoration will be as previously described. Construction of the flood berm extension would have limited impacts to fish and intertidal invertebrate species as only approximately 350ft of the approximate 6,770 foot berm extension would be below MHHW. The berm would also be planted with native vegetation to provide food, shading, and habitat for nearby aquatic species.

### *4.1.5. Wildlife*

*Alternative 1, No-Action Alternative*

In the absence of a project, wildlife species that are dependant upon current habitat conditions would likely continue to be impacted by existing and future eroding conditions (USFWS 2006).

*Alternative 6, Barrier Dune Restoration*

Barrier dune restoration is not expected to adversely impact wildlife that live in or otherwise utilize North Cove. Historical records indicate that the barrier dune has been a more or less contiguous feature for the majority of the 20$^{th}$ century, with periodic, short-lived breaches. The barrier dune system is very dynamic. Wildlife populations that utilize the project area will be temporarily displaced as a result of the construction associated with the restoration, but are expected to return upon completion of dune construction. The completion of the project will help to maintain the existing tidal flat habitat in North Cove habitat that is essential to many of the current waterfowl and wildlife inhabitants. No significant impacts are expected to the quantity or type of wildlife that occur in the area. Construction of the barrier dune could have

minor, short-term impacts to wildlife due to increased noise and turbidity in the project area. However, construction would occur in accordance with the Washington Department of Fish and Wildlife approved construction windows to minimize impacts to wildlife species during sensitive life stages. The completion of the project will help to maintain and restore the existing tidal flat habitat in North Cove habitat that is essential to many of the current waterfowl and wildlife inhabitants.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Impacts associated with the alternative will be similar to those described for the barrier dune restoration. In addition, the presence of the flood berm may act as a barrier to some types of wildlife and serve to fragment habitat along the shoreline.

#### *4.1.6. Threatened and Endangered Species*

*Alternative 1, No-Action Alternative*

The no-action alternative is not likely to have any major effects on endangered species; however, it is possible that continued erosion of the dune would result in a loss of potential habitat for the Western snowy plover.

*Alternative 6, Barrier Dune Restoration*

Refer to the following paragraph titled Alternative 7, Dune Restoration with Flood Berm Extension for a discussion regarding project impacts to threatened and endangered species.

*Alternative 7, Dune Restoration with Flood Berm Extension*

The Corps prepared a BE (Corps, 2006a) describing the potential effects of this alternative and submitted the document to the NMFS and USFWS for review. The BE determined that the dune restoration, flood berm extension, and relocation of the southern North Cove channel (see Section 2.4.3) would not have any major effects on the listed species currently found in the project area. A summary of the effect determinations can be found in Table 3.

The Corps received concurrence from USFWS on all project elements (barrier dune, flood berm, and channel relocation) on August 30, 2007. Subsequently, the Corps decided to reduce the project scope to address only the barrier dune restoration. The Corps advised USFWS and NMFS of the change in project scope in October 2007. NMFS concurred with the Corps' effect determinations for the modified project scope on December 12, 2007. USFWS determined that no further consultation was necessary as the impacts associated with the modified project scope are similar to those previously described in the BE.

**Table 3. Effect determination summary.**

| Species | Effect Determination | Critical Habitat Determination |
|---|---|---|
| Brown Pelican | Not likely to adversely affect | Not applicable |
| Marbled Murrelet | Not likely to adversely affect | No effect |
| Western Snowy Plover | Not likely to adversely affect | No effect |
| Northern Spotted Owl | No effect | No effect |
| Short-tailed Albatross | No effect | Not applicable |
| Streaked Horned Lark | Candidate Species[6] | Not applicable |
| Coastal-Puget Sound Bull Trout | Not likely to adversely affect | No effect |
| Green Sturgeon | Not likely to adversely affect | Not likely to adversely modify proposed critical habitat |
| Leatherback, Loggerhead, Green, and Olive Ridley Sea Turtles | No effect | Not applicable |
| Oregon Silverspot Butterfly | No effect | No effect |
| Steller Sea Lion | Not likely to adversely affect | No effect |
| Humpback Whale | Not likely to adversely affect | Not applicable |
| Sperm, Sei, Fin, and Blue Whales | No effect | Not applicable |
| Southern Resident Killer Whale | Not likely to adversely affect | No effect |

Proposed critical habitat for green sturgeon includes the aquatic portions of the project area. The Corps does not believe the work associated with restoration and maintenance of the barrier dune is likely to adversely modify proposed green sturgeon critical habitat since the proposed work will have insignificant and discountable effects on sturgeon prey resources, water flow, water quality, migratory corridors, depths, or sediment quality. In the event that NMFS designates green sturgeon critical habitat in the future, the Corps believes that the proposed work is not likely to adversely affect that habitat provided that the designation is similar to the proposal.

It is important to note that restoration of the barrier dune may further attract snowy plovers to nest on the dune in subsequent years after completion of the project. Therefore, based on the recommendations of the USFWS, the Corps will work to develop a snowy plover monitoring plan to determine plover use of the restored dune. In addition, future maintenance placements of sand will be timed to avoid the snowy plover nesting season to the maximum practicable extent should the birds begin to utilize the barrier dune.

[6] No determination of effect is made for candidate species. However, the Corps does not anticipate negative impacts to Streaked Horn Lark by project implementation. After project completion the restored barrier dune may increase available habitat for streaked horned larks.

## 4.2. ELEMENTS OF THE BUILT ENVIRONMENT

### *4.2.1. Land and Shoreline Use*

*Alternative 1, No-Action Alternative*

The no action alternative is likely to result in continued overwash and loss of barrier dune elevation, and consequently, increased flooding and storm damages on the Shoalwater Reservation and in Dexter-by-the-Sea. Even under current conditions, the barrier dune has eroded to the point that it provides little if any wave attenuation, with the full force of storm-generated waves attacking and overtopping the reservation shoreline. Table 4 summarizes the number of structures at risk of flooding and damage for different magnitude storm surges occurring concurrently with typical high tides (approximately MHHW or 8.9 feet referenced to MLLW) and an extreme high tide (maximum astronomical tide, which is estimated at 11 feet referenced to MLLW[7]). As the tables demonstrate, the no-action alternative results in risks to a substantial percentage of structures under reasonably foreseeable storm conditions.

**Table 4. Percentage of Structures at Flooding Risk at Various Storm Surge Event Occurrence Frequency under the Alternative 1, No-Action Alternative**

| Storm Surge Event Frequency Occurring at MHHW | | | |
|---|---|---|---|
| Flood and Storm Damage Risk | 50% Annual Occurrence | 2% Annual Occurrence | 1% Annual Occurrence |
| Low | 85 | 17 | 12 |
| Medium | 7 | 40 | 35 |
| High | 8 | 43 | 53 |
| **Storm Surge Event Frequency Occurring at Maximum Astronomical Tide** | | | |
| Flood and Storm Damage Risk | 50% Annual Occurrence | 2% Annual Occurrence | 1% Annual Occurrence |
| Low | 9 | 8 | 8 |
| Medium | 35 | 12 | 12 |
| High | 56 | 80 | 80 |

The Corps has also estimated the amount of flood and storm damage under the no-action alternative for a storm identical to the March 3, 1999 storm, the storm of record. If such a storm were to recur in the future under the no-action alternative, 24 structures would be at high risk of damage, 19 would be at a medium risk, and 44 would be at low risk.

Increased flooding and storm damages are likely to depress new construction activities and may result in abandonment of existing structures and infrastructure due to the risk to life and safety

[7] For reference, the highest tide in the next two years is forecasted to be 11.15 feet (MLLW) on New Years Day 2010.

and to the expense of rebuilding and restoring in the aftermath of a storm/flooding event. The steep topography of a significant portion of Tribal uplands severely limits the land to which Tribal facilities and housing can be relocated. Developable land is relatively low-lying and immediately adjacent to the shoreline.

*Alternative 6, Barrier Dune Restoration*

Restoring the barrier dune will result in less flooding and storm damages on the Shoalwater Reservation and in Dexter-by-the-Sea during combined high tides and storm events. Due to its location within the 100 year floodplain, the Reservation will always be at risk of flooding. However, the severity of the flooding and the risk of storm damages associated with wave activity at the shoreline should be greatly reduced over the current conditions. For example, analysis indicates that with the barrier dune restoration, a storm identical to the March 3, 1999 storm of record would place no structures at high risk of damage, 5 structures at medium risk of damage, and 44 at low risk of damage.

Reducing the risk of flood and storm damages may result in an increased amount of new construction in the area. There should be no change in land use on the barrier dune itself as a result of the restoration.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Effects under this alternative would be similar to those described for the preferred alternative.

### *4.2.2. SocioEconomics*

*Alternative 1, No-Action Alternative*

The no action alternative is likely to result in continued overwash and loss of barrier dune elevation, and consequently, increased flooding and storm damages on the Shoalwater Reservation and in Dexter-by-the-Sea. Increased flooding and storm damages are likely to depress new construction activities and may result in abandonment of existing structures and infrastructure due to the expense of rebuilding and restoring in the aftermath of a storm/flooding event. This in turn would further depress the local economy and standard of living in the area.

*Alternative 6, Barrier Dune Restoration*

The preferred alternative is expected to reduce flooding and storm damage to the Reservation lands and surrounding areas. This would improve the economic and social conditions on the Shoalwater Bay Reservation and in the Dexter-by-the-Sea community by enabling continued economic growth and development in the area. Navigation in the vicinity of the borrow areas may experience temporary and minor inconveniences during the actual dredging process, but no long-term adverse effects to navigation will occur as a result of the proposed work.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Socioconomic effects under this alternative would be similar to those described for the preferred alternative.

### *4.2.3. Cultural Resources*

*Alternative 1, No-Action Alternative*

Staying and sustaining a viable and vibrant Tribal community will become increasingly difficult – if not impossible – as the frequency and severity of storm damage increases under the future without project condition. The result, over time, is likely to be a disbanding of the community, as storm damages mount to the point that governmental functions and individual Tribal families are forced to relocate to avoid the disruptive effects of increasingly frequent and severe coastal storm flooding and damage. The result will be a once-thriving community that becomes scattered as Tribal members are dispersed. More than likely, they will be forced to locate in a variety of areas, distant from one another. This is a foreign principle to both the Shoalwater Tribe's idea of being a people and to their meaning of "place". The Tribe acknowledges that the loss of "place" amounts to a loss of culture, a loss of spiritual foundation, and a loss of community.

*Barrier Dune Restoration*

Please see the paragraph titled Alternative 7, Dune Restoration with Flood Berm Extension below for a description of potential effects to cultural resources as a result of barrier dune restoration.

*Alternative 7, Dune Restoration with Flood Berm Extension*

The Corps has determined that the proposed project is a Federal undertaking of the type that could affect historic properties and must comply with the requirements of Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended through 2004 (16 USC 470). Section 106 requires that Federal agencies identify and assess the effects of Federal undertakings on historic properties and to consult with others to find acceptable ways to resolve adverse effects. Properties protected under Section 106 are those that are listed or are eligible for listing in the National Register of Historic Places (NRHP). Eligible properties must generally be at least 50 years old, possess integrity of physical characteristics, and meet at least one of four criteria for significance. Regulations implementing Section 106 (36 CFR Part 800) encourage maximum coordination with the environmental review process required by the National Environmental Policy Act (NEPA) and with other statutes. The Washington State Archaeological Sites and Resources Act (RCW 27.53) may also apply.

To comply with Section 106 of the NHPA, a cultural resources investigation has been completed. The project Area of Potential Effect (APE) consists of three discontiguous areas: 1) the alignment of the northern shoreline flood berm extension; 2) the alignment of the southern shoreline flood berm extension; and 3) the dune restoration area. The cultural resources investigation included a search of the Washington Department of Archaeology and Historic Preservation (DAHP) electronic Historic Sites Inventory Database, background and archival research, consultation with the Shoalwater Tribe, pedestrian surveys of all three areas, and excavation of 43 shovel tests in the two flood berm extension APEs. No historic properties listed in the National Register of Historic Places (NRHP) were found to be located in or near the APEs. One cultural resource is listed in the Washington State inventory where it is shown located near one of the APEs. To further identify historic properties, Section 106 of the National

Historic Preservation Act (NHPA; 36 CFR 800.4[a][3]) requires Federal agencies to seek information from tribes likely to have knowledge of, or concerns with, historic properties within the project APEs. Because the project is partially located on Shoalwater Indian Reservation lands the Corps archaeologist has been consulting with the tribe to identify properties that may be of religious or cultural significance, including Traditional Cultural Properties (TCP), and that may be eligible for the NRHP.

The subject of archaeological cultural resources in the vicinity of the project is confidential and has been reported on in a separate document that was submitted to the Washington State Historic Preservation Officer (SHPO) at the DAHP and the Shoalwater Tribe. The report includes an archaeological monitoring plan and a determination by the Corps of No Historic Properties Affected, with the provision that archaeological construction monitoring will be conducted in certain portions of the APEs. If construction activities reveal items that might have historical or archeological value, the Corps will notify the appropriate authorities as well as make a determination of their significance and what, if any, special disposition of the finds should be made. Construction activities that may result in the destruction of these resources shall cease, and employees shall not be allowed to trespass on, remove, or otherwise damage such resources.

#### *4.2.4. Native American Issues*

*Alternative 1, No-Action Alternative*

The no action alternative would allow continued and possibly more frequent flooding of the Shoalwater Bay Tribal reservation. The flooding and storm damages will continue to negatively impact the Tribal members economically, socially, and culturally as some members choose to leave the area.

*Alternative 6, Barrier Dune Restoration*

The preferred alternative is expected to reduce flooding and storm damage to the Reservation lands and surrounding areas. This will improve the economic and social conditions of the Shoalwater Bay Tribe, allowing continued existence and continuation of cultural activities on the Reservation.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Effects under this alternative would be similar to those described for the preferred alternative.

#### *4.2.5. Recreation*

*Alternative 1, No-Action Alternative*

The no-action alternative would likely have harmful long-term effects to recreation in the area. The barrier dune would likely continue to erode, preventing recreational access to the dune. Flooding during storm events would likely limit recreational access to the reservation and surrounding area.

*Alternative 6, Barrier Dune Restoration*

The preferred alternative would likely increase recreational opportunities in the project area. Restoration of the dune would maintain recreational access to the dune. Because the project would provide increased flood protection to the neighboring communities, it would allow for continued recreational access to Shoalwater Bay Reservation during storm events where access to the community otherwise might be limited. No negative impacts to recreational opportunities are expected as a result of the project.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Impacts from the dune restoration will be as previously described. In addition, the expanded flood berm would provide a larger pedestrian access to the waterfront for the local community and visitors. No negative impacts to recreational opportunities are expected as a result of the project.

### *4.2.6. Noise*

*Alternative 1, No-Action Alternative*

The no-action alternative is not anticipated to have any effects on noise levels in the area.

*Alternative 6, Barrier Dune Restoration*

The preferred alternative would have only short term and discountable increases in noise due to the operation of heavy equipment and construction vehicles during the dune construction. The equipment would operate well away from developed areas, and changes in residential noise levels are unlikely. No long-term increases in existing ambient noise levels are expected.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Effects under this alternative would be similar to those described for the preferred alternative.

### *4.2.7. Air Quality*

*Alternative 1, No-Action Alternative*

The no-action alternative is not anticipated to have any effects on air quality.

*Alternative 6, Barrier Dune Restoration*

The proposed action would have short term and discountable effects to air quality due to the operation of heavy equipment and construction vehicles.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Effects under this alternative would be similar to those described for the preferred alternative.

### *4.2.8. Environmental Health/ Hazardous and Toxic Waste*

*Alternative 1, No-Action Alternative*

The no-action alternative is not anticipated to have any major effects on the environmental health of the area. It is possible, however, that without any increased flood protection to the reservation and nearby communities, major flood events could result in overflow situations that could cause common household contaminants to flow into the bay.

*Alternative 6, Barrier Dune Restoration*

Because no surveys found contaminated sites or other contamination within the project area, construction of the preferred alternative is unlikely to affect or be affected by any hazardous or toxic waste. The restoration of the barrier dune will reduce flooding on the Shoalwater Reservation and in the adjacent community, and thus may reduce the transport of household contaminants into the bay.

Sediments from the proposed dredge borrow sites have been tested for contamination and been characterized as suitable for beneficial uses such as this barrier dune restoration.

*Alternative 7, Dune Restoration with Flood Berm Extension*

Because no surveys found contaminated sites or other contamination within the project area, construction of the preferred alternative is unlikely to affect or be affected by any hazardous or toxic waste.

## 5. UNAVOIDABLE ADVERSE EFFECTS

Unavoidable adverse effects associated with this project include:

1. temporary and localized increases in noise and turbidity, which may temporarily disrupt fish, shorebird, waterfowl, and wildlife in the area;
2. temporary and localized disruptions of benthic invertebrate productivity;
3. temporary disruption to recreational and Tribal cultural uses at the project site;
4. temporary loss of 11 acres of barrier dune vegetation.

## 6. MITIGATION

Mitigation for impacts of a proposed action is required under NEPA. According to NEPA's implementing regulations, mitigation measures include the following actions (40 CFR 1509.20):

a. Avoiding the impact altogether by not taking a certain action or parts of an action.
b. Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
c. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
d. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
e. Compensating for the impact by replacing or providing substitute resources or environments.

The preferred alternative includes several mitigative measures that would be employed to avoid and minimize adverse effects, including:

a. All in-water work would occur during approved construction windows. The proposed dredging timeframe reflects the current windows in accordance with guidance, policies, and regulations pursuant to the Endangered Species Act (to protect bull trout) and Washington Hydraulic Code (to protect juvenile salmonids). No in-water work will occur between February 16th and July 15th.
b. All provisions of the Washington Department of Ecology's and EPA's Section 401 Water Quality Certifications will be implemented to minimize turbidity and dissolved oxygen impacts, as well as impacts to commercially important species.
c. To reduce entrainment and the generation of turbidity, the hydraulic dredge will only be operated with the intake at or below the surface of the material being removed, and the intake will only be raised a maximum of three feet above the bed for brief periods of purging or flushing of the intake system.
d. Dredged sediments will remain within the coastal environment, which will allow coastal processes to continue to form habitat for Essential Fish Habitat species and their food sources.
e. The Corps will coordinate with WDFW and USFWS staff to conduct nesting surveys for western snowy plovers at the project site prior to construction. The construction timing and implementation will be adjusted as necessary to avoid impacts to nesting western snowy plovers based on these survey results and coordination with these two agencies.
f. As part of the dune restoration, the Corps will create and enhance suitable nesting habitat for western snowy plovers on the waterward side of the dune system in the project area.
g. The Corps will consult with the Shoalwater Tribe and work with the USFWS to develop a western snowy plover monitoring plan for future monitoring on the barrier dune.
h. Planting of the barrier dune will occur with native vegetation, but only on the backside of the dune to allow approximately 12 acres of the barren nesting conditions preferred by Western snowy plovers on the front slopes of the dunes.
i. Prior to and/or concurrent with the proposed dredging action, including periodic nourishment, the Corps will conduct studies to determine abundance and distribution of Dungeness crabs within the project area. Collected crab abundance data will provide a basis for adaptive management to minimize impacts to crab populations as discussed in Section 4.1.4.

## 7. PUBLIC COORDINATION

The proposed project alternatives have been extensively coordinated with the local communities as well as several resource agencies. A regulatory and resource agency coordination kickoff meeting was conducted by the Corps at the Tribal Center on August 20, 2002. Attendees included representatives from the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, Port of Willapa Harbor, Washington Department of Ecology, Washington Department of Fish and Wildlife, and Shoalwater Bay Tribal Council.

A community meeting was held on May 12, 2004 at the Shoalwater Bay Indian Tribal Center. The purpose of the meeting was to provide the public with detailed information, and to have a dialogue with the public, on the technical study findings and alternatives formulation for the

proposed project. Approximately 40 persons, including Tribal members and persons associated with the Dexter-by-the-Sea and Tokeland communities attended the meeting. Technical study team members making presentations included research scientists from the Corps' Coastal and Hydraulics Laboratory, U.S. Geological Survey's Coastal and Marine Geology Program, Washington Department of Ecology's Coastal Monitoring and Analysis Program, and the Corps Seattle District. State and Federal regulatory agencies represented at the meeting included U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Natural Resources, Washington Department of Ecology, and U. S. Environmental Protection Agency.

Another interagency meeting was held on May 16, 2004 at the Shoalwater Bay Indian Tribal Center. The purpose of the meeting was to discuss environmental aspects and avoidance/mitigation measures associated with Shoalwater project alternatives. The meeting agenda included a description of several alternatives (sea dike, dune restoration, and dune restoration with flood berm extension), design considerations (construction techniques, project footprint below MHHW, maintenance intervals, borrow sources, beneficial use of dredged material), and environmental considerations associated with technically feasible alternatives. The meeting was attended by representatives from the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Fish and Wildlife, Washington Department of Natural Resources, Washington Department of Transportation, Pacific County, and Shoalwater Bay Tribal Council.

A meeting was held on Saturday, July 16, 2005 at the Shoalwater Bay Indian Tribal Center. The meeting was hosted by the Dexter-by-the-Sea property owners association as part of their annual property owners meeting. The meeting was attended by approximately 35 people and included the Shoalwater Bay Tribal Council Chair, the Shoalwater Bay Tribe's project manager, and the Corps' project manager. Strong support for the project was expressed by Dexter-by-the-Sea property owners, based on recognition that both Tribal and non-Tribal residents of area would directly benefit from construction of the project.

A meeting was held on July 22, 2006 at the Shoalwater Bay Indian Tribal Center. The meeting was hosted by the Dexter-by-the-Sea property owners association as part of their annual property owners meeting. The meeting was attended by 34 property owners. The Shoalwater Bay Tribe's project manager briefed attendees on the status of the proposed shoreline erosion control project. Continued strong support for the project was expressed by Dexter-by-the-Sea property owners.

Finally, Seattle District posted the draft EA for public review and comment between January 24, 2007 and February 28, 2007. Subsequently, the project scope was reduced. The Corps posted a notice of intent to prepare the final EA with a preferred alternative of reduced scope for public review and comment between October 31, 2007 and November 30, 2007. Several agencies and individuals provided comments.

# 8. ENVIRONMENTAL COMPLIANCE

## 8.1. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) (42 USC 4321 ET SEQ.)

The purpose of this document is to solicit public comment and fulfill Corps documentation requirements under NEPA. This EA in draft form was posted for public review and comment between January 24, 2007 and February 28, 2007. Subsequently, the project scope was reduced. In order to ensure appropriate public participation, a notice of intent to prepare the final EA was posted for public review and comment between October 31, 2007 and November 30, 2007. Several agencies and individuals provided comments on the draft EA and/or the notice of intent. Please see Appendix A to view the comments and Corps' responses.

## 8.2. ENDANGERED SPECIES ACT OF 1973 (16 USC 1531-1544)

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, Federally funded, constructed, permitted, or licensed projects must take into consideration impacts to Federally listed or proposed threatened or endangered species and designated critical habitat. A Biological Evaluation (BE) was prepared and submitted to NMFS and USFWS in May 2007 for concurrence prior to initiation of construction (Appendix B). See section 4.1.6 for a summary of effect determinations for individual species and any associated designated critical habitat. On 30 August, 2007, the Corps received concurrence from USFWS on the project alternative that included the barrier dune, flood berm, and channel relocation. Subsequently, the Corps decided to reduce the project scope to address only the barrier dune restoration. The Corps advised USFWS and NMFS of the change in project scope in October 2007. NMFS concurred with the Corps' effect determinations for the modified project scope on December 12, 2007. USFWS determined that no further consultation was necessary as the impacts associated with the modified project scope are similar to those previously described in the BE. See Appendix C for the concurrence letters.

## 8.3. CLEAN WATER ACT, AS AMENDED (33 USC 1251 ET SEQ.)

The Clean Water Act requires Federal agencies to protect waters of the United States. The Act prohibits the placement of dredged or fill material into waters of the United States and their adjacent wetlands unless it can be demonstrated there are no practicable alternatives. The Corps has prepared a Section 404(b)(1) Consistency Evaluation (Appendix D) and will acquire a Section 401 water quality certification from the Washington Department of Ecology (WDOE) and the Environmental Protection Agency (EPA) prior to proceeding with the project.

## 8.4. RIVERS AND HARBORS ACT

Navigation may experience temporary and minor inconveniences during the actual dredging process, but no long-term adverse effects to navigation will occur as a result of the proposed work. Accordingly, the work complies with the Rivers and Harbors Act.

## 8.5. COASTAL ZONE MANAGEMENT ACT (16 U.S.C. 1451-1465)

The Coastal Zone Management Act of 1972 as amended requires Federal agencies to carry out their activities in a manner which is consistent to the maximum extent practicable with the enforceable policies of the approved Washington Coastal Zone Management Program. Only the portions of the proposed project that will occur off the Shoalwater Reservation are subject to the

Washington Coastal Zone management program.[8] Accordingly, the Corps has prepared a Coastal Zone Consistency Determination to address the off-reservation portions of the proposed project (Appendix E) and will coordinate this with the WDOE to obtain their concurrence that the work is consistent with the Coastal Zone Management program.

### 8.6. NATIONAL HISTORIC PRESERVATION ACT (16 USC 470 ET SEQ., 110)

Section 106 of the National Historic Preservation Act requires that the effects of proposed actions on sites, buildings, structures, or objects included or eligible for the National Register of Historic Places must be identified and evaluated. As required under Section 106 of the NHPA, the Corps coordinated with the Washington State Department of Archeology and Historic Preservation (DAHP) and consulted with the Shoalwater Bay Indian Tribe. On June 14, 2006, The DAHP concurred with the Corps' finding of No Historic Properties Affected (Appendix F). The DAHP was contacted via email on October 31, 2007 regarding the change in project scope, and that same day concurred that the Corps revised project scope would also not affect historic properties.

### 8.7. CLEAN AIR ACT AS AMENDED (42 USC 7401, ET SEQ.)

The Clean Air Act requires states to develop plans, called State Implementation Plans (SIP), for eliminating or reducing the severity and number of violations of National Ambient Air Quality Standards (NAAQS) while achieving expeditious attainment of the NAAQS. The Act also requires Federal actions to conform to the appropriate SIP. An action that conforms with a SIP is defined as an action that will not: (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The Corps has determined that emissions associated with this project will not exceed EPA's *de minimis* threshold levels (100 tons/year for carbon monoxide and 50 tons/year for ozone).

### 8.8. MAGNUSON STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The project area is located within designated Essential Fish Habitat (EFH) for salmon, groundfish, and coastal pelagic species as designated under the Magnuson Stevens Fishery Conservation and Management Act. The Corps has determined that the proposed project may adversely impact EFH. This determination was included in the BE submitted to the NMFS for review. In a letter dated December 12, 2007 (Appendix C). NMFS concurred with the Corps effect determination for EFH and concluded that the conservation measures proposed in the BE are adequate to avoid, minimize, or otherwise offset potential adverse impacts to EFH.

[8] The Shoalwater Reservation is excluded from the State's coastal zone per 15 CFR Sec. 923.33 (Excluded lands), which states:

> (a) The boundary of a State's coastal zone must exclude lands owned, leased, held in trust or whose use is otherwise by law subject solely to the discretion of the Federal Government, its officers or agents. To meet this requirement, the program must describe, list or map lands or types of lands owned, leased, held in trust or otherwise used solely by Federal agencies.

### 8.9. FISH AND WILDLIFE COORDINATION ACT

The Fish and Wildlife Coordination Act requires Federal agencies to consult with the US Fish & Wildlife Service on any activity that could affect fish or wildlife. On August 23, 2006, the Corps received the final Fish and Wildlife Coordination Report for the Shoalwater Bay Erosion Project. The proposed project includes all conservation measures developed during coordination with the USFWS subsequent to the Coordination Report. The Corps addressed these concerns during the Section 7 ESA consultation, the primary issues concerned the timing of the dune restoration and the extent of dune grass plantings to avoid and minimize impacts to snowy plovers. This coordination resulted in agreement on the timing of construction and the extent of dune grass planting. As documented in Sections 4.1.6 and 8.2, the project has received concurrence from the USFWS that the proposed work is not likely to adversely affect snowy plovers or any other threatened or endangered species under USFWS jurisdiction.

### 8.10. MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT (16 USC 701-715)

The proposed project would be conducted in such a manner that migratory birds would not be harmed or harassed to any significant degree. The proposed work would be outside the nesting season for most birds.

### 8.11. EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE

Executive Order 12898 directs every Federal agency to identify and address disproportionately high and adverse human health or environmental effects of agency programs and activities on minority and low-income populations. This project will not exclude, deny benefits to, or discriminate against minority or low-income populations, nor does the project involve siting a facility that will discharge pollutants or contaminants. The preferred alternative is strongly supported by the Shoalwater Bay Tribe. Therefore the project is in compliance with this order.

### 8.12. EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT GUIDELINES

Executive Order 11988 requires Federal agencies to evaluate the potential effects of actions on floodplains and to avoid undertaking actions that directly or indirectly induce growth in the floodplain or adversely affect natural floodplain values. This Executive Order also directs that proposed projects consider how natural moderation of floods may be attained and promotes the restoration of environmental features that act to modify floods (e.g. wetlands). The proposed project may enable additional development of the Shoalwater Reservation because it will result in less severe flooding of the low-lying areas. However, the barrier dune will only be rebuilt to its historic height. The Corps will not be providing additional protection beyond the historic level that it offered in its pre-eroded state. In addition, the restoration of the barrier dune is a "natural" method of moderating the flood hazard on the Shoalwater Reservation and in the nearby Dexter-by-the-Sea community. Therefore, the project is in compliance with this order.

### 8.13. EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS

Executive Order 11990 directs Federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of

wetlands when undertaking Federal activities and programs. The preferred alternative avoids wetland impacts and will help maintain the historic tidal flats in North Cove.

## 9. CUMULATIVE EFFECTS

As defined by the Council on Environmental Quality implementing regulations for NEPA (40 CFR 1508.7), "cumulative impact" means "the impact on the environment which results from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."

The northern shoreline of Willapa Bay to the west of the project area has changed drastically since the Shoalwater Reservation was established in 1866, (Terich and Levensellar, 1986). Over the last century, portions of the Cape Shoalwater shoreline have retreated more than three miles. As Cape Shoalwater rapidly eroded during the early part of the 20th century, the main spit, which became known as Graveyard Spit, retreated landward to the north-northeast. Comprehensive geologic studies have determined that this long-term shoreline retreat is clearly related to the northerly migration of the entrance channel. By 1985, the channel encountered the erosion-resistant Pleistocene sediments at the base of the terrace bordering the present day State Route (SR) 105, and its northerly migration at this location essentially halted. In fact, since that time, the channel thalweg has migrated slightly to the south.

Presently, Graveyard Spit (located immediately west of Empire Spit) exists as a thin and fragmented landform that is anchored and aligned by consolidated and erosion-resistant Pleistocene substrate in the vicinity of the SR 105 emergency stabilization project groin. Extending to the east of Graveyard Spit is Empire Spit, a series of segmented sand islands. In contrast to historical conditions, this fragile line of barrier dunes no longer appears to receive sand supply from the eroding beach plain to the northwest. The lack of sand supply indicates that this landform will remain of low relief, compromising its historical function as a flood barrier for the Tokeland Peninsula.

Shoreline retreat along this northwest corner of North Cove has slowed substantially relative to historical rates of change, but the present condition and orientation of the spit suggest that it will continue to pivot towards the north-northeast from its hinge point at the base of the Pleistocene terrace. Thus, the present condition of the spit is locally controlled by the geological framework of the region. However, the alignment, depth and extent of the consolidated-erosion resistant substrate is not completely known, and recent erosion trends along selected cross-sections of the area suggest that the shoreline may pivot landward about this southeasterly point.

The present situation suggests that Graveyard and Empire Spits will likely continue their landward retreat, particularly as the crest elevation and width of the spit and associated island continues to diminish. The geometry and position of the main channel does not appear to have a significant or direct influence on the present shoreline behavior.

Numerous projects have been undertaken in the local area in an effort to reduce the impacts associated with the coastal erosion processes discussed above. Impacts include not only the

erosion that has occurred and is on-going, but also the increased flooding and storm damages on the Shoalwater Reservation and adjacent community due to the deterioration of barrier dunes.

The March 3, 1999 storm caused severe flooding and resulted in the initiation of an emergency flood protection planning process by the Corps Seattle District Emergency Management Branch. Subsequently, in March 2001, a 1,700-foot-long riprap flood berm segment was constructed along the Shoalwater Reservation shoreline under the Corps' flood fight emergency response authority. The existing flood berm was extended an additional 450 feet in early December 2007 in response to an extreme storm event and associated anticipated localized flooding. While this segment of flood berm provides protection to this segment of the Shoalwater Reservation shoreline from direct wave attack, the structure fails to address flooding caused by storm wave overtopping of the adjacent Reservation shoreline areas. Portions of the shoreline that are not protected by the 1,700 foot-long flood berm will continue to be overtopped, causing flooding of all the low lying backshore areas of the Shoalwater Reservation with elevations lower than +15 feet MLLW. The implementation of the preferred alternative (barrier dune restoration only) will significantly reduce flooding and erosion on the upland portions of the Shoalwater Reservation and in the Dexter-by-the-Sea community. Reestablishing the barrier dune will also protect intertidal habitat in North Cove from further infilling and loss due to storm waves that overwash the Empire Spit barrier dune.

In addition to the above mentioned Corps project, the Washington Department of Transportation has constructed numerous projects immediately north of the proposed project area in attempts to protect State Route (SR) 105 from coastal erosion damage. Over the long term, SR 105 in the vicinity of milepost 20 has been eroding due to powerful currents, wave action, and storm events. In 1998, WSDOT constructed the SR 105 Emergency Stabilization Project. Most recently, WSDOT crews finished the SR 105 Emergency Embankment project in an area that became unstable in December 2005 when high tides eroded the bank along the westbound lane of SR 105. In October 2006, WSDOT repaired 100 feet of the embankment and constructed an additional 500 feet of bank protection using rock and timbers found on site. No work has occurred in the interim, but if additional erosion occurs at the toe of the road, it is probable that WSDOT will extend the bank protection farther south towards the Shoalwater Reservation. More information on WSDOT projects can be found on the world-wide-web at http://www.wsdot.wa.gov/**.** Possible impacts from these projects could also include the minor loss of some existing vegetation and a minor loss of some benthic production in the project areas.

In October – December 2000, the Corps placed approximately 130,000 cy of maintenance dredged material from Toke Point at a beneficial use site located immediately offshore of the North Cove islands. The material was placed in the hope that it would help to reduce the rate of erosion of the barrier dunes. Intensive monitoring was conducted within the disposal site. Survey results indicate that material was accumulating within the disposal site, but that material was not being transported landward onto the upper beach. Consequently, little change has taken place within the site since the initial placement. The placement of maintenance dredged material appears to have no disadvantages, and continuing to place suitable maintenance dredged material in the vicinity of the primary borrow site would help to offset the material being borrowed for

the dune maintenance. The Federal entrance channel and the mooring basin at Toke Point have shoaled extensively and should be dredged, but the Corps currently does not have the budget to conduct the dredging. If funds become available, it is likely that Corps will dredge this area in the summer of 2009. If dredging occurs, beneficial use of the spoils as conducted in 2000 will likely occur.

The barrier dune will require periodic nourishment to maintain its function of blocking wave action into North Cove. To replace sand lost to coastal erosion and maintain the barrier dune width and height necessary to protect the Shoalwater Reservation from coastal flooding and erosion, the Corps would maintain the barrier dune approximately every five years by dredging approximately 250,000 cy from the Willapa Bay channel and placing the dredged material on the restored dune. The shoaling at the primary borrow site appears to be of sufficient magnitude to easily support this relatively small quantity of material required for periodic nourishment. Impacts associated with the maintenance dredging will be as described in Section 4.1.1 and are expected to be minor and temporary in nature. No long term cumulative impacts from this action are expected due to the dynamic nature of the sediment movement in the channel.

Considering the magnitude of the coastal processes that have occurred and are ongoing in the project area, restoration and nourishment of the barrier dune (Empire Spit) will not result in significant cumulative effects. The barrier dune is a naturally occurring feature that maintained a more or less stable configuration for the majority of the 20$^{th}$ century until its sand supply was diminished. Nourishing the barrier dune with sand from the nearby channel mimics the natural process that occurred until recently.

Cumulative effects on the natural environment are not expected to increase and may actually decrease due to the proposed barrier dune restoration. The mitigation measures implemented to ameliorate negative effects act to further reduce the cumulative impacts of this project. The human environment will benefit by the proposed action and associated future maintenance dredging actions through the reduction of storm damages and associated flooding on the Shoalwater Reservation and in Dexter-by-the-Sea. In the context of past, present, and reasonably foreseeable actions, the implementation of the preferred alternative will not result in significant cumulative effects.

*Alternative 7, Dune Restoration with Flood Berm Extension*
If pursued, extension of the flood berm both to the north and the south of the existing flood berm would result in extensive wetland impacts. At this time, the Corps is not actively pursuing this alternative. If the restored barrier dune fails to provide adequate protection to the Shoalwater Reservation, the Corps will reconsider this alternative and prepare a supplemental environmental assessment that fully evaluates the degree and magnitude of this alternative's impacts, contributions to cumulative impacts, and any mitigation options. Construction of the extended flood berm would add to cumulative impacts of shoreline armoring associated with Toke Point to the southeast and State Route 105 to the north.

## 10. CONCLUSION

Based on the preceding analysis, the proposed dune restoration is not a major Federal action significantly affecting the quality of the human environment, thus preparation of an Environmental Impact Statement is not required. It is the conclusion of this EA that the preferred alternative is dune restoration, the impacts of such construction on the environment are short-term, temporary, and insignificant, and project benefits, including the dune restoration and flood damage reduction are substantive and in the public interest.

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# Appendix A: Response to Public Review Comments

# Response to Public Review Comments
# Shoalwater Bay Shoreline Erosion Project, Washington

The Corps provided multiple opportunities for public review and comment on the proposed project, as follows:

- The Corps circulated a Draft Environmental Assessment (EA) for review and comment from January 24, 2007, through February 28, 2007;
- The Corps circulated the Draft Decision Document and its Draft Engineering Analysis and Design Appendix for review and comment from March 7, 2007, through April 6, 2007;
- Forty-five people attended and two people submitted written comments at a public meeting held by the Corps the evening of March 29, 2007, at the Shoalwater Administration Building Meeting Room; and
- The Corps circulated a Notice of Preparation (NoP) regarding preparation of the final EA with a revised preferred alternative that focused work only on restoration of the barrier dune; the NoP comment period was October 31, 2007, through November 30, 2007.

These opportunities generated comments from Pacific County, Washington Department of Ecology (WDE), Washington Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service (USFWS), and three private citizens. These comments are listed below *in italics*, with Corps of Engineers responses **in bold type**. Where we received several similar comments from the same commenter in different letters, we've grouped the comments together and provided a single response.

Pacific County Comment 1:
*…you will need to obtain a Shorelines Permit from Pacific County for all work conducted off of Tribal Lands.*

Response:
**The Corps has prepared a Coastal Zone Consistency Determination to comply with the Coastal Zone Management Act. The Corps will not obtain a shoreline permit from Pacific County because applicable Federal law prohibits application of the permit system to Federal agencies. The Federal government cannot be regulated or required to obtain a permit by a State or local government unless the Federal government has waived its sovereign immunity (reference Supremacy Clause of the U.S. Constitution, article VI, clause 2). The Coastal Zone Management Act (CZMA) does not contain such a waiver.**

Washington Department of Ecology Comment 1:
*Because of the combination of tribal and non-tribal property on the project site, permitting issues will be a little more complicated than is typical. This will require a high degree of coordination between the Corps, the Tribe, the County, the EPA, and the state (DNR, DFW, and DOE). We have the responsibility of evaluating potential shoreline and wetland impacts, on non-tribal land, associated with this project.*

Response:
**Comment noted. The Corps will work with the stakeholders and agencies mentioned above to assure that the necessary environmental permitting is complete prior to construction and that the reasonable potential impacts to shorelines and wetlands are evaluated and considered.**

Washington Department of Ecology Comment 2:
*Our primary concern is likely to be the construction of the flood berm extension. The Draft EA presents information of the deposition of berm material below MHHW (350 sq ft); however, our jurisdiction is set by the Shoreline Management Act (SMA, Chapter 90.58 RCW) as the Ordinary High Water Mark (OHWM), which often extends landward of MHHW. The OHWM is a biological line based on vegetation, soil, and hydrology. If an OHWM cannot be found, we will default to MHHW (RCW 90.58.030(1)(b)). Under the state Water Pollution Control Act (Chapter 90.48 RCW), our Section 401 Water Quality Certification will extend to potential impacts to all waters of the state affected by this project.…*

*The preferred alternative calls for an additional 6,770 linear feet of flood berm placed north and south of the existing berm. We will need a more detailed description of the existing conditions where the berm will be placed; especially for those areas above MHHW and waterward of the built environment, if appropriate. We encourage you to design the berm in a manner that minimizes or avoids intrusion into the North Cove below the OHWM. If there are impacts to shorelines or wetlands associated with this project, we also expect that appropriate mitigation will be identified.*

Response:
**After reviewing additional information, the Corps has determined that the preferred alternative will not include the flood berm extension due to associated, extensive estuarine and freshwater wetland impacts. The new preferred alternative (alternative 6) which is barrier dune restoration only has no associated wetland impacts yet it affords the same degree of coastal erosion protection to the Shoalwater Reservation. Incidentally, it also provides protection to the Dexter-by-the-Sea community.**

**For portions of the project that lie outside of the Reservation boundary, approximately 24 acres of the barrier dune restoration lie below the OHWM. This area consists primarily of sand beach. Please see the EA for a complete description of the project area and associated impacts. Because the project consists of the restoration of the barrier dune, the Corps considers the project to be self-mitigating.**

Washington Department of Ecology Comment 3:
*As you know, I've had some involvement with this project in terms of evaluation of the problem and to some extent, recommendation of potential solutions. Overall I think the project is a good one in that it primarily uses sand (and native vegetation) to partially restore the eroded barrier spit in front of Tokeland and provide some measure of stability to a unique and disappearing tidal flats and salt marsh, the last remnants of North Cove. As a backup, there is a flood berm proposed that is for the most part above MHHW level to be constructed along the Tokeland Peninsula. Together, this project offers increased flood and erosion protection to the Tribe and neighboring communities, and it does not appear to me to have a significant environmental impact, and, at least for the dune restoration portion, likely provides some environmental benefits/enhancements.*

Response:
**Comment noted and appreciated. It was an interagency objective from the outset to formulate a technically feasible project that had as many environmental benefits as possible. Please see our response to comment 2 above for information regarding the new preferred alternative.**

Washington Department of Ecology Comment 4:
*One apparent modification to the original draft 'preferred alternative' is the relocation of the North Cove channel 1,000 feet westward, involving excavation of 100,000 CY of sand. I think the Corps should have provided an evaluation of both the need for and the feasibility of that proposed channel relocation. The USGS developed a very good sediment transport and morphology change model for the project area, so technically there is/was a means to objectively evaluate channel stability and the apparent Tribal concerns about the potential for increased flow to cause erosion along the Tokeland Peninsula. It is unfortunate that the flows and morphology change of North Cove were not fully evaluated in the studies leading up to this proposal.*

Response:
**The Corps has removed this project component from the preferred alternative. The project will consist solely of the barrier dune restoration. However, the final EA does include an evaluation of the alternative that includes the channel relocation and describes the rationale for, and description of, relocation of the North Cove embayment tidal channel in Paragraph 4.3.2 of the Engineering Analysis and Design analysis for the project (Appendix 1 of the Project Decision Document). Due to erosion and breaching of the barrier dune, the flow through the tidal channel has diminished such that the channel has migrated against the Tokeland peninsula shoreline, resulting in significant shoreline erosion. Relocation of the tidal channel outlet to its former position would preclude the increased tidal flow following dune restoration from exacerbating the shoreline erosion at this location. If the Corps is given authority to evaluate ecosystem restoration opportunities in North Cove, we do plan to fully evaluate the flows and morphology in order to formulate and evaluate ecosystem restoration alternative plans for restoring shallow subtidal and intertidal habitat in North Cove.**

Washington Department of Ecology Comment 5:

*The other, and much more minor issue I see is related to the borrow site. Compared to the amount of sand in transit, the total amount of sand needed for construction and maintenance of the dune project is small. However, it would be preferable to use a borrow site from the south/west side of the channel (such as the secondary site) rather than the north/east side of the channel (such as the primary site) because: (a) it is better to use sand coming from the ocean/entrance, and (b) it is better to keep the accreting shelf left undisturbed because the more it accretes, the more protection it offers to the dune/spit.*

*The potential additional cost of dredging/pumping from farther away is uncertain, but pumping sand from the opposite side of the channel is feasible. The Corps acknowledges that the SR-105 borrow site for the groin project was located on the south side of the Willapa North Channel, approximately 6,000 feet north of the proposed secondary borrow site for the barrier dune restoration. For that project, some 300,000 CY of dredged sand was pumped approximately 9,000 feet.*

Response:

**Comment is noted. Selection of sand borrow sites for barrier dune restoration initial construction and periodic nourishment alike, including monitoring prior to actual site selection, is described in detail in Section 5.0 of the Engineering Analysis and Design analysis for the project. As noted in Paragraph 5.1 of the Appendix, material will not be removed from the primary borrow site if bathymetric surveys prior to dredging indicate that the rate of natural accretion has decreased significantly. In that case, the secondary site, located on the south side of the Willapa North Channel will be utilized.**

Washington Department of Ecology Comment 6:

*As to monitoring, it would be nice to know what monitoring of the borrow site(s) the Corps intends to perform. If there is concern about potential physical impacts of potential borrow sites, a borrow site impact assessment could be efficiently performed via a relatively modest adjustment of the existing USGS morphodynamic model. Of course, like the evaluation of the channel relocation, the issue is not technical capacity; it comes down to willingness and the availability of funding to do the work.*

Response:

**Borrow site physical monitoring is described in Section 5.0 of the Engineering Analysis and Design analysis for the project. A bathymetric survey of the borrow site will be performed both prior to and following dredging. The natural accretion of sand at the proposed dredging borrow sites, at a rate greater than one million cubic yards per year, greatly exceeds that necessary to supply sand for the barrier dune. These borrow areas are extremely high energy areas such that no effect on fish and aquatic species is anticipated.**

Washington Department of Fish and Wildlife Comment 1:
*The Washington Department of Fish and Wildlife (WDFW) shares many of the same concerns about plan details as that outlined by Washington Department of Ecology. Specifically project impact details up to the OHWL, well within WDFWs regulatory authority (77.55.011(1)(7)(11)(18)). I would suggest that if there is a question on the OHWL, that WDFW along with Ecology conduct a site visit to make its determination. I have experience working with Ecology in doing this in heavily urbanized environments (Commencement Bay), where the OHWL can be difficult, but not impossible to determine. I am confident that such a determination can be made for this project.*

Response:
**The Corps worked with a representative from Ecology to determine the OHWM in relation to the proposed project alignment. See Response to Washington Department of Ecology Comment 2.**

Washington Department of Fish and Wildlife Comment 2:
*WDFW also has concerns about the construction of the flood berm extension. Any additional filling, or armoring above MHHW, relative to the North Cove area may alter shoreline littoral drift processes and possible effect to the bed and hydrology waterward of the berm. Any efforts to minimize further disturbance to this and adjacent shorelines would be encouraged, so any additional plan details to this effect would be deeply appreciated.*

Response:
**This project component has been removed from the preferred alternative. See Response to Washington Department of Ecology Comment 2.**

U.S. Fish and Wildlife Service Comment 1:
*The draft EA lists the ESA section 7 determination for Western Snowy Plovers as "may affect, not likely to adversely affect"; however, the document only describes 1) avoidance of the nesting window during construction and maintenance and 2) monitoring of future Western Snowy Plover use of the site. We recommend that the Corps continue to coordinate with our office and with Washington Department of Fish and Wildlife biologists (i.e., Scott Pearson) during section 7 consultation, construction planning, and project implementation to ensure that sand placement and the resulting topography/slope on the waterward portion of the dune will not preclude Western Snowy Plover nesting in the project area.*

Response:
**Concur. We will continue our coordination with both your office and the Washington Department of Fish and Wildlife, as recommended, to ensure that the dune restoration will not preclude Western snowy plover nesting in the project area.**

Ms. Andrea Grad Comment 1:
*Flood Berm Extension's Impacts on Pine Lane Beach Access: (a) Will the flood berm extend in front of Pine Lane's beach access?; (b) If the answer to "a" is yes, how will that affect our current beach access? For example, how big of a slope will there be on each side of the berm? Will it impede access beyond the berm, out onto the beach grass and mud flats? Will it still be easy for elderly people and dogs to navigate, or will there be, e.g., any big rocks to climb over? (c) if the answer to "a" is yes, how much further south than Pine Lane will the flood berm extend (i.e., where exactly will the end of it be?).*
Response:
**This project component has been removed from the preferred project alternative. The preferred alternative will consist solely of the barrier dune restoration. However, if the flood berm extension were to be built, it would extend approximately 250 feet beyond the Pine Lane beach access right-of way, tying into higher ground. The flood berm would prevent further erosion of the entire shoreline, but would not impede beach access. A gravel path to be constructed at Pine Lane and at Oregon Trail Lane would facilitate pedestrian access across the flood berm to the beach.**

Ms. Andrea Grad Comment 2:
*Path on Top of Flood Berm: Is there going to be a path along the top of the entire length of flood berm? If so, how wide will the actual path be, and what will the surface be composed of? If there is going to be a continuous path, we are concerned that it will end up being used by motorized vehicles such as "quads." Is the Corps planning on doing anything to restrict access to motorized vehicles on the berm path, such as putting partial barricades [which would not impede walkers or bicyclists] at intervals along the berm path? We would encourage such measures.*

Response:
**As described previously, the flood berm extension is no longer part of the preferred alternative. However, if the Corps were to build the flood berm extension, we would restrict access on the top of the flood berm to use by walkers and bicyclists. We share your concern about use of the berm by unauthorized vehicles. It would be accessible only to motorized vehicles performing infrequent maintenance. Bollards would be erected at intervals to ensure that unauthorized motorized vehicles could not traverse the flood berm. The top width of the berm would be 16 feet, and the surface would be gravel.**

Ms. Andrea Grad Comment 3:
*Dune Restoration: Currently, although many areas of the dunes have been worn away, there are still sections in the dune restoration area which are fairly high, and have vegetation still growing on top of them. Compared to these areas where the dunes are currently the highest, how much higher (if any) will the restored dunes be? Although we recognize the importance of restoring the dunes to protect the shoreline, we hope that they will not be higher than they need to be, and thus block views of the Willapa Bay bar beyond the dunes. The dunes which are currently the highest do not block this view.*

Response:

**The central portion of the barrier dune has eroded such that storm waves at extreme high tide roll right over it and transmit increased wave energy into North Cove, resulting in wave attack and flooding of the shoreline. The eastern end of the dune is naturally lower, and will stay that way after we restore the central and western ends. Before it eroded, the dune was high enough (approximately + 25 feet MLLW in places) that views of ocean waves entering the bay were not visible. The top elevation of the barrier dune will also be + 25 feet MLLW.**

Mr. C.M. "Chris" Newman Comment 1:
*Each of the members of the TradeWinds Mutual Services Board of Directors have read the draft Environmental Assessment prepared for the Shoalwater Bay Erosion Project, as have I. We are unanimous in our support for this project and will be eager to see the work begin. The project as designed looks to be an excellent solution to the problems we had during the heavy storms in February, 2006 and again in November of that same year. Thank you for sending the draft report to us for review. If there is any assistance we can provide to the Shoalwater tribe or to the Corps of Engineers through our voluntary efforts, please call upon us to discuss your needs and how we might be able to fulfill them.*

Response:
**Thank you for your expression of support for the proposed project.**

Mr. Dick Nelson Comment 1:

February 20, 2007 letter

*Summary. These comments are organized as a set of questions, primary and secondary, that should be answered in a full and comprehensive environmental impact analysis. Also included is a list of references that were used to help frame the questions.*

*The EA falls considerably short of a complete and comprehensive analysis. The questions that need answers cover the following subjects: specific project authority, non-build alternatives, flood risk assessment, cost-effectiveness, ecological impacts, barrier spit and dune evolution, lessons from previous erosion projects, documentation deficiencies, and the draft finding that the project has no significant environmental impacts. A complete and objective environmental analysis will require the preparation of an environmental impact statement.*

April 3, 2007 letter

*Summary. These comments are in addition to and supplement comments previously submitted on February 20, 2007. They are organized as a set of questions, primary and secondary, that should be answered in a full and comprehensive environmental impact analysis. Also included is a list of references that were used to help frame the questions.*

*The documents released on March 7, 2007 do not change the previous conclusion that the EA falls considerably short of a full and comprehensive analysis. The questions that need answers include the following subjects: flood risk assessment, non-build alternatives, cost-effectiveness, ecological impacts of proposed build alternative, hydrologic and ecological environment, lessons from previous attempts to control erosion, public involvement in selection of alternatives for study, independent technical review, and the draft finding that the project has no significant environmental impacts. A complete and objective environmental analysis will require the preparation of an environmental impact statement.*

November 29, 2007 letter

*Summary. These comments are organized as a set of questions, primary and secondary, that should be answered in a full and comprehensive environmental impact analysis. Also included is a list of references that were used to help frame the questions. Except for a few modifications, they were previously submitted on February 20 and April 3, 2007, in response to the original Draft Environmental Assessment and FONSI, Final Draft Decision Document, and Appendix 1, Engineering Analysis and Design.*

*The questions that need detailed answers cover the following subjects: specific project authority, barrier spit and dune evolution, flood risk assessment, public involvement in selection of alternatives for study, non-build alternatives, cost-effectiveness of alternatives, misleading nomenclature and ecological impacts of preferred alternative, hydrologic and ecological environment, lessons from previous attempts to control erosion, documentation deficiencies, independent technical review, and the draft finding that the project has no significant environmental impacts.*

*Only an environmental impact statement would comply with federal and state laws that require a complete and objective environmental analysis when a proposed project has a significant*

*environmental impact, as is the case for this project. If the final EA does not address the issues raised by these questions it will fall considerably short of a complete and comprehensive environmental analysis and violate applicable statutes.*

Response:
**For this project, we have complied with all requirements of the NEPA and we believe that the final EA has fulfilled the requirements of NEPA that require the Corps, as the federal action agency, to provide a full and fair discussion of significant environmental impacts and shall inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment. We have provided responses to all comments on the draft EA and other project documents and feel that the EA provides a sound and objective analysis of all potential impacts and benefits of a reasonable range of alternatives. Based on the analysis in the final EA, Seattle District intends to promulgate a Finding of No Significant Impact, meaning that the project will not be a major Federal action significantly affecting the quality of the human environment and, therefore, an environmental impact statement is not required.**

Mr. Dick Nelson Comment 2:
February 20, 2007 and November 29, 2007 letters
*Authority. Primary question: Is the project intended to lessen erosion or damage from flooding?*

*Secondary question: Why does the federal authorization speak only to erosion protection, while the EA emphasizes flooding and debris damage?*

Response:
**The EA discussion focuses on analysis of the effects of the alternatives intended to provide coastal erosion protection to the Shoalwater Bay Indian Reservation. The primary consequences of the coastal erosion include narrowing, breaching and storm wave overwash of the barrier dune on Graveyard Spit, which has directly led to increased flooding of Tribal land and facilities; debris deposition and associated damage; and disruption of access into and out of the Reservation area due to flooding of, and debris deposition on, roads and State Highway 105. Accordingly, the EA provides detailed discussion about these impacts.**

Mr. Dick Nelson Comment 3:
February 20, 2007 letter
*Non-build Alternatives. Primary question: Why did the EA not include "non-build" alternatives that have been long studied and advocated by coastal engineers and scientists?*

*Secondary questions: Why did the EA not include an alternative that outlined a program of preparing buildings and their systems to withstand the 100-year flood? Why did property along the south shore of the Tokeland Peninsula where natural vegetation and drift material had not been removed suffer insignificant flood damage in recent storm events? How would better*

*management of vegetation and drift along the upland property edge help lessen flooding, erosion, and drift material incursion, and thereby reduce flood damage? By what amount and cost? To what extent does invasive cordgrass (Spartina) contribute to changes in the North Cove tidal and marsh areas that are related to concern about flooding? Have recent efforts to control cordgrass infestations been successful, and what is the prognosis for future reduction? Why did the EA not include analysis of an alternative to extending the existing shoreline flood berm that combines improvements to built property with cordgrass, shoreline vegetation, and drift zone management?*

November 29, 2007 letter

*Non-build Alternatives. Primary question: Why have previous project documents not included "non-build" alternatives that have been long studied and advocated by coastal engineers and scientists? Will the final EA include them?*

*Secondary questions: Why did the EA not include an alternative that outlined a program of preparing buildings and their systems to withstand the 100-year flood? Why did property along the south shore of the Tokeland Peninsula where natural vegetation and drift material had not been removed suffer insignificant flood damage in recent storm events? How would better management of vegetation and drift along the upland property edge help lessen flooding, erosion, and drift material incursion, and thereby reduce flood damage? By what amount and cost? To what extent does invasive cordgrass (Spartina) contribute to changes in the North Cove tidal and marsh areas that are related to concern about flooding? Have recent efforts to control cordgrass infestations been successful, and what is the prognosis for future reduction? Why did the EA not include analysis of an alternative to that combines improvements to built property with cordgrass, shoreline vegetation, and drift zone management? Will the final EA answer these questions?*

Response:

**No viable "non-build" alternatives to address the effects of coastal erosion on the Shoalwater Bay Indian Reservation were identified by the interagency technical team of coastal engineers and scientists. Erosion of Graveyard Spit has severely compromised its historical function as a storm barrier. The resulting wind-generated waves during periods of extreme high tides has resulted in significant loss of subsistence intertidal habitat due to infilling of the Cove with sand from storm overwash of the eroded barrier dune, as well as shoreline erosion and flooding of very limited Tribal uplands and infrastructure due to the increased wave energy and wave height in North Cove. The finding is that protective structure measures are suitable to effectively address these problems; these are described in the EA. Finally, while *Spartina* colonization has altered the ecology of the North Cove marsh, we do not believe that it has any effect on the frequency or magnitude of barrier dune erosion or flooding as it has not caused more than minimal changes in cove topography. With the recent addition of ecosystem restoration to the Shoalwater authority, future authorized activities could involve *Spartina* control/management in concert with other estuarine enhancements.**

Mr. Dick Nelson Comment 4:

February 20, 2007 and November 29, 2007 letters

*<u>Flood Risk</u>. Primary question: What is the actual risk to flood damage in the project area?*

*Secondary questions: How many buildings and systems (including septic and water) are threatened by flooding? How many buildings have been built or substantially improved that comply with Pacific County's flood damage prevention ordinance which anticipates a 100-year flood? How many of these buildings and systems are on the Shoalwater Bay Indian Reservation and how many are on adjacent property? What is the estimated number of existing buildings and systems that are likely to be renovated at future dates to meet the county's flood damage prevention requirements? What is the potential financial cost of flood damage taking into account current and future compliance with the county's ordinance? For those buildings that were built before the effective date of the ordinance and that have not been substantially renovated since the date of adoption, are there federal or state funds that could be available to assist owners who wish to prevent and mitigate flood damage? Does ineffective drainage exacerbate flooding? What can be done to improve drainage in the flood-prone area? How does the proposed project comport with the flood hazard mitigation strategies and approaches of various federal and state agencies? Should the first priority be a comprehensive flood hazard mitigation plan for the Tokeland Peninsula that encompasses enhanced shoreline and inter-tidal zone management, improvements to older buildings, and better drainage systems?*

Response:

**Section 3.3.1 of the final EA summarizes the land use inventory of the Shoalwater Bay Indian Reservation and provides details on surrounding land uses. This section also details efforts by the Tribe to address issues related to coastal storm damages through building codes, environmental ordinances, and emergency plans. However, flood risks are a symptom of coastal erosion and the project is authorized to provide coastal erosion protection to the Shoalwater Reservation. Erosion of Graveyard Spit has compromised its historical function as a storm barrier to the Shoalwater Bay Indian Reservation and the entire Tokeland Peninsula. Alternatives that effectively address coastal erosion have the additional benefit of reducing flooding of the Shoalwater Reservation and some adjacent areas. Most recently, serious flooding in the area occurred in 1999, again in 2006, and was narrowly averted in 2007 through emergency response actions by the Corps. The deterioration of the barrier dune, appears linked to an observed increase in the magnitude of El Nino events (and associated sustained high water) since the mid-1970s (see Section 2.2.3 in the Engineering Analysis and Design analysis for the project). The formulation of the project alternatives focused on coastal erosion protection for the Shoalwater Reservation and measures or programs designed to mitigate flooding (such as any Pacific County flood hazard reduction programs) would not have fully met the project purpose. as authorized and defined by Section 545 of Public Law 106-541.**

Mr. Dick Nelson February 20, 2007 Comment 5:

February 20, 2007 letter

*<u>Cost and Cost-Effectiveness</u>. Primary question: What is the cost and cost-effective of each technically feasible and reasonable alternative, build and non-build?*

*Secondary questions: How is cost-effectiveness, as required under federal authorization, defined and determined? When will it be determined and what document will provide it? If, after comparison, one or more alternatives are found to be substantially more cost-effective than the others, would these alternatives be preferred?*

April 3, 2007 letter

*<u>Cost-Effectiveness</u>. Primary Question: Is "annualized cost" the Corps' standard metric for comparison of the cost-effectiveness of project alternatives?*

*Secondary Questions: How does annualized cost measure "benefits," which is the usual way effectiveness is measured? Why didn't the Corps estimate benefits of each project alternative, including both direct and indirect monetary benefits, such as flood damage costs that are mitigated, and calculate a benefit/cost ratio on an annualized basis? Why didn't the Corps follow the benefit/cost analysis methodology that it used in numerous shoreline protection and beach erosion projects it has been involved in on the East and Gulf coasts of the US (see references)? Why didn't the Corps follow the benefit/cost analysis method it used to arrive at an economic justification for dredging the Willapa channel (see references)? Did the Corps consult the recent study by the Heinz Center on risk assessment and mitigation of costs of coastal hazards?*

November 29, 2007 letter

*<u>Cost and Cost-Effectiveness</u>. Primary question: How is cost-effectiveness, as required under federal authorization, defined and determined? When will it be determined and what document will provide it?*

*Secondary questions: Assuming the final EA will again use "annualized cost", is this the Corps' standard metric for comparison of the cost-effectiveness of project alternatives? How does annualized cost measure "benefits," which is the usual way effectiveness is measured? Shouldn't the Corps estimate benefits of each project alternative, including both direct and indirect monetary benefits, such as flood damage costs that are mitigated, and calculate a benefit/cost ratio on an annualized basis? Shouldn't the Corps follow the benefit/cost analysis methodology that it used in numerous shoreline protection and beach erosion projects it has been involved in on the East and Gulf coasts of the US (see references)? Shouldn't the Corps follow the benefit/cost analysis method it used to arrive at an economic justification for dredging the Willapa channel (see references)? Did the Corps consult the recent study by the Heinz Center to ascertain modern methods of risk assessment and mitigation of costs of coastal hazards (see references)? What is the cost and cost-effective of each technically feasible and reasonable alternative, build and non-build? If, after comparison, one or more alternatives are found to be substantially more cost-effective than the others, would these alternatives be preferred?*

Response:
**An economic evaluation was performed on the three alternatives that comprised the final array of plans, using a life-cycle cost analysis approach. The project authorization exempts the project from any requirement for economic justification, including a comparison of economic benefits verses costs. Cost effectiveness, from an annualized life-cycle basis, was chosen as an element for consideration in decision-making.**

Mr. Dick Nelson Comment 6:
February 20, 2007 letter
*Biological Impacts. Primary question: What will happen to the ecological balance of the inter-tidal and marsh areas of North Cove if the barrier dune is "restored" as proposed in the preferred alternative?*

*Secondary questions: What are the biota that now inhabit and use the inter-tidal and marsh areas? How would their quantity and quality change with dune restoration? To what extent will tidal water in and out flows be reduced, and how will this affect the extent of the inter-tidal area and the biota?*

November 29, 2007
*Ecological Impacts. Primary Question: What will happen to the ecological balance of the inter-tidal and marsh areas of North Cove if the barrier dune is "restored" as proposed in the preferred alternative?*

*Secondary Questions: What are the biota that now inhabit and use the inter-tidal and marsh areas? How would their quantity and quality change with dune restoration?*

Response:
**See Section 4.1 of the EA for a discussion of identified potential biological impacts. In summary, biological impacts associated with the implementation of the barrier dune restoration are anticipated to be minor, temporary, and localized in nature. Potential impacts to crab populations are being investigated and will be mitigated if necessary as coordinated with WDFW.**

**Sand placement will only occur through inlets which were pioneered by recent overwash events leading to breaches through the barrier island. Well defined inlets located at the eastern and western edges of the embayment will be left intact. Circulation and biota in the inter-tidal area is not expected to be adversely affected.**

Mr. Dick Nelson Comment 7:
February 20, 2007 and November 29, 2007 letters
*Spit and Dune Evolution/Configuration and Inter-tidal Hydrology Over Time. Primary question: Given that the records (nautical charts, topographic maps, aerial photos) that describe the shape, location, and topography of Graveyard and Empire spits date from the late 1800's, why was only one year (1994) selected as the control year and one year (2003) selected as the comparison year to depict change?*

Response:
**The 1994-2003 represents a common place in time when the Willapa Bay North Channel has followed a relatively stable trend (compared to the prior 100 yrs). The Engineering Analysis Document depicts the movement of the thalweg in 2.2.50. This time frame is more representative of the spit evolution due to wave overtopping and breach events rather than morphology associated with the channel thalweg movement. These data were used to quantify erosion rates of Empire Spit and in turn estimate renourishemt quantities and intervals.**

**Limited accuracy of earlier survey data is a secondary reason. Survey coverage on old nautical charts and USGS quads is not detailed enough to make quantitative comparisons in the intertidal region.**

Mr. Dick Nelson Comment 8:
February 20, 2007 and November 29, 2007 letters
*Secondary questions: How many years in the span of time from the earliest records to the latest records have there been breaches in Graveyard Spit and in Empire Spit?*

Response:
**This information is graphed in the Engineering Analysis (Fig. 2.2.48) in the Engineering Analysis and Design analysis for the project. The figure depicts five breaches have occurred through Graveyard spit and/or Empire spit into North Cove since 1930.**

Mr. Dick Nelson Comment 9:
February 20, 2007 and November 29, 2007 letters
*Is it possible to describe a rough norm for the configurations of these spits?*

Response:
**The configuration of the spits is dynamic. However, when there are only one to two inlets into North Cove embayment, the inlets are more stable than when there are multiple inlets (resulting from breaches). Several inlets from the ocean into North cove embayment result in lower scouring potential among each respectively, thereby creating more variability in flow patterns which drive spit morphology.**

Mr. Dick Nelson Comment 10:
February 20, 2007 and November 27, 2007 letters
*If the dune is "restored," at what rate will wind-drift sand fill the inter-tidal area?*

Response:
**Vegetation will be planted on the landward (Cove) side slope of the dune. Native dune grass has successfully been shown to limit the amount of wind blown transport on South Beach at Grays Harbor. A wind-drift erosion rate is built into the erosion rate used to compute renourishment quantities. However, since other forms of erosion are also included in this quantity it is impossible to separate this rate without a specific field monitoring plan.**

Mr. Dick Nelson Comment 11:
February 20, 2007 and November 29, 2007 letters
*What has been the change over time in the configuration of the sand islands and shoals that lay off the mouth of the bay and reduce ocean wave propagation into the bay and onto the Tokeland Peninsula?*

Response:
**The shoal situated directly offshore of Graveyard Spit and Empire Spit Islands has been accreting since 2000 as depicted in Figure 5.1 of the Engineering analysis. The most recent condition survey from October 2005 shows a similar trend. Additionally the shoal located just west of North Channel has also continued to accrete material.**

Mr. Dick Nelson Comment 12:
February 20, 2007 and November 29, 2007 letters
*Why didn't the Corps follow its own advice (USACE 2000), to wit: "Rates of erosion (like the wind, waves, and currents that drive sediment transport) are extremely variable. Long-term trends seen in the channel cycle further compound the danger of extrapolating from changes measured in any single year?*

Response:
**A major interagency effort was expended to understand the geology, geomorphology, and hydraulics of Willapa Bay and the Willapa Bay entrance prior to initiating any engineering work on alternative plans. The results of the interagency investigation are documented in the Engineering Analysis and Design report for the project. In particular, this report provides extensive time series photo documentation and analysis of Graveyard Spit over time. The studies documented culminated in some unexpected findings that led to formulation and evaluation of relatively straightforward, economically viable, and environmentally acceptable engineering solutions to identified coastal erosion problems. The full range of available bathymetric surveys, photographs, and related data were utilized by the project technical team in formulating, modeling, and evaluating alternative plans.**

Mr. Dick Nelson Comment 13:
February 20, 2007 and November 29, 2007 letters
*<u>Lessons from Previous Erosion Control and Shoreline Stabilization Projects</u>. Primary question: What can be learned and applied to this project from previous efforts to stem erosion and flooding on and near the Tokeland Peninsula?*

*Secondary questions: Since several previous projects have produced mixed results, and in some conspicuous cases (e.g. SR 105 Stabilization Project) have failed to generate benefits commensurate with costs, what assurance can be provided that the preferred alternative for this project will have a different outcome?*

Response:

**Excellent questions, which we recognized at the outset of the study. The Corps' Seattle District office formally partnered with the agencies and entities listed as preparers in the Engineering Analysis and Design report for the project. Their collective experience and expertise was crucial to our gaining an understanding of coastal processes on the Pacific Ocean coast and at Willapa Bay in particular, and in formulating and evaluating viable alternative measures and plans. It is the collective judgment of our technical team -- with extensive input from resource and regulatory agencies and the general public – that the identified plan is the most appropriate long-term solution to the coastal erosion and storm damage problems affecting the Shoalwater Bay Indian Reservation.**

Mr. Dick Nelson February 20, 2007 Comment 14:

February 20, 2007 letter

*<u>Unavailable and Un-referenced Project Documents</u>. Primary question: Why does the EA reference a document that is not publicly available, why does it refer to another document as "confidential", and why does it not reference previous documents relating to the project, including one that provides cost estimates?*

*Secondary questions: Why can't a member of the public who desires to fully understand the rationale for a Corps project, be privy to a key project document, even one that is cited in the EA as a reference? Does this not violate the spirit if not the letter of federal regulations promulgated by the Council on Environmental Quality instructing federal agencies that carry out the intent of NEPA? (I.e.: CEQ Regulations for Implementing NEPA, Sec. 1500.1 Purpose. "NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA.") Why is the historic properties investigation (USACE, Seattle District. Historic Property Investigation for the Shoalwater Bay Indian Reservation Shoreline Erosion Project on Willapa Bay, Pacific County, Washington, June 12, 2006) a confidential report? Why is a report dealing with engineering and design (USACE, Seattle District. 2006 Shoalwater Bay Shoreline Erosion, Washington. Flood and Coastal Storm Damage Reduction, Shoalwater Bay Indian Reservation. Appendix 1, Engineering Analysis and Design, Draft, January 2006) not available for public inspection? And why was the only available public document (USACE, Seattle District. Project Update: Flood and Coastal Storm Damage Reduction Project at Willapa Bay, Washington, Shoalwater Bay Indian Reservation and Adjoining Property, July 16, 2005) that provides cost information not included in references listed in the EA?*

November 29, 2007 letter

*<u>Unavailable Project Documents</u>. Primary question: Why are not all project documents publicly available?*

*Secondary questions: Why can't a member of the public who desires to fully understand the rationale for a Corps project, be privy to a key project document? Does this not violate the spirit if not the letter of federal regulations promulgated by the Council on Environmental Quality instructing federal agencies that carry out the intent of NEPA? (i.e.: CEQ Regulations for Implementing NEPA, Sec. 1500.1 Purpose. "NEPA procedures must insure that environmental*

*information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA.") Specifically, why is the historic properties investigation (USACE, Seattle District. Historic Property Investigation for the Shoalwater Bay Indian Reservation Shoreline Erosion Project on Willapa Bay, Pacific County, Washington, June 12, 2006) a confidential report? Why are the comments from the Corps of Engineers Alaska District after their review of the project not available? Why is the Corps Biological Evaluation for the project not available?'*

Response:

**The draft Environmental Assessment (EA) cited those documents that the authors referred to in preparing the EA, and determined should be documented as references. Data from the draft Engineering Analysis and Design report was utilized by the preparers of the EA. The earlier draft report was a pre-decisional document that was independently reviewed by Alaska District staff in accordance with Corps of Engineers regulations. The independent technical review comments on a pre-decisional document are, likewise, pre-decisional, and are generally not released. Reports mentioned above that were released for public review and comment include the draft EA/FONSI (circulated in January 2007) and draft Decision Document (circulated in March 2007). Final reports will be made available to the public following their review and approval by our higher authority.**

**The historic properties/cultural resource report is not for general public dissemination due to the sensitive cultural resources information it contains, information which is protected from public release by Section 304 of the National Historic Preservation Act. However, the reference in the EA is still appropriate as the report does exist and is logged with the Washington State Department of Archaeology and Historic Preservation (DAHP).**

**The Biological Evaluation (BE) is typically not available to the public until the consultation with US Fish and Wildlife Service and NOAA National Marine Fisheries Service has been concluded. As documented in the final EA, the project has received concurrence from both agencies on the proposed project has been received and the BE is now included as an appendix to the EA.**

Mr. Dick Nelson February 20, 2007 Comment 15:

*<u>Draft FONSI</u>. Primary question: How, given major uncertainties in environmental impacts, incomplete analysis of feasible alternatives, and lack of any cost-effectiveness determination across feasible alternatives, can the Corps conclude that the proposed project "will not constitute a major federal action significantly affecting the quality of the human environment" (i.e. the natural and physical environment and the relationship of people with that environment)?*

*Secondary questions: Is this finding concurred with by other federal agencies (e.g. USFWS, USEPA, FEMA), Washington State agencies (e.g. Fish and Wildlife, Ecology, Natural Resources), and local government agencies (e.g. Pacific County Department of Community Development)?*

Response:

**For this project, we have complied with all requirements of the NEPA and we believe that the final EA has fulfilled the requirements of NEPA that require the Corps, as the federal action agency, to provide a full and fair discussion of significant environmental impacts and shall inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment. Throughout project development and analysis, there has been a high degree of coordination between the Corps and the various agencies that have an interest or potential interest in the project. Based on the analysis in the final EA, Seattle District intends to promulgate a Finding of No Significant Impact, meaning that the project will not be a major Federal action significantly affecting the quality of the human environment and, therefore, an environmental impact statement is not required. The responsibility for the FONSI determination lies solely with the Corps of Engineers.**

Mr. Dick Nelson Comment 16:

April 3, 2007 letter

*Public Involvement. Primary Question: How and when was the public invited to help identify alternatives for study and for comparison on the basis of cost-effectiveness, environmental acceptability, technical feasibility, and economic and social benefits?*

*Secondary Questions: When was the formal scoping meeting held to allow the public to submit alternatives for consideration, as required under the National Environmental Policy Act (NEPA) and the Washington State Environmental Policy Act (SEPA), similar to the meeting held in 1996 to determine alternatives for the SR 105 Emergency Stabilization Project? If this meeting was held, who was notified and how? Were notices sent via the US Postal Service to property owners in the affected area?*

November 29, 2007 letter

*Public Involvement. Primary Question: How and when was the public invited to help identify alternatives for study and for comparison on the basis of cost-effectiveness, environmental acceptability, technical feasibility, and economic and social benefits?*

*Secondary Questions: When was the formal scoping meeting held to allow the public to submit alternatives for consideration, as required under the National Environmental Policy Act (NEPA) and the Washington State Environmental Policy Act (SEPA), similar to the meeting held in 1996 to determine alternatives for the SR 105 Emergency Stabilization Project? If this meeting was held, who was notified and how? Were notices sent via the US Postal Service to property owners in the affected area?*

Response:

**Community meeting workshops were conducted throughout the planning process. Dates of meetings held at the Tribal Center included September 23, 1999; June 18, 2002; May 12, 2004; July 17, 2004; July 16, 2005; July 22, 2006. A formal Public Meeting was held on March 29, 2007. The project Decision Document includes a summary of the various meetings.**

**An Environmental Assessment (EA) to evaluate the environmental effects of the proposed project was prepared by the Corps. The EA was prepared specifically to determine if the project warrants the preparation of an Environmental Impact Statement (EIS). An independent environmental analysis was conducted by the U.S. Fish and Wildlife Service, in accordance with the Fish and Wildlife Coordination Act. Based on our analysis, the EA concluded that the project does not require preparation of an EIS and, thus, there was no formal EIS scoping conducted.**

Mr. Dick Nelson Comment 17:

April 3, 2007 letter

*Alternatives Studied. Primary Question: If the Willapa Bay Channel that is immediately south of the project area has stopped in its northward movement and has recently shifted to the south, why were "training dikes" considered to be reasonable alternatives for study?*

*Secondary Questions: How would training dikes affect the wind and wave climate that erodes the spits (barrier dunes) that protect North Cove? Would they lessen the risk of flooding?*

Response:

**Training dikes were suggested to the Corps very early in the study. They were modeled by the Coastal and Hydraulics Laboratory and determined not to be viable alternatives for addressing coastal erosion problems, and thus were not carried forward into the final array of alternative plans that were evaluated. Findings are documented in Chapter 4 of the Engineering Analysis and Design report for the project.**

Mr. Dick Nelson April 3, 2007 Comment 18:

April 3, 2007 letter

*Nomenclature. Primary Question: Why is the preferred alternative called "dune restoration" when the Corps' records over a span of about 120 years (maps, bathymetric surveys, aerial photos) indicate that Graveyard Spit has been without a breach for only a short period in the 1990's?*

November 29, 2007 letter

*Nomenclature. Primary Question: Why is the preferred alternative called "dune restoration" when the Corps' records over a span of about 120 years (maps, bathymetric surveys, aerial photos) indicate that Graveyard Spit has been without a breach for only a short period in the 1990's?*

Response:
**We believe there is some confusion regarding what part of the project is classified as dune restoration. The current project will only restore the dune to the configuration closely representing what was occupied in 1994 before the breaches to Empire Spit occurred. The inlet between Graveyard spit and the western most Empire Spit island will remain intact. The rational for filling in the breaches which opened in 1994 is to limit the wave energy and storm surge effects on the shoreline. This will in turn help reduce flooding and erosion impacts to the shoreline.**

Mr. Dick Nelson Comment 19:

April 3, 2007 letter

*Secondary Questions: Would it not be more accurate to call the preferred alternative "sand berm with revetment extension"? Is the Corps following an unfortunate pattern in naming the preferred alternative, which is very similar to the name selected for the preferred alternative for the SR 105 stabilization project, "beach restoration," when that project was actually a channel dike and plug, with sand nourishment a secondary consideration since the sand blew away shortly after the project was completed and was never replaced?*

November 29, 2007 letter

*Secondary Questions*: *Doesn't "restoration" mean putting something back into its original condition? What was the original configuration of the channel margin along the Graveyard Spit and the adjacent Empire Spit? Would it not be more accurate to call the preferred alternative "sand berm with revetment extension"? Is the Corps following an unfortunate pattern in naming the preferred alternative, which is very similar to the name selected for the preferred alternative for the SR 105 stabilization project, "beach restoration," when that project was actually a channel dike and plug, with sand nourishment a secondary consideration since the sand blew away shortly after the project was completed and was never replaced?*

Response:
**The preferred alternative is termed "Barrier Dune Restoration" in that it will re-create the barrier dune similar to the 1994 configuration. As noted in the final EA, the preferred alternative is different from that described in the initial draft EA in that the new preferred alternative does not include the extension of the riprap berm along the shoreline. Since the project will use only sand to provide erosion protection and does not involve any hardened structures the project will help ensure that the project will not interfere with coastal sediment transport processes in the project vicinity. It is the consensus of the Corps' Coastal Hydraulic Laboratory and the U.S. Geological Survey scientists that dune restoration is an appropriate and effective means to accomplish the objective of restoring Graveyard Spit to its historical function as a storm barrier for the Shoalwater Bay Indian Reservation. Selected areas of the barrier dune will be planted with native dune grass in an effort to reduce wind blown erosion rates.**

Mr. Dick Nelson Comment 20:

April 3, 2007 letter

*<u>Risk of Sand Berm Failure</u>. Primary Question: What is the probability that the 12,500 foot long by 25 foot high sand berm will breach in the 10-year period following construction?*

November 29, 2007 letter

*<u>Risk of Sand Berm Failure</u>. Primary Question: What is the probability that the 12,500 foot long by 25 foot high sand berm will breach in the 5-year period following construction and in each subsequent 5-year period?*

Response:

**If a breach were a transient occurrence triggered by a specific extreme water level, the combined tidal & surge water level frequency curve (see Fig. 4.3 in the Engineering and Design Report, Appendix 1 of the Project Decision Document) could be utilized to estimate this probability. However, as witnessed at Grays Harbor, the development of a breach was found to follow a process of progressive damage cumulating over time. A breach would likely form via localized erosion notches to the oceanside side slope. These slopes would steepen the slope beyond the natural angle of repose and cause avalanching of sediment down the slope. The process would repeat until the crest elevation was low enough for a storm event to overtop the dune and hydraulically connect to the embayment side. The development of breaches and when they will occur in time is not an exact science. However, the probability of a breach occurring strictly due to elevated mean sea level (i.e. El Nino) as indicated in the past is considerably low. The barrier dune will have a crest elevation 10 ft above the maximum water level recorded at Willapa Bay (14.41 ft above MLLW on November 14, 1981).**

Mr. Dick Nelson Comment 21:

April 3, 2007 letter

*Secondary Questions: How many breaches are likely and where will they occur? Where will the sand go that is washed-out in a breach? If one or more breaches occur, will they be repaired before the 10-year period elapses? If so, what is the likely cost of repair and is it included in the annualized project costs?*

November 29, 2007 letter

*Secondary Questions: How many breaches are likely and where will they occur? Where will the sand go that is washed-out in a breach? How much sand will be redistributed? If one or more breaches occur, will they be repaired before the 5-year period elapses? If so, what is the likely cost of repair and is it included in the annualized project costs?*

Response:
**The breaches would likely occur in areas were the consolidated holocene terrace deposits do not occur. Vegetation should also slow the progression of erosion, both to wind and notching. After a breach develops it would most likely grow in size and transport sediments into North Cove. The renourishment period is currently estimated at 5-yr intervals. Renourishment would specifically focus on repairing lowered elevations on the dune or any breaches that were to occur. The restored dune will be monitored for erosion of sand, so that periodic nourishment can be budgeted and scheduled. Periodic nourishment costs are included in the annualized project costs.**

Mr. Dick Nelson Comment 22:
April 3, 2007 and November 29, 2007 letters
*Hydraulics of North Cove. Primary Question: Where in the project documentation, including the Engineering Analysis and Design, is there an analysis of the hydrologic environment of North Cove?*

Response:
**Tidal hydraulics of Willapa Bay are simulated using the ADvanced CIRCulation (ADCIRC) numerical model in Section 3.0 of the Engineering Appendix. The same model is used to analyze flow patterns within North Cove. During the analysis, it was determined that the inlet between Graveyard Spit and the center Empire Spit Island was well developed and essential to circulation in the western portion of the embayment.**

Mr. Dick Nelson Comment 23:
April 3, 2007 letter
*Secondary Questions: How and where does water currently flow in and out of the Cove, and at what volumes and speeds? If there is only one entrance/exit channel ("North Cove channel") at the eastern end of the Cove, as the design appears to suggest, how will water in the western part of the Cove exit on a low tide? Is there a high point or area between the western and eastern parts of the Cove that controls drainage from the Cove at low tide? What are the water volumes and intertidal areas of both the western and eastern parts of the Cove? Will the Cove need to be dredged to ensure that water leaves the western part on each tidal cycle to ensure the project does not adversely impact the intertidal environment?*

November 29, 2007 letter
*Secondary Questions: How and where does water currently flow in and out of the Cove, and at what volumes and rates? If there is only one entrance/exit channel ("North Cove channel") at the southeastern end of the Cove, as the design appears to suggest, how will water in the western part of the Cove exit on a low tide? Is there a high point or area between the western and eastern parts of the Cove that controls drainage from the Cove at low tide? Has the bathymetry/topography of the Cove been measured at a micro level (i.e. plus or minus one foot increments or less)? What are the water volumes in the intertidal areas of both the western and eastern parts of the Cove at high and low tide? Will the Cove need to be dredged to ensure that water leaves the western part on each tidal cycle to ensure the project does not adversely impact the intertidal environment?*

Response:
**The purpose of the design is to restore the dune similar to the 1994 configuration prior to the breaches through the Empire Spit islands. The configuration prior to 1994 resulted in a relatively stable and self maintaining inlet into North Cove (see Figure 2.2.19). With this configuration, currents through the two North Cove inlets were large enough to scour the sediment supplied to the southeast via littoral drift. Following the breaches, tidal velocities through the eastern North Cove inlet became too weak to scour the sediment on the distal end of the eastern island. This caused sand to accumulate and forced the North Cove entrance channel to migrate toward the shoreline.**

**Currently water is conveyed through four inlets into North Cove as shown in Figure 2.2.25 of the Engineering Analysis and Design report for the project. The discharge and current velocity of each inlet is a function of the cross-sectional area and depth. Currently the widest channel is located between the Empire Spit Islands.**

**In the latest aerial photograph from June 2006 (with a tidal elevation of minus-2.0 ft MLLW), the inner network of channels through North Cove are hydraulically connected from the far western portion of the Cove to the far eastern inlet, see Figure 4 in the EA. The western and eastern portions of North cove are also connected to the ocean independently via inlets.**

**Figure 2.5.51 in the Engineering Analysis and Design analysis for the project plot the area in acres of North Cove verses time. North Cove was approximately 550 acres in 2003. The area has been declining since.**

**No dredging will be necessary in North Cove to maintain hydrologic connectivity throughout the Cove; see early response regarding hydraulic connectivity. The eastern inlet has shortened in width ever since the breaches developed in Empire Spit. Reduced current velocities are not capable of scouring newly deposited sands transported via littoral drift. When these breaches are filled, the conveyance and current velocity through the eastern inlet will increase. A revetted shoreline and pile dike structure on the Tokeland Peninsula side of the eastern inlet will likely cause the inlet to progress toward the Empire Spit side of the channel as the system re-equilibrates.**

Mr. Dick Nelson Comment 24:
April 3, 2007 letter
*<u>Ecological Impacts</u>. Primary Question: How will the sand berm affect the fish, shellfish, and birds that live in or on the Cove?*

*Secondary Questions: If there is only one entrance/exit to the Cove from the Willapa Bay channel, as the design appears to suggest, how will juvenile crabs, salmon, and other fish enter the cove on a high tide? How will fish that provide food for numerous species of birds throughout the year, such as anchovies, find there way into the Cove? Will they go to the channel at the eastern end and make a u-turn? If they do, will they be able to navigate to the western part of the Cove where there is currently much more and deeper water on a high tide? If*

*water in the western part of the Cove does not drain on a low tide, will the current intertidal area be available for restoration of hard-shell clams, which is a stated goal of the project?*

November 29, 2007 letter

*If there is only one entrance/exit to the Cove from the Willapa Bay channel, as the design appears to suggest, how will juvenile crabs, salmon, and other fish enter the cove on a high tide? How will fish that provide food for numerous species of birds throughout the year, such as anchovies, find there way into the Cove? Will they go to the channel at the eastern end and make a u-turn? If they do, will they be able to navigate to the western part of the Cove where there is currently much more and deeper water on a high tide? If water in the western part of the Cove does not drain on a low tide, will the current intertidal area be available for restoration of hard-shell clams, which is a stated goal of the project? What is the target in annual production for the restoration of native clams, and to what extent will it be achieved? How will the sand berm (restored barrier dune) impact razor clam beds along the channel shoreline?*

Response:

**The restored barrier dune will have no known adverse effect on fish, shellfish, and birds that live in and/or utilize the Cove. Sand will be placed on Empire Spit, replacing sand that has eroded due to interruption of the littoral transport of sand that naturally nourished the barrier dune. The current project will only restore the dune to the configuration closely representing what was occupied in 1994 before the breaches to Empire Spit occurred. The inlet between Graveyard spit and the western most Empire Spit island will remain intact as will the inlet between the southernmost portion of Empire Spit and the Tokeland Peninsula. These two entrances/exits to North Cove will not be restricted in any way by the proposed project, thus aquatic species will continue to find their way into and out of the Cove as they do presently. Circulation and biota in the inter-tidal area is not expected to be adversely affected compared to current conditions.**

Mr. Dick Nelson Comment 25:

April 3, 2007 letter

*<u>Shoreline Erosion at Eastern End of Cove</u>. Primary Question: How much erosion has occurred at the inlet/outlet channels at the eastern end of the cove ("North Cove channel"), and is it significant enough that would require the channel to be relocated 1,000 feet south?*

*Secondary Questions: If there has been erosion of the shoreline and there is a risk of continued erosion, are there not alternatives to relocation? Could the shoreline be reinforced by natural elements such as vegetation and drift logs? Could the existing revetment that starts just a short distance to the east be extended to the west? If one of these measures is taken, does the sand berm need to extend all the way to the shore, or could it terminate at high vegetated ground on Empire spit?*

November 29, 2007 letter

*<u>Shoreline Erosion at Eastern End of Cove</u>. Primary Question: How much erosion has occurred at the inlet/outlet channels at the eastern end of the cove ("North Cove channel")?*

*Secondary Questions: If there has been erosion of the shoreline and there is a risk of continued erosion, could the shoreline be reinforced by natural elements such as vegetation and drift logs? If these measures are taken, does the sand berm need to extend all the way to the shore, or could it terminate at high vegetated ground on Empire spit?*

Response:
**This project component is no longer part of the preferred alternative, which is barrier dune restoration only. However, since the most recent breaching of the barrier dune on Graveyard Spit, the North Cove channel at the east end of the Cove has migrated 1,000 feet the north, eroding the Tokeland Peninsula shoreline. Channel relocation to the south, would restore the channel to its previous location. Restoration of the barrier dune will eliminate the breaches which have diverted tidal waters that formerly maintained the North Cove channel outlet to the east. Hydraulic engineers concluded that moving the North Cove channel away from the shoreline to its former location would be effective in promoting the restoration of tidal flushing of the North Cove embayment. The dune restoration on Graveyard Spit would not extend to the shoreline. The tidal channel at the southeastern end of North Cove normally flushes sediment, keeping the Spit from connecting to the shoreline. The time series of photos in Chapter 2 of the Engineering Analysis and Design analysis for the project bears this out.**

Mr. Dick Nelson Comment 26:
April 3, 2007 and November 29, 2007 letters
*Technical Review. Primary Question: Why did the Corps use another Corps unit for technical review and comment, and not an independent technical review body?*

*Secondary Questions: Isn't it important to obtain truly independent technical input on this important and expensive project, especially since it's in an area impacted by severe wave and wind forces that are hard to predict, and because previous projects in the area have failed to deliver advertised benefits? Why didn't the Corps use an independent panel similar to the one it recommended for the SR 105 Emergency Stabilization Project (see references)?*

Response:
**Independent technical review is required by the Corps to be performed by entities external to the Corps District that managed the study, and may include another qualified Corps District. As noted in both the Engineering Analysis And Design analysis for the project and the project's Decision Document, technical studies for this project were conducted by an interagency team that included the Corps' Seattle District; the Corps' Engineer Research and Development Center; U.S. Geological Survey; Washington Department of Ecology; and visiting scientists to the USGS, including Delft Hydraulics in the Netherlands.**

Mr. Dick Nelson November 29, 2007 Comment 16:
*FONSI. Primary question: Will the Corps again promulgate a Finding of No Significant Environmental Impact?*

*Secondary questions: Can the Corps conclude that the proposed project "will not constitute a major federal action significantly affecting the quality of the human environment" (i.e. the*

*natural and physical environment and the relationship of people with that environment) unless the environmental impacts of all feasible alternatives are assessed?*

Response:
**We believe that the final EA has fulfilled the requirements of NEPA that require the Corps, as the federal action agency, to provide a full and fair discussion of significant environmental impacts and shall inform decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment. Based on the analysis in the final EA, Seattle District intends to promulgate a Finding of No Significant Impact for the preferred alternative. The FONSI is based on the determination that the project will not be a major Federal action significantly affecting the quality of the human environment and, therefore, an environmental impact statement is not required.**

# Appendix B:  Biological Evaluation

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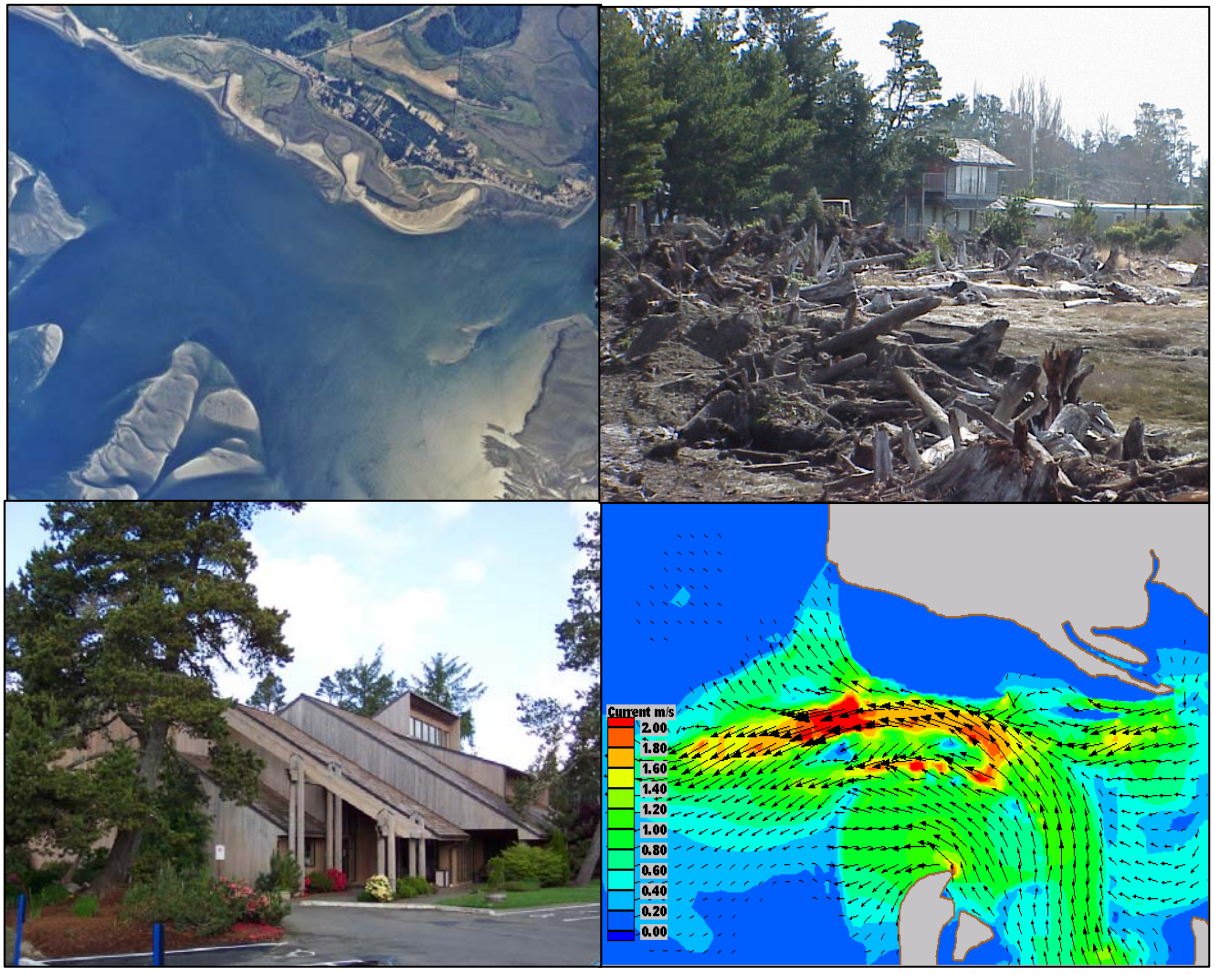
**Biological Evaluation**

# FLOOD AND COASTAL STORM DAMAGE REDUCTION PROJECT

## Shoalwater Bay & Shoalwater Bay Indian Reservation
## Pacific County, Washington
## May 2007




US Army Corps
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Seattle District

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## FIGURES



## TABLES

**Index of Acronyms & Abbreviations**

| | |
|---|---|
| BE | biological evaluation |
| BMP | best management practices |
| Corps | U.S. Army Corps of Engineers |
| EFH | Essential Fish Habitat |
| ESA | Endangered Species Act |
| ESU | evolutionarily significant unit |
| FR | Federal Register |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| PFMC | Pacific Fishery Management Council |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| WDFW | Washington Department of Fish and Wildlife |
| WWFWO | Western Washington Fish and Wildlife Office |

# 1. INTRODUCTION

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973 (ESA), as amended, the U.S. Army Corps of Engineers (Corps) has prepared this biological evaluation (BE) to evaluate the potential effects of proposed dune restoration and flood berm extension on threatened and endangered species, and their critical habitat, that may occur in the project vicinity. The BE also evaluates potential effects of the proposed work on Essential Fish Habitat pursuant to the Magnuson/Stevens Fishery Conservation and Management Act.

## 1.1. BACKGROUND

Section 545 of WRDA 2000, Public Law 106-541, signed into law on December 11, 2000, authorizes the Corps to conduct both a study and a project for coastal erosion protection for the tribal reservation of the Shoalwater Bay Indian Tribe. The complete text of Section 545 of WRDA 2000 is as follows:

***SEC. 545. WILLAPA BAY, WASHINGTON.***

*(a) STUDY. – The Secretary shall conduct a study to determine the feasibility of providing coastal erosion protection for the tribal reservation of the Shoalwater Bay Tribe on Willapa Bay, Washington.*

*(b) PROJECT. –*

*(1) IN GENERAL. – Notwithstanding any other provision of law (including any requirement for economic justification), the Secretary may construct and maintain a project to provide coastal erosion protection for the tribal reservation of the Shoalwater Bay Tribe on Willapa Bay, Washington, at Federal expense, if the Secretary determines that the project –*

*(A) is a cost-effective means of providing erosion protection;*

*(B) is environmentally acceptable and technically feasible; and*

*(C) will improve the economic and social conditions of the Shoalwater Bay Tribe.*

*(2) LANDS, EASEMENTS, AND RIGHTS-OF-WAY. – As a condition of the project, described in paragraph (1), the Shoalwater Bay Tribe shall provide lands, easements, rights-of-way, and dredged material disposal areas necessary for implementation of the project.*

The historical trends of primary concern in this project are related to the evolution of the spits and associated islands fronting the Tokeland Peninsula. These spits formed the genesis of North Cove and have historically defined the environmental setting in which the Shoalwater Bay Reservation was established. As Cape Shoalwater rapidly eroded during the early part of the 20th century, the main spit, which became known as Graveyard Spit, retreated landward to the north-northeast. The reason for this long-term shoreline retreat is clearly related to the northerly migration of the entrance channel. By 1985, the channel encountered the erosion-resistant Pleistocene sediments at the base of the terrace bordering the present day State Route (SR) 105, and its northerly migration at this location essentially halted. In fact, since that time, the channel thalweg has migrated slightly to the south.

The alignment and geometry of the channel thalweg has been relatively stable since the mid-1980's, which indicates that large-scale erosion due to channel migration in the future is unlikely. The reason for the changes to the spit in the last two decades is likely a loss of sand supply from the west, during which time the spit/islands have become lower and thinner.

Presently, Graveyard Spit exists as a thin and fragmented landform that is anchored and aligned by the consolidated and erosion-resistant Pleistocene substrate. In contrast to historical conditions, this fragile line of barrier beaches no longer appears to receive sand supply from the eroding beach plain to the northwest. The lack of sand supply indicates that this landform will remain of low relief, compromising its historical function as a flood barrier for the Tokeland Peninsula.

### 1.2. PROJECT LOCATION

The project area is located on and adjacent to the Shoalwater Bay Indian Reservation and slightly west of Tokeland, Washington, on the north side of the entrance to Willapa Bay, a large estuarine system located on the southwest Pacific Ocean coast of the State of Washington, in Pacific County (see Figure 1 and Figure 2). Willapa Bay's entrance to the Pacific Ocean is approximately 28 miles north of the mouth of the Columbia River and 17 miles south of the Grays Harbor entrance. The project would occur along approximately 3 miles of shoreline.

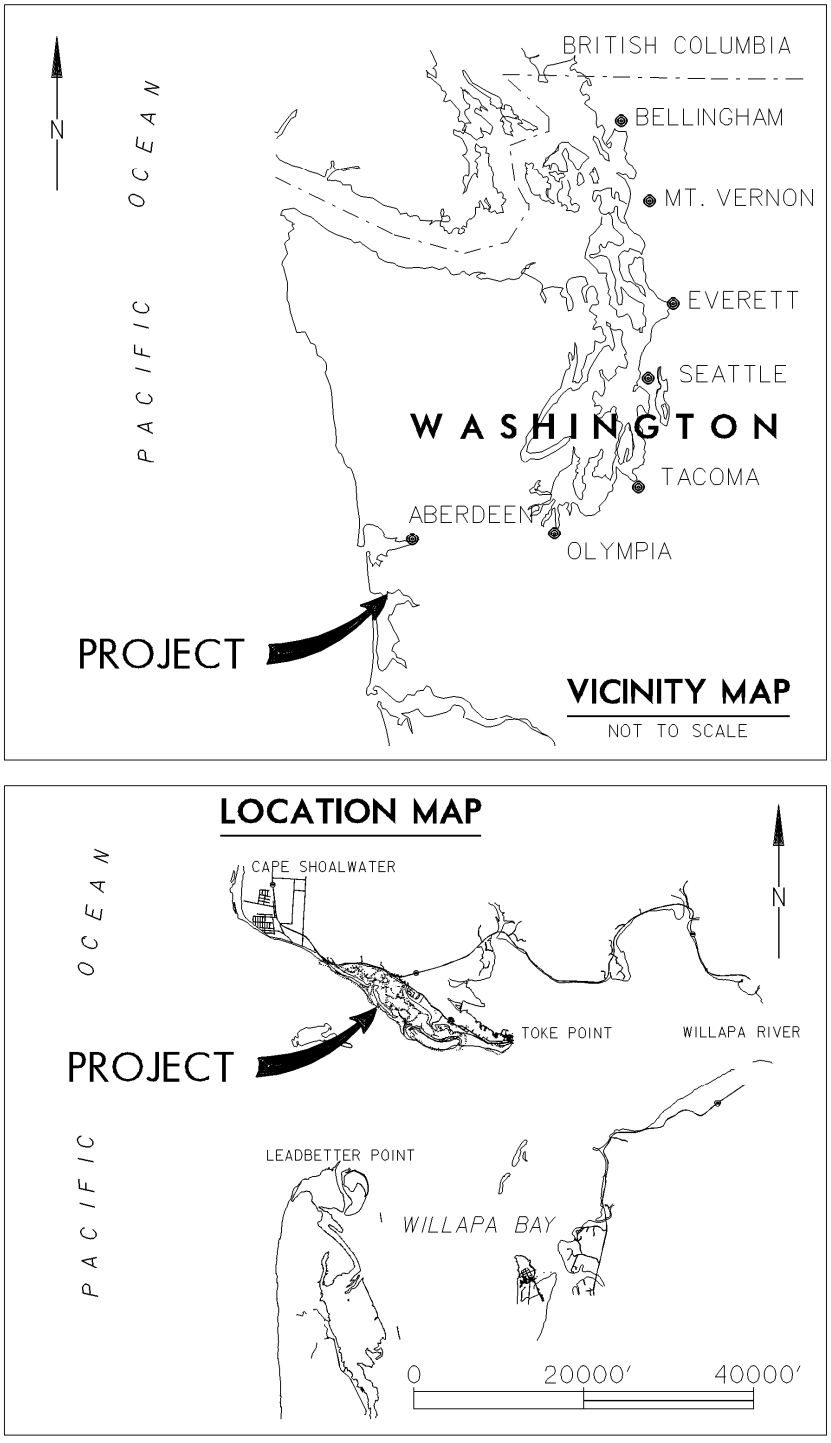


**Figure 1. Vicinity Map and Project Location**

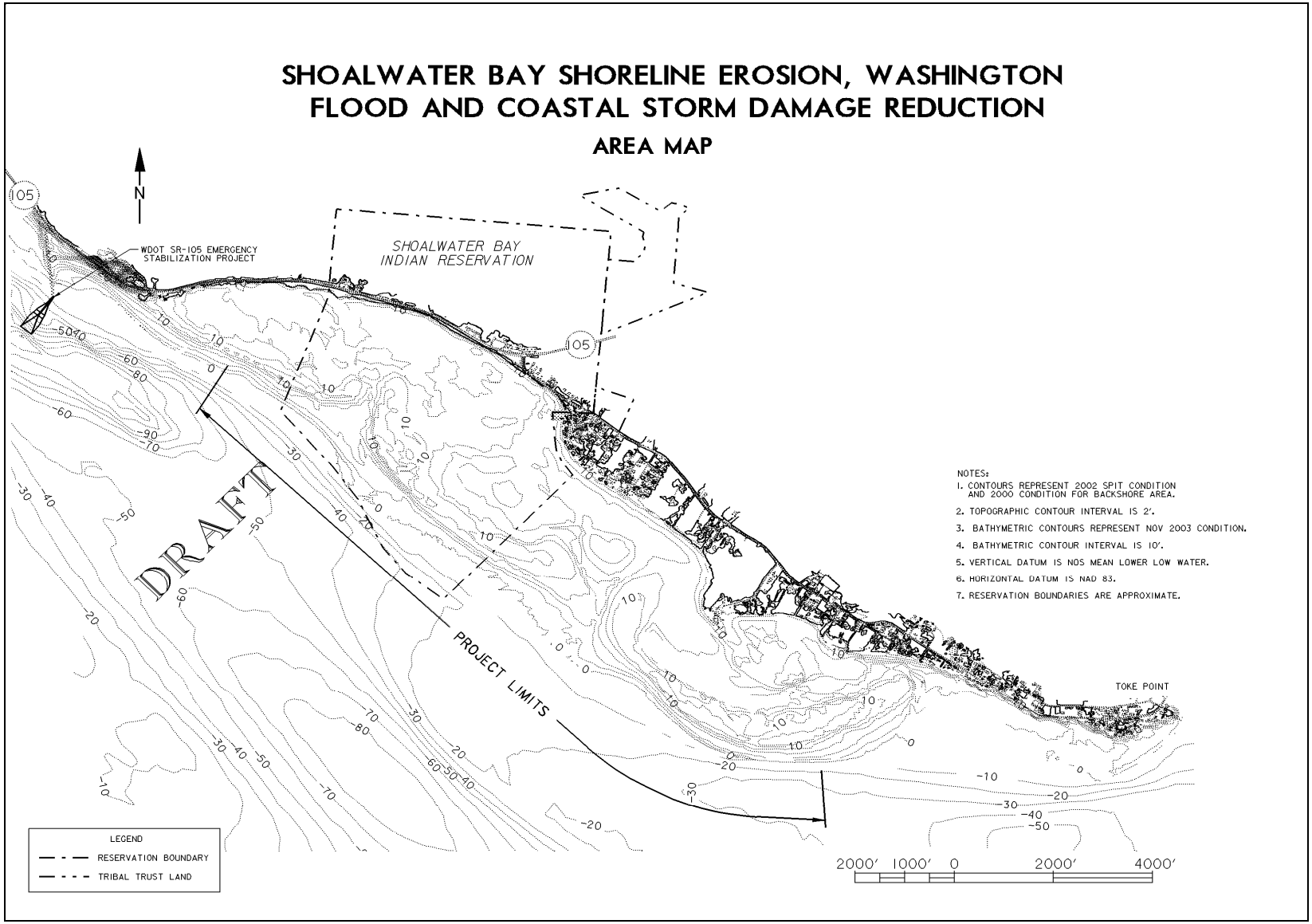


**Figure 2. Area map – Shoalwater Bay Flood and Coastal Storm Damage Reduction Project**

### 1.3. PROJECT OBJECTIVES

The purpose of the proposed construction project is to design and construct the most appropriate and effective plan to provide long-term flood and coastal storm damage reduction to the Shoalwater Bay Indian Reservation (Shoalwater Reservation), in accordance with the WRDA 2000 Section 545 project authorization.

North Cove geomorphology has been changing in recent history. Changes in North Cove geomorphology between 1994 and 2003 are illustrated on Figure 3. The purpose of this project is to provide coastal erosion protection for the tribal reservation of the Shoalwater Bay Tribe on Willapa Bay, Washington, that is cost-effective; environmentally acceptable and technically feasible; and will improve the economic and social conditions of the Shoalwater Bay Tribe. In addition to reducing flood hazards to the upland areas, the protection afforded by the proposed work will reduce erosion and associated degradation to tide flats and marshes in North Cove, an area that the Shoalwater Tribe relies on for shellfish resources.

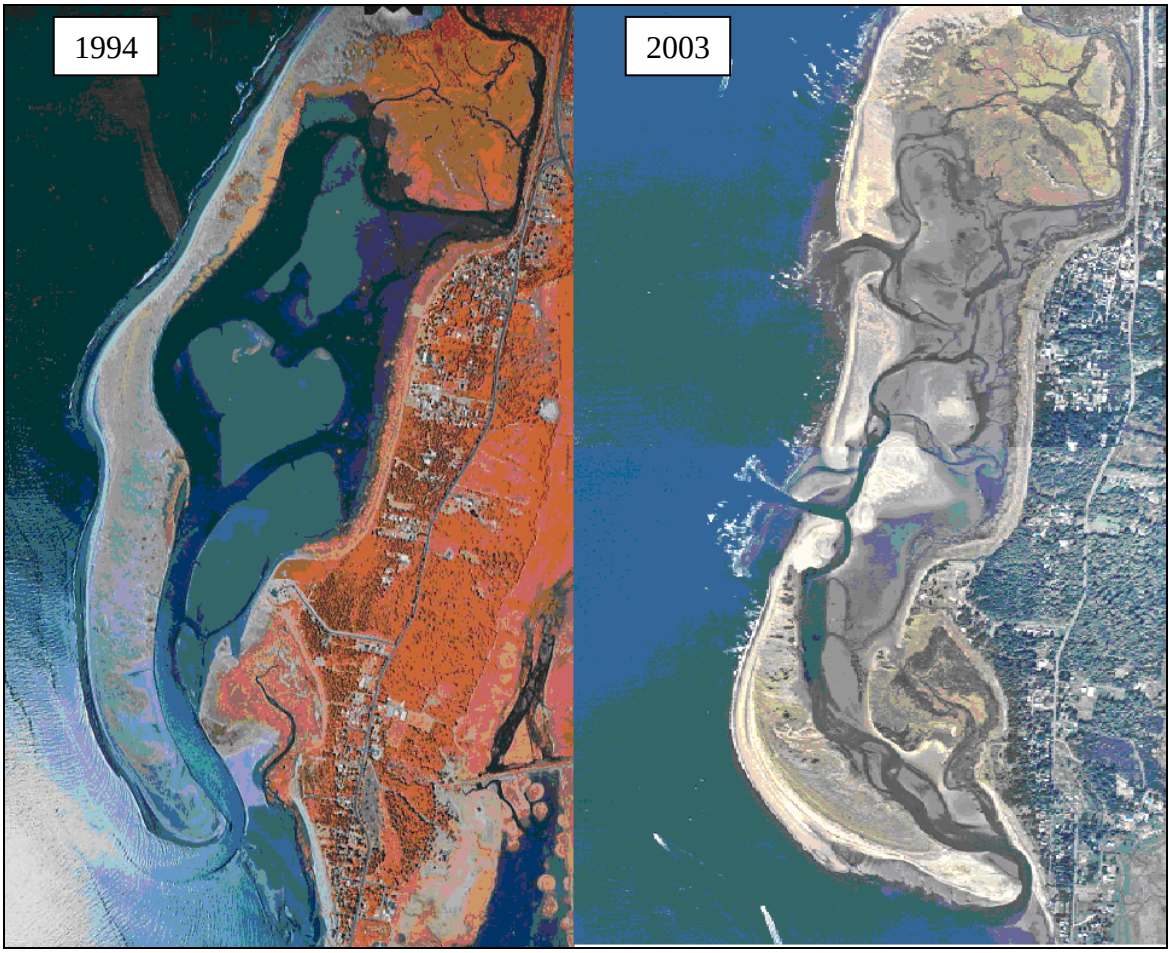


**Figure 3. Aerial photography illustrating changes in North Cove geomorphology between 1994 and 2003.**

## 2. PROPOSED ACTION

The proposed project combines restoration of the now deteriorated barrier dune system with an extension of a shoreline flood berm that was constructed in 2001 to protect the Shoalwater Reservation. See Figure 4 and the sections below for project details.

### 2.1. DUNE RESTORATION AND CHANNEL RELOCATION

Erosion and lowering of the barrier dune that extends southward on Graveyard Spit and Empire Spit is exposing the Shoalwater Bay Indian Reservation and the Tokeland Peninsula shoreline to increased flooding from storm waves during periods of extreme high tides. The dune restoration alternative is intended to rebuild, and maintain the now deteriorated dune system with sand dredged from the adjacent Willapa Bay entrance and channel. The restored dune would be 12,500-feet-long, with a top elevation of +25 feet MLLW, a top width of 20 feet, and a side slope of 5H:1V (Figure 4). The dune restoration would be constructed along the crest of the now deteriorated dune. The restored dune would be graded and planted in areas primarily with native American dune grass (*Elymus mollis*), while allowing other areas to remain sparsely vegetated to provide preferred habitat for Western snowy plovers (see Section 7.4).

The initial dune restoration would require the placement of approximately 600,000 cubic yards (cy) of sand dredged from the entrance to Willapa Bay (Figure 5). The sand for the dune restoration is proposed to be pumped from a borrow site by a large pipeline dredge. A similar construction process for dredged sand placement was successfully carried out by the Washington State Department of Transportation in 1998 for the SR-105 Emergency Stabilization Project to the west of Graveyard Spit. For that project, some 350,000 CY of dredged sand for a beach fill was pumped approximately 9,000 feet. The primary borrow site is located on the north side of the Willapa North Channel, approximately 3500 feet southwest of Graveyard Spit. A secondary borrow site is located across North Channel from the primary borrow site and approximately 7500 feet southwest of Graveyard Spit.

Over the last ten years, the erosion of the barrier dune has profoundly affected the channel that flows into North Cove. Figure 3 shows that, in 1994, the dune formed a continuous barrier separating North Cove from Willapa Bay and a single, well-defined channel entered the southern end of the cove. The tidal flow in this channel was strong enough to scour away sand that was being carried southward on the ocean side of the spit. In 1995 erosion of the dune resulted in the formation of a breach. This additional entrance and exit for tidal flows, combined with the reduction in the cove volume due to infilling, resulted in a diminished flow through the channel. The flow through the North Cove channel was no longer strong enough to resist the southward encroachment of the spit, and the channel began migrating to the southeast. In 2003, a second breach developed in the spit, decreasing the channel flow even further. The 2003 aerial photograph (see Figure 3) clearly shows that the migrating channel is now eroding the southern Tokeland Peninsula shoreline. Rehabilitation of the barrier dune will close the breaches, which will result in increased flow through the channel. Tribal members expressed concerns that the increased flow could exacerbate the channel-caused erosion along the Tokeland Peninsula shoreline. This potential problem will be addressed by relocating the North Cove channel 1,000 feet westward, to the approximate location it occupied in 1994. Relocation of the channel will require excavating approximately 100,000 cy of sand. The excavated material will be relocated

to the area presently occupied by the existing channel. There will be no net change in intertidal area due to the channel relocation since the areas below MHHW of the excavated new channel and fill in the existing channel balance each other.

Although the migration of the Willapa channel appears to have halted, other littoral processes continue. Erosion by storm waves and currents will continue, and the restored barrier dune will require maintenance on a regular basis. The cost of mobilizing a large dredge to the project site is a major consideration, and the lowest life-cycle cost is obtained by maximizing the dune maintenance interval. For this reason, the initial dune dimensions maximize the volume of sand that is placed within the available plan area of the existing spit. Maintenance requirements for the dune restoration were estimated by using topographic surveys of the dune to compute the sand loss that that occurred between 2000 and 2002. Based on the 2000-2002 erosion rates, the annual loss of sand from the dune (above +6 feet MLLW) is estimated to be 50,000 cy/year.

### 2.2. FLOOD BERM EXTENSION

The existing flood berm will be extended northward 4,000 feet and southward 2,770 feet (see Figure 4). The flood berm extension will utilize a design that is similar to the existing flood berm and will be constructed of graded riprap with a top elevation of +17 feet MLLW, a top width of 16 feet, and a side slope of 1.5H:1V. Combined with the existing 1700-foot-long berm, the proposed 4,000-foot-long north flood berm extension and 2,770-foot-long south flood berm extension will form a continuous protective structure that has a total length of 8,470 feet.

The north extension of the flood berm requires approximately 35,000 tons of graded riprap and 14,000 tons of core material. Approximately 15,000 cubic yards of sand will be excavated to make way for the core material. The south extension of the flood berm requires approximately 25,000 tons of graded riprap and 15,000 tons of core material. Approximately 10,000 cubic yards of sand will be excavated to make way for the core material. All construction materials for the flood berm extension will be brought to the construction site by truck, and access to the site will be along the berm alignment. The excavated sand will be re-graded over the flood berm and planted with native vegetation.

### 2.3. FUTURE MAINTENANCE PROJECTIONS

The restored barrier dune will provide primary protection from storm waves, but the presence of the flood berm allows considerable erosion of the barrier dune before maintenance is required. The maintenance requirements for this alternative are assumed to be 500,000 cubic yards of sand at 10-year-intervals for dune maintenance, replacement of 25 percent of the flood berm riprap and core material at 25-year intervals, and replacement of 5,000 cy of the sand covering the seaward face of the flood berm at 25-year-intervals. The “backup” protection provided by the flood berm allows considerable flexibility in the maintenance schedule for the dune restoration, allowing the maintenance interval to increase to at least 10 years verses every five years if only the dune restoration were implemented. This flexibility alleviates some of the concerns regarding availability and timing of funding for dune maintenance, and scheduling of relatively scarce dredging equipment, and the short four-month-long dredging “window” within which dredging equipment can safely operate in the severe wave climate at Willapa Bay.

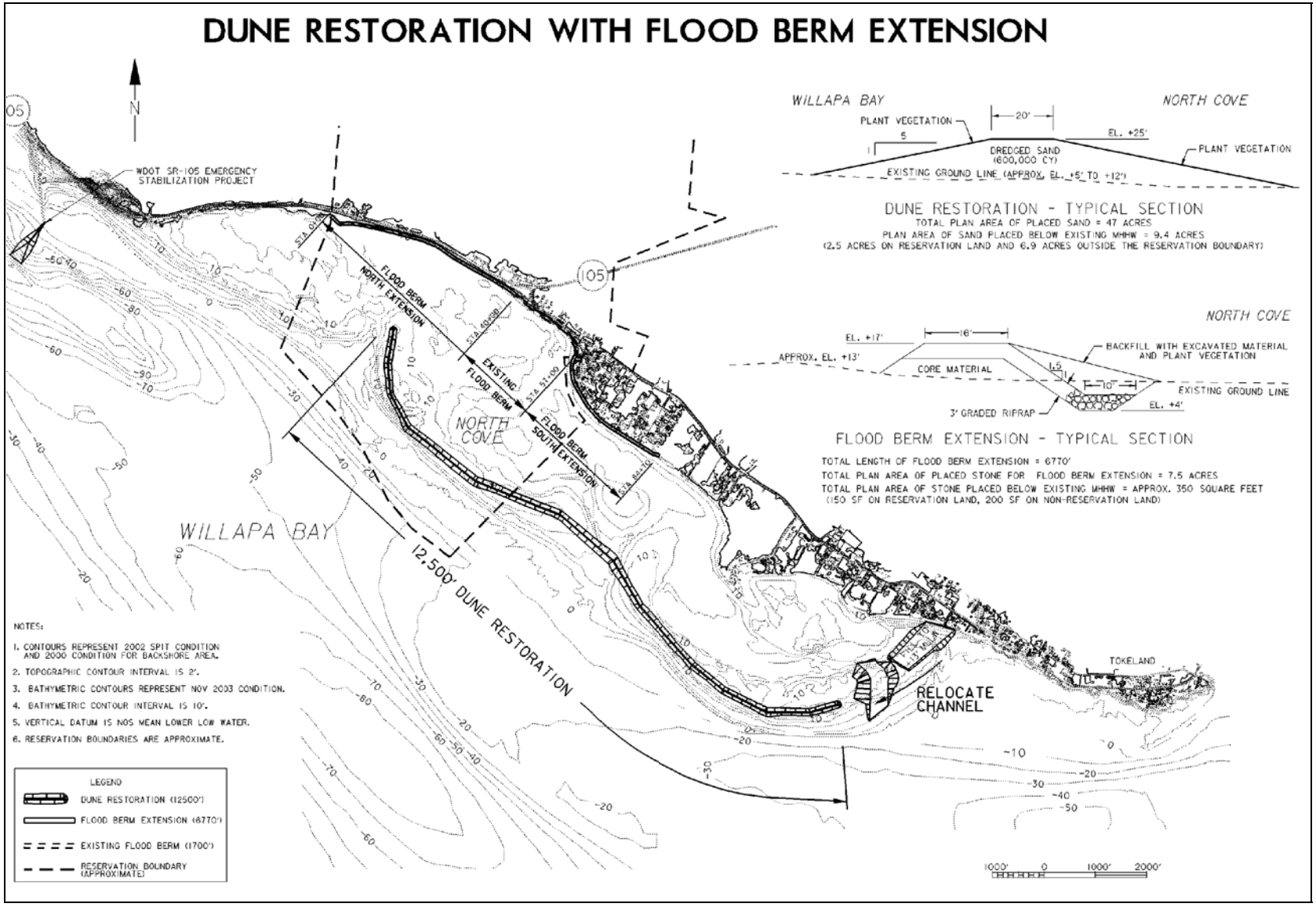


**Figure 4. Proposed action - barrier dune restoration with extension of the existing flood berm**

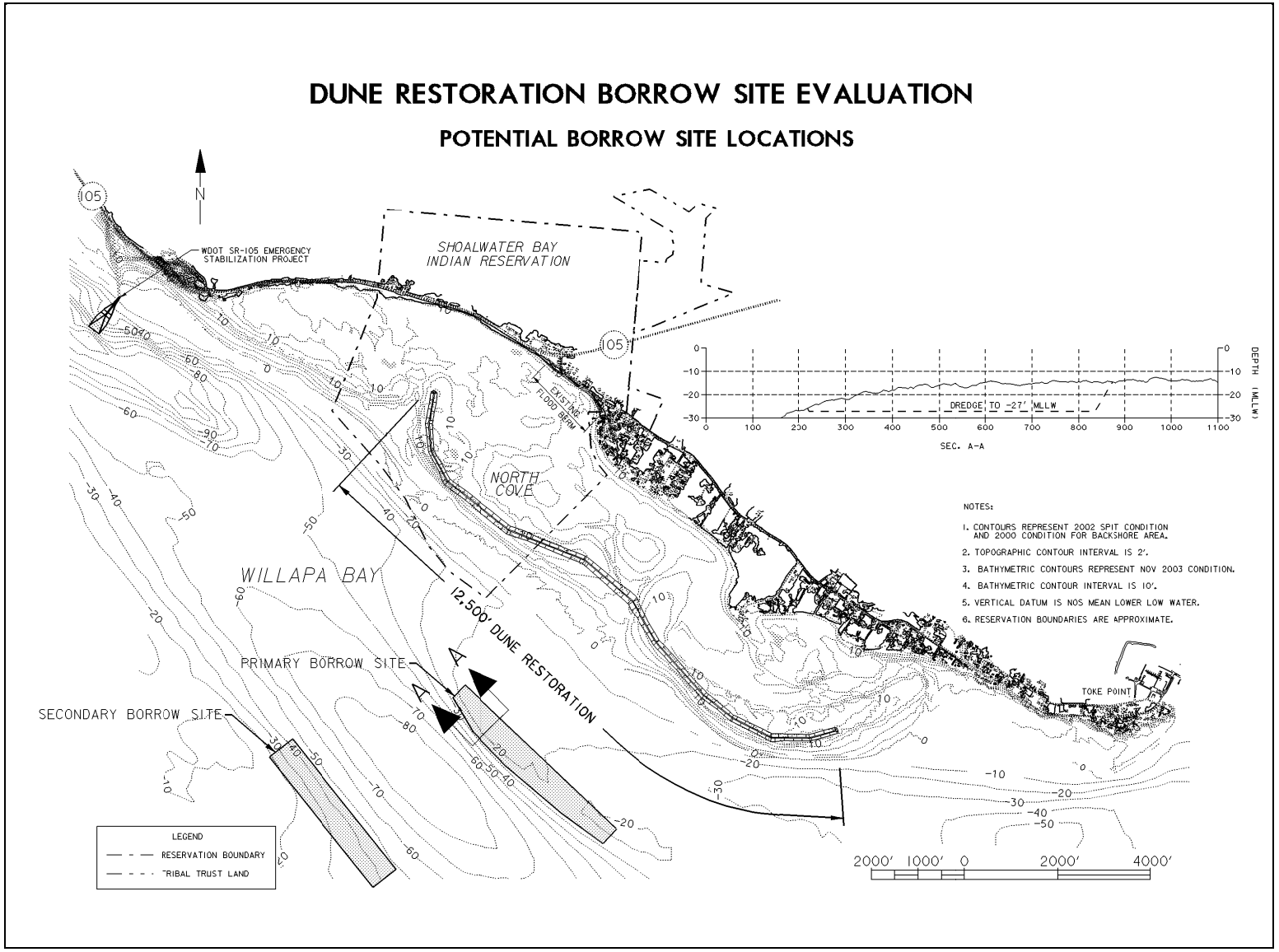


**Figure 5. Proposed action – borrow sites for barrier dune restoration**

The restored barrier dune will provide primary protection from storm waves, but the extension of the flood berm allows considerable erosion of the barrier dune before maintenance of the dune would be required. The maintenance requirements for this alternative are assumed to be 500,000 CY at 10-year-intervals for dune maintenance, replacement of 25 percent of the flood berm riprap at 25-year intervals, and replacement of 5,000 CY of the sand covering the seaward face of the riprap flood berm extension at 25-year-intervals. However, the "backup" protection provided by the flood berm allows considerable flexibility in the maintenance schedule for the barrier dune restoration, allowing the dune maintenance interval to increase to at least 10 years verses every five years if only the barrier dune restoration were implemented.

Given the long interval until the next potential maintenance event following initial construction, maintenance of the dune and flood berm is not part of the proposed Federal action covered by this biological evaluation. Separate Section 7 consultation would be necessary to address effects of project maintenance on threatened and endangered species at the time the Corps or other entity proposes such maintenance activities.

## 3. LISTED SPECIES AND CRITICAL HABITAT IN THE PROJECT VICINITY

Table 1 lists the threatened and endangered species and designated critical habitat that may occur in the vicinity of the project (WWFWO 2005; NOAA 1999).

**Table 1. Listed Species and Critical Habitat Potentially Occurring in the Project Vicinity**

| Species | Listing Status | Critical Habitat |
|---|---|---|
| Bald Eagle<br>*Haliaeetus leucocephalus* | Threatened | None |
| Brown Pelican<br>*Pelecanus occidentalis* | Endangered | None |
| Marbled Murrelet<br>*Brachyramphus marmoratus* | Threatened | Designated (none in project area) |
| Western Snowy Plover<br>*Charadrius alexandrinus nivosus* | Threatened | Designated—project area included |
| Northern Spotted Owl<br>*Strix occidentalis caurina* | Threatened | Designated (none in project area) |
| Short-tailed Albatross<br>*Phoebastria albatrus* | Endangered | None |
| Streaked Horned Lark<br>*Eremophila alpestris strigata* | Candidate | N/A |
| Coastal-Puget Sound Bull Trout<br>*Salvelinus confluentus* | Threatened | Designated (none in project area) |
| Southern Green Sturgeon<br>*Acipenser medirostris* | Threatened | None |
| Leatherback Sea Turtle<br>*Dermochelys coriacea* | Endangered | Designated (none in project area) |
| Loggerhead Sea Turtle<br>*Caretta caretta* | Threatened | None |

| Species | Listing Status | Critical Habitat |
|---|---|---|
| Green Sea Turtle<br>*Chelonia mydas* | Threatened | Designated (none in project area) |
| Olive Ridley Sea Turtle<br>*Lepidochelys olivacea* | Threatened | None |
| Oregon Silverspot Butterfly<br>*Speyeria zerene hippolyta* | Endangered | Designated (none in project area) |
| Steller Sea Lion<br>*Eumetopias jubatus* | Threatened | Designated (none in project area) |
| Humpback Whale<br>*Megoptera novaeangliae* | Endangered | None |
| Sperm Whale<br>*Physeter catodon* | Endangered | None |
| Sei Whale<br>*Balaenoptera borealis* | Endangered | None |
| Fin Whale<br>*Balaenoptera physalus* | Endangered | None |
| Blue Whale<br>*Balaenoptera musculus* | Endangered | None |
| Southern Resident Killer Whale<br>*Orcinus orca* | Endangered | Designated (none in project area) |

Threatened and endangered species under the jurisdiction of the U.S. Fish and Wildlife Service (FWS) are bald eagle, brown pelican, coastal/Puget Sound bull trout, green sea turtle, olive Ridley sea turtle, marbled murrelet, northern spotted owl, short tailed albatross, Western snowy plover, streaked horned lark, and Oregon silverspot butterfly.

Federally listed, proposed, and candidate animal species under the jurisdiction of the NOAA Fisheries (formerly the National Marine Fisheries Service), which may occur in the project vicinity, include: green sturgeon, leatherback sea turtle, loggerhead sea turtle, Steller sea lion, sperm whale, sei whale, fin whale, humpback whale, blue whale, and killer whale. In addition, the project area is located within designated Essential Fish Habitat for salmon, groundfish, and coastal pelagic species as designated under the Magnuson/Stevens Fishery Conservation and Management Act.

## 4. CONSERVATION MEASURES

### 4.1. CONSTRUCTION TIMING

To avoid impacts to bull trout, no in-water construction will occur between February 15 and July 15 of any calendar year. This window is consistent with timing requirements for in-water work in Grays Harbor, which likely exhibits similar timing patterns for bull trout use as Willapa Bay (see Section 7.8.1).

Prior to initiating the dune restoration work, the area will be surveyed for nesting Western snowy plovers. If they are found to be nesting, the Corps will coordinate work with the USFWS and

avoid work in the immediate area between March 15 and September 15 (thereby avoiding the snowy plover breeding season).

Timing windows are summarized in Table 2.

**Table 2. Work Windows for Construction Activities**

| Work | Allowable Work Period | Species Protected |
|---|---|---|
| *In-water work* | July 15-February 15 | Bull trout |
| *Dune restoration (Around nesting birds if nesting Western snowy plovers are present)* | September 15-March 15 | Western snowy plover |

### 4.2. CONSTRUCTION BEST MANAGEMENT PRACTICES

Several construction best management practices (BMPs) will be implemented to minimize potential water quality and noise effects during all periods of construction:

1. Timing restrictions described in Section 4.1 will be utilized.
2. All work will be coordinated with the Washington Department of Ecology and the Environmental Protection Agency and conditions of a 401 water quality permit will be followed.
3. During construction of the berm extensions, care will be taken to avoid impacting as many large trees as possible.
4. Spill response kits will be on site during construction and fueling will occur away from the water.
5. Construction equipment will be regularly checked for drips or leaks.
6. Equipment that will be used near the water will be cleaned prior to construction.

## 5. ACTION AREA

The project would be located on and adjacent to the Shoalwater Bay Indian Tribe's Reservation in Pacific County, Washington (see Figure 1). Reservation lands are on the northern edge of Willapa Bay, between Cape Shoalwater/Washaway Beach and Toke Point (see Figure 2). The Shoalwater Reservation is slightly greater than one-square mile in area. The original reservation encompasses only 335 acres of uplands, and an adjoining area of tidelands and intertidal habitat in North Cove to MLLW of approximately 700 acres. The Shoalwater Tribe has acquired an additional 105 acres which are held in trust, thus increasing their uplands area from 335 acres to approximately 440 acres.

The action area for the proposed project includes the immediate project areas of the mainland shoreline (including access areas between Graveyard Spit and SR 105) and ¼ mile distant from their boundaries, North Cove (situated between the dune restoration area and the mainland), Graveyard Spit and up 1000 feet waterward (generally towards the southwest) of shoreline of the dune restoration area, the borrow areas and up to ¼ mile distant from their boundaries, and the pipeline corridor extending from the borrow areas to the dune restoration area. This action area

defines the extent of potential effects of the proposed work on fish, sea turtles, birds, insects, and marine mammals.

## 6. ENVIRONMENTAL BASELINE

Willapa Bay has an area of 109 square miles at mean higher high water (MHHW) elevation and 62 square miles at mean lower low water (MLLW). Its spring or diurnal range tidal prism is more than ten billion cubic feet, making it one of the largest of all inlets of the continental United States. The magnitude of the tidal prism is produced by the broad bay area and relatively large tidal range (approximately 7 feet) at the site.

The bay entrance is about 6 miles wide between Cape Shoalwater on the north and Leadbetter Point on the south. The Willapa River is its principal tributary and enters from the east, and the Naselle River enters the bay at its southerly end. The bay has a southerly arm 19 miles long and an easterly arm 12 miles long. Both arms have numerous shoals and tide flats, with intervening channels formed by the discharge of tributary streams. Cape Shoalwater, bordering the bay's entrance channel on the north, consists of sand dunes adjacent to an actively eroding shoreline, wooded sand ridges about 40 feet high in the central part, and relatively low ground to the east.

Focusing on the immediate project area, the Shoalwater Reservation occupies a flat area along the shore, with lands extending north toward a Pleistocene rock ridge, which generally runs east to west, and comes within 200 feet of the shore at Washaway Beach. Washington State Route (SR) 105 runs east west though the Reservation, with Toke Point Road running Southeast off SR 105.

The northern portion of Willapa Bay near its entrance is characterized by a broad shallow shoal, a deep main channel, and three prominent sand ridges that protrude obliquely into the bay. Marshes and tidal flats form fringing wetlands that occupy the low elevations between the sand ridges. The oldest exposed sand ridge, Kindred Island, is low (< 4 m above mean lower lower water, MLLW), uninhabited, and serves as an anchor point for dikes that transform the adjacent marshes into grazing pasture. Tokeland Peninsula, the relatively large middle ridge, is also about 4 m above MLLW. Both Tokeland Peninsula and Kindred Island are stable landforms that are experiencing wave-generated erosion of their southeastern margins.

The present-day Graveyard Spit fronts Tokeland Peninsula and helps protect it from direct exposure to waves from the Pacific Ocean. In general, the spit is a low (< 4 m above MLLW), relatively young, segmented and unstable beach-washover deposit that is covered with grasses and low shrubs. Its recent formation is thought to be related to the rapid northward migration of the entrance channel and attendant 3.8 km historical beach retreat at Cape Shoalwater (Terich and Levensellar, 1986; Dingler and Clifton, 1994; Kaminsky *et al.*, 1999). Two relatively shallow tidal inlets divide Graveyard Spit into three segments (Figure 3). The northwestern segment, which is attached to the Pleistocene upland, is a transgressive beach that is migrating landward as the beach retreats. Overwash sand is deposited into the adjacent North Cove marsh. At low tide, muddy marsh sediments are exposed along most of the beach of the northwestern spit segment.

Average water temperature of the Pacific Ocean adjacent to Willapa Bay is 48°F to 58°F, and water temperature in the Bay is likely similar to and influenced by ocean exchange. Average air temperature ranges from 34.9° F to 72.4°F, with an annual average of 86.9 inches of precipitation.

Marine surface waters adjacent to the Shoalwater Reservation are regularly sampled by the Washington Department of Ecology; there has been a station adjacent to Toke Point since 1990. In 2000, the most recent data available, surface water temperature ranged between 46.23°F and 62.2°F; salinity was within the range for brackish water to seawater (19.15 ppt to 31.63 ppt); Dissolved oxygen was between 7.8 mg/L and 10.5 mg/L. The tide range 6.8 feet, with a spring tide range of 8.9 feet.

The Naselle, North, and Willapa Rivers are the principal tributaries flowing into Willapa Bay. Flow measurements from the U.S. Geological Survey show an average annual range for the Willapa River from 411 cubic feet per second (cfs) to 1,011 cfs; average annual flow in the Naselle is between 284 and 648 cfs. Modeling by the Corps of Engineers shows an ebb tide flow of up to 500,000 cfs at the mouth of Willapa Bay.

In the vicinity of the Shoalwater Reservation, the Washington Department of Ecology (Ecology) has waterbodies listed under Section 303 (d) of the Clean Water Act. North Cove and many other areas around Willapa Bay have been designated a Class 4 water (Impaired by a Non-Pollutant) for the invasive and exotic species, *Spartina alterniflora* (Ecology 2006). Ecology has also designated several sites around North Cove, Graveyard Spit, and Toke Point as Waters of Concern (Class 2) for Carbaryl.

Marsh plants dominate the intertidal areas of North Cove. Species present include European beach grass (*Ammophila arenaria*), sedges, rushes, *Salicornia* sp., and *Spartina alterniflora*. Upland areas are composed of coastal woodlands and residential ornamental plants and grasses. Within the tidal portion of the reservation (behind Graveyard Spit and including parts of North Cove) there are small bays, and extensive intertidal marsh communities. The marsh is a mix of native plants and invasive smooth cordgrass (*Spartina alterniflora*). The existing barrier dune of Graveyard Spit is sparsely vegetated with grasses and low shrubs. The mainland shoreline in the project vicinity is fringed by intertidal marsh, large woody debris, high salt marsh vegetation, and coniferous trees. Upland portions along the mainland shoreline are characterized by coastal woodlands and residential ornamental plants and grasses. The north flood berm extension area lies directly adjacent to SR 105, which limits vegetation to a narrow strip between the road and the intertidal zone. The south flood berm extension is adjacent to residential areas on the Shoalwater Reservation, again limiting shrubs and trees to a narrow strip between property lines and intertidal areas.

## 7. PROJECT EFFECTS ON LISTED SPECIES AND HABITAT

The following sections discuss the occurrence of listed species in the project area; the occurrence of critical habitat; and the effects of the proposed action on the listed species and critical habitat.

## 7.1. BALD EAGLE

The bald eagle (*Haliaeetus leucocephalus*) is a federally listed threatened species and a "State Threatened" species in Washington (Watson and Rodrick 2004). The bald eagle was proposed for de-listing in July 1999.

### *7.1.1. Occurrence in Project Area*

Bald eagles nesting activities in western Washington typically occur between January 1 and August 15. The characteristic features of bald eagle breeding habitat are nest sites, perch trees, and available prey. Bald eagles primarily nest in uneven-aged, multi-storied stands with old-growth components. Factors such as tree height, diameter, tree species, position on the surrounding topography, distance from water, and distance from disturbance also influence nest selection. Bald eagles normally lay two to three eggs once a year, which hatch after about 35 days. Snags, trees with exposed lateral branches, or trees with dead tops are often present in nesting territories and are critical to eagle perching, movement to and from the nest, and as points of defense of their territory.

The bald eagle wintering season extends from October 31 through March 31. Food is recognized as the essential habitat requirement affecting winter numbers and distribution of bald eagles. Other wintering habitat considerations are communal night roosts and perches. Generally the largest, tallest, and more decadent stands of trees on slopes with northerly exposures are used for roosting; eagles tend to roost in older trees with broken crowns and open branching (WDFW 1998). Bald eagles select perches on the basis of exposure, and proximity to food sources. Trees are preferred over other types of perches, which may include pilings, fence posts, powerline poles, the ground, rock outcrops, and logs (Steenhof 1978).

Bald eagles commonly occur along the Pacific Ocean coastline in Washington and they likely utilize the shoreline in the vicinity of the Shoalwater Reservation for foraging and perching. In the immediate project vicinity, the Washington Department of Natural Resources Wildlife Heritage Points database maps 3 eagle nests within 5 miles of the project, with one of these nests along the shoreline within ½-mile from the northwestern end of the northern extent of both the dune restoration and the north flood berm extension. No winter roost sites associated with Willapa Bay have been identified (Stinson et al. 2001).

### *7.1.2. Conservation Measures for Bald Eagles*

To protect nesting bald eagles, no work on the flood berm extension would occur from January 1 to August 15 of any year.

### *7.1.3. Effects of the Proposed Action on Bald Eagle*

Construction activities will occur in areas that are either adjacent to developed areas or, in the case of the dune restoration, located offshore in areas that eagles do not frequent. The north flood berm extension will avoid most trees but will require removal of several large conifers adjacent to State Route 105. These trees are located directly adjacent to the shoreline and conceivably could be used for perching by bald eagles. Removal of these few trees will not appreciably affect the number or quality of trees along shoreline areas in the Tokeland area.

Construction activities on the flood berm will occur in late summer through fall time period and will avoid bald eagle nesting periods. Increased noise and levels of activity during construction have the potential to result in minor disturbance to eagle in the project vicinity. However, given the limited extent of the proposed work in relation to the availability of other high quality habitat adjacent to the project site, construction disturbance impacts to eagles are likely to be inconsequential. Work on the dune restoration occurs far enough from more suitable eagle habitat along the mainland shore that effects on eagles for this component of the project are discountable.

Given the minimization efforts to limit removal of large trees, the small scale of disturbance in relation to the available nearby eagle habitat, and the timing of the work, the Corps has determined that the proposed project **is not likely to adversely affect** bald eagles.

## 7.2. BROWN PELICAN

Brown pelicans in the western U.S. were listed as endangered in 1970.

### *7.2.1. Occurrence in Project Area*

Brown pelicans were common in Willapa Bay in the 19th century, then declined in the early 20th century. By the 1960s, sightings of single pelicans were noteworthy. Pelican numbers along the Washington coast began to increase in the 1980s and have since remained at relatively high numbers (Wahl *et al.* 2005). Brown pelicans in Washington roost on sand islands in the Columbia River estuary, Willapa Bay, and Grays Harbor (Cullinan 2001).

Brown pelicans may be present in Willapa Bay and Tokeland area from late April through fall, peaking from July through September. Although no pelican nesting areas are located in Washington (nesting typically occurs in California during the winter and spring), pelicans utilize the marine waters in the action area for foraging. Many of these birds may "commute" to Willapa Bay from night roosts in Grays Harbor or the Columbia River estuary (Jaques and O'Casey 2006).

Prior to 2002, a large sand island offshore of Graveyard Spit provided night roosting for the largest number of brown pelicans north of the Farrallon Islands in California. By 200, this island had eroded, with a consequent decrease in use of the Willapa Bay area by pelicans and an increase in use of the surrounding estuaries. In 2002, East Sand Island, in the Columbia River estuary, became the largest roost site known on the U.S. west coast (Jaques *et al.* 2003).

Monitoring in 2004 and 2005 observed night roosting at a newly accreted island at the mouth of Willapa Bay (Jaques and O'Casey 2006), with resultant increases in pelican use of the bay. In 2005, most pelicans using Willapa Bay were immature birds (Jaques and O'Casey 2006). The sand islands that currently make up Graveyard Spit appear to provide habitat suitable for roosting brown pelicans, but monitoring has not found evidence roosting pelicans on these islands, possibly because access from upland areas to these islands could be possible during low tides.

### *7.2.2. Effects of the Proposed Action on Brown Pelicans*

Noise associated with dredging and disposal operations may result in localized, temporary disruptions to foraging in areas near the navigation channel. It is thought that effects of disturbance on non-breeding pelicans are not as significant as effects of similar disturbances during the breeding season. Pelicans are thought to be more flexible in their response to disturbance when not breeding, since they are not held to a relatively limited geographic area as they are during the breeding season (Gress and Anderson, 1983). No perching spots or night roost areas would be affected by proposed activities.

Since brown pelicans forage by sight, any increases in turbidity could result in reduced foraging success in the vicinity of dredging operations. Prey items may experience a parallel reduction in the visibility of prey, and are expected to avoid any turbidity plumes. Brown pelicans are a highly mobile species that range over large areas to forage. Any reduction in availability of food would be highly localized and would subside rapidly upon completion of the dredging and disposal operations.

Since the proposed activities will not substantially alter the characteristics of the marine habitat in the vicinity, including Graveyard Spit and off-shore islands, the Corps does not expect any effects to pelican roost sites.

In summary, impacts to pelican prey base or foraging behavior are expected to be highly localized and minor in degree, and no long-term reduction in the abundance and distribution of pelicans or their prey items are anticipated as a result of this action. Accordingly, the Corps has determined that the proposed project is **not likely to adversely affect** the brown pelican.

## 7.3. MARBLED MURRELET

Marbled murrelets were listed as threatened in 1992 and its critical habitat was designated in 1996.

### *7.3.1. Occurrence in Project Area (including critical habitat)*

Marbled murrelets spend most of their lives in the marine environment where they forage in areas 0.3 to 2.0 km from shore. Murrelets often aggregate near localized food sources, resulting in a clumped distribution. Prey species include herring, sand lance, anchovy, osmerids, seaperch, sardines, rockfish, capelin, smelt, as well as euphausiids, mysids, and gammarid amphipods. Marbled murrelets also aggregate, loaf, preen, and exhibit wing-stretching behaviors on the water.

Designated critical habitat for marbled murrelet is limited to terrestrial nesting habitat that is typically located in large-diameter, old-growth trees in low-elevation forests with multi-layered canopies forests that are located inland as far as 52 miles of the coast. The closest designated critical habitat for marbled murrelet occurs in the western portion of the Willapa Hills and approximately 10 miles east of the project site (USFWS, 1996).

In the marine environment, the USFWS is primarily concerned with direct mortality from gillnets and spills of oil and other pollutants. Although marine habitat is critical to marbled

murrelet survival, USFWS' primary concern with respect to declining marbled murrelet populations is loss of terrestrial nesting habitat.

Marine observations of murrelets during the nesting season generally correspond to the presence of large blocks of nesting habitat. Studies have found that during the nesting season murrelets are more numerous along Washington's northern coast and less abundant along the southern coast. Studies in the early 1990s indicate that murrelets are not present in abundance off the entrances to Willapa Bay, the Columbia River, or Grays Harbor in the late summer/early fall, but may utilize these areas for foraging in the late fall, winter, and spring (Varoujean and Williams 1995). This distribution appears to be correlated with proximity to old growth forest, the distribution of rocky shoreline versus sandy shoreline, and the abundance of kelp and prey items (USFWS, 1996). Murrelets, therefore, would not be expected to forage in abundance in the project vicinity during the summer nesting season. Observations documented by Speich and Wahl (1995) for Grays Harbor support this conclusion. They found that marbled murrelets are generally present in Grays Harbor during the fall, winter, and spring; with low numbers in August and September. The highest numbers occurred in habitats closer to shore (shallower than the 50 meter depth contour). Murrelet use of the mouth of Willapa Bay is likely similar to that observed for Grays Harbor. Murrelet foraging in action area likely occurs at the proposed borrow areas, offshore of the dune restoration area, and, during high tides, in North Cove.

### *7.3.2. Effects of the Proposed Action on Marbled Murrelet and its Critical Habitat*

Construction activities would have no effect on murrelet nests, nesting habitat, or nesting season foraging behaviors. However, construction activities would occur in and adjacent to foraging habitat and at times of the year when foraging murrelets are likely present. Therefore, during non-nesting periods, some disturbance to prey items and foraging behaviors could be expected.

Noise levels are a concern, as proposed berm construction and dune restoration construction will produce noise above ambient levels. The effect of human disturbance on murrelets at sea is not well documented, but they apparently habituate to heavy levels of boat traffic (Strachan *et al*., 1995). USFWS guidance suggests that noise above ambient levels could potentially disturb marbled murrelets when it occurs within 0.25 mile of suitable foraging habitat (USFWS, 1996).

Project activities will occur in and adjacent to suitable foraging habitat, but associated effects will be in a localized area with respect to this species' foraging range. Increases in turbidity associated with dredging at the borrow sites could reduce visibility in the immediate vicinity of dredging, thereby reducing foraging success for any murrelets that remain in the area. Any reduction in availability of food would be temporary, highly localized, and would subside rapidly upon completion of dredging operations.

Sand lance will likely be entrained by the dredging. McGraw and Armstrong (1990) found that Pacific sand lance get entrained and killed by hydraulic dredges at a rate of 594 fish per 1000 cy dredged. On average, up to 360,000 sand lance may be killed by the dredging, depending on the abundance and distribution of sand lance during dredging. No comprehensive biological studies of outer coast sand lance stocks have been undertaken to

determine if this mortality rate has a significant affect on the population dynamics of sand lance in Willapa Bay, but the Corps expects that cumulative impacts to the forage fish resource will be relatively minor given the temporary nature of the dredging and the limited geographic extent of the borrow sites.

Marbled murrelets are relatively opportunistic foragers; they have flexibility in prey choice, which likely enables them to respond to changes in prey abundance and location (USFWS, 1996). This indicates that if murrelets are present in the immediate vicinity of maintenance activities, and they are disturbed while foraging, they would likely move with inconsequential resultant effects.

Since the proposed activities will not substantially alter the characteristics of the marine habitat in the vicinity, the Corps does not expect any long-term reduction in the abundance and distribution of murrelet prey items.

In summary, impacts on the prey base for murrelet are expected to be highly localized relative to this species' foraging range and minor in degree. Accordingly, the Corps has determined that the proposed project is **not likely to adversely affect** the marbled murrelet. All activities occur a great distance from critical habitat units; thus the project will have **no effect** on murrelet designated critical habitat.

## 7.4. WESTERN SNOWY PLOVER

The western snowy plover was listed as a threatened species in 1993. Critical habitat for snowy plovers was designated in 1999.

### *7.4.1. Occurrence in Project Area (including critical habitat)*

Snowy plovers likely utilize ocean beaches in Pacific County throughout the year. In Washington, snowy plovers nest on coastal beaches in open areas with general absence of vegetation or driftwood. After hatching, beach and debris wrack provide cover and food sources for chicks. Most snowy plovers are site-faithful over the years, but some disperse to multiple locations within and between years (USFWS 2001).

Snowy plovers nest in small numbers (less than 10 birds; USFWS 2001) at Midway Beach, approximately 3 miles (measured along the coast) north of Graveyard Spit. Larger numbers of plovers (<25 birds) also nest at Leadbetter Point, on the south side of the Willapa Bay entrance approximately 4 miles southwest of Graveyard Spit. Since 2002, the Willapa National Wildlife Refuge has restored native coastal habitat at Leadbetter Point to create suitable nesting areas for snowy plover. In 2005, 30 nests were observed in the restored area.

The Cape Shoalwater/Midway Beach area represents the northern limit of observations of wintering snowy plovers, with as many as 8 birds observed (USFWS 2001). Plovers also winter at Leadbetter Point and further south along the Long Beach peninsula. After the breeding period ends in the early summer, plovers from interior areas of the Western U.S. migrate to coastal areas to join coastal-nesting plovers during the winter. Because of their

similarity of appearance, wintering individuals from the interior and Pacific coast are essentially indistinguishable (USFWS 1999).

In the summer 2006, western snowy plovers were observed on Graveyard Spit by WDFW. This is not unexpected given the proximity of the spit to known snowy plover nesting areas. Given its dynamic nature and general lack of vegetation, the islands that comprise Graveyard Spit appear to currently provide suitable foraging and nesting habitat for snowy plovers, although current use by plovers appears to be sporadic.

Designated critical habitat for snowy plovers includes a portion of the project area (USFWS 1999). A second critical habitat area in Washington is located at Damon Point on the north side of the entrance to Grays Harbor.

### *7.4.2. Conservation Measures for Snowy Plover*

Prior to construction of the barrier dune, the Corps will work with the USFWS and WDFW to conduct snowy plover nesting surveys in the project area. If nesting plovers are observed, the Corps will develop a buffer around these birds in order to allow construction to proceed in other project areas.

### *7.4.3. Effects of the Proposed Action on Snowy Plover and its Critical Habitat*

The Corps does not anticipate any long-term harmful impacts to snowy plovers from the proposed project. Because of the proximity of the proposed berm extensions to the highway and populated noisy areas, it is highly unlikely that plovers would be found utilizing these areas. While small numbers of snowy plovers have been observed in the project area on the barrier dune in recent years, it is not known if they will return to the dune in future years. It is likely that without a dune nourishment project, any available snowy plover habitat would be drastically reduced or eliminated by erosion. As part of the project purpose is to restore dunal habitat appropriate to snowy plover nesting habitat, there is potential that snowy plovers may one day nest in the restored area. Surveys prior to construction will determine presence of nesting snowy plovers in the project area (on the barrier dune), and if the birds are present, the Corps will coordinate with USFWS and WDFW to set up an appropriate buffer around the birds so as to limit any short-term disturbances that would occur from operating heavy equipment in the area.

Because 1) it is unlikely that snowy plovers will be present in the project area; 2) efforts will be made to survey for plover presence and develop a work plan to avoid possible identified sensitive areas; and 3) the long-term effects of the project will likely result in substantial gains in snowy plover habitat; the Corps has the determined the project is ***not likely to adversely affect*** Western snowy plovers and have ***is not likely to adversely affect*** designated critical habitat.

## 7.5. NORTHERN SPOTTED OWL

Northern spotted owls were listed as threatened in 1990 and its critical habitat was designated in 1992.

### *7.5.1. Occurrence in Project Area (including critical habitat)*

Spotted owls primarily inhabit mature forests from southern British Columbia to central California. The action area does not contain mature forests that are typically used by spotted owls. In the vicinity of the project, most nearby forests have been recently logged and do not contain mature components. Nevertheless, the action area includes the edge of immature forests that spotted owls could conceivably utilize during some parts of their life history. Given the lack of their preferred habitat types in the action area, the likelihood of spotted owl occurrence is extremely low. The nearest critical habitat for spotted owls occurs about 45 miles away in northeastern Grays Harbor County.

### *7.5.2. Effects of the Proposed Action on Northern Spotted Owl and its Critical Habitat*

The project will occur in littoral or shoreline areas with scattered, discontinuous patches of trees. Impacts to trees will be limited to construction of the proposed flood berm that will occur in or adjacent to areas with trees that area associated with the residential community of Dexter-by-the-Sea or in a narrow strip of land between North Cove and State Route 105. Increased noise and levels of activity during construction have the potential to result in minor disturbance to any owls that happen to move through the project vicinity during the work. However, based on the unsuitable habitat in the action area and the general vicinity and the localized and temporary nature of the proposed work, the Corps believes that the proposed project will have **no effect** on spotted owls or their designated critical habitat.

## 7.6. SHORT-TAILED ALBATROSS

Short-tailed albatross were listed as endangered in 2000.

### *7.6.1. Occurrence in Project Area*

The short-tailed albatross is a pelagic seabird that ranges widely in the temperate and subarctic North Pacific Ocean, with concentrated abundance along the edge of the continental shelf in the northern Gulf of Alaska, Aleutian Islands, and Bering Sea. Sightings of individual albatrosses have been recorded as far south as the Baja Peninsula, Mexico (USFWS 2005). Few observations have occurred closer than 3 miles of the west coast of North America. The only known breeding occurs on two islands in the western Pacific Ocean near Japan. Short-tailed albatross typically do not occur in nearshore areas within the action area and the chance of encountering an albatross near the Washington coast is extremely unlikely.

### *7.6.2. Effects of the Proposed Action on Short-Tailed Albatross*

The proposed work has no real potential for effect on short-tailed albatross since it will occur in areas that are not used by this species or their prey resources. The draft recovery plan for the short-tailed albatross considers the possible eruption of a volcano on the primary breeding island to be the main threat to the species recovery. Other threats include incidental catch in commercial fisheries, ingestion of plastics, contamination by oil and other pollutants, the potential for competition with non-native species, and adverse effects related to global climate change (USFWS 2005). The proposed work will not increase the likelihood of magnitude of any of the identified threats to short-tailed albatross recovery. The Corps has determined that the proposed project will have **no effect** on short-tailed albatross.

## 7.7. STREAKED HORNED LARK

The streaked horned lark is a rare subspecies of the horned lark that breeds and winters in Oregon and Washington that was petitioned for listing under the ESA in 2003. The species remains on the candidate list; however, the USFWS upgraded its listing priority status from a "6" to a "3", due to increasing threats to its nesting habitat (USFWS 2006).

### *7.7.1. Occurrence in Project Area*

Streaked horned larks nest and winter on beaches with few or no trees and shrubs and sparsely vegetated expanses of sand. Suitable habitat for streaked horned lark is similar to that for western snowy plovers. Streaked horned larks establish territories and breed from late March to early August. On the Washington coast, known breeding sites occur at Damon Point (in Grays Harbor), Graveyard Spit, Midway Beach, and Leadbetter Point. In 2004, 6 birds established 3 nesting territories on Graveyard Spit (Pearson and Altman 2005).

Wintering horned larks utilize Midway Beach, but have not been recently observed at Graveyard Spit or Leadbetter Point (Pearson and Altman 2005).

### *7.7.2. Effect Determination*

Effect determinations are not made for candidate species. The proposed work will include placement of large quantities of dredged sand on Graveyard Spit, which will temporarily displace streaked horned larks from the project vicinity. Sand placement activities could occur as early as mid-July, which potentially could disturb nesting or foraging horned larks. Disturbance during the nesting period could result in abandonment of the nest and resulting breeding failure. Given recent observations of nesting larks on Graveyard Spit, the proposed work has the potential to disturb or displace small numbers of nesting larks.

Sand placement activities later in the summer or during the fall and winter could displace foraging larks. Given the availability of suitable foraging habitat in the vicinity, larks present near the project site during the non-breeding season will likely re-locate to Midway Beach or Leadbetter Point.

After project completion the restored barrier dune may likely increase available habitat for streaked horned larks. Erosion and sediment deposition processes will continue to act on the spit, which would continue to create and maintain lark habitat in the project vicinity.

## 7.8. COASTAL-PUGET SOUND BULL TROUT

The Coastal-Puget Sound distinct population segment of bull trout was listed as threatened in 1999. Unique to this population segment is its amphidromous life strategy, which means it transitions from marine to fresh water several times before spawning in fresh water. Critical habitat for Coastal-Puget Sound bull trout was designated in 2005.

### *7.8.1. Occurrence in Project Area (including critical habitat)*

The major rivers that drain into Willapa Bay are characterized by a relatively low gradient, low elevations, and dominant winter peak flows with a lack of spring snowmelt—all conditions less than optimal for bull trout. It is likely that no spawning populations occur in the Willapa Basin, meaning that any bull trout in the project area likely would be an

anadromous individual using the system for foraging. Until recently, bull trout were not known or presumed to use the Willapa River system. However, a bull trout was caught by a WDFW fish technician at approximately river mile 29 on the Willapa River in February 2002 (USFWS, 2003). The fish was caught approximately one mile downstream of the Willapa/Forks Creek State Salmon Hatchery. There are no other confirmed observations USFWS is aware of in the Willapa system (Chan, personal communication, 2006).

The status of bull trout in Willapa Bay and the Willapa River, particularly the species' migration patterns within the estuary, is largely unknown. Similar to observations in Grays Harbor, a large embayment located just north of Willapa Bay that also does not likely support spawning populations of bull trout (Jeanes and Morello 2006), any bull trout in Willapa Bay or its tributaries are most likely from coastal watersheds further north (areas that are known to support bull trout spawning) like the Quinault River or Queets River. Since the Willapa River is located at the southern extent of the species, abundance may be naturally low.

Studies of bull trout life history in northern Puget Sound provide some indication of the timing and patterns of migration for anadromous bull trout. In the Skagit and Snohomish River systems, bull trout sub-adults migrate downstream between April and May at two or three years of age (Goetz *et al.* 2004). By early autumn, sub-adult bull trout move back to the lower portions of their natal streams where they likely overwinter. Adult bull trout (older than 4 years) migrate to the marine environment as early as February where they spend several months before returning to natal tributaries in May through July during spawning migrations. During their residency in marine waters, bull trout have been observed to make extensive forays into non-natal estuaries (Goetz *et al.* 2004).

In the marine environment, bull trout prey on forage fish like surf smelt, sand lance, northern anchovy, and herring. The closest documented herring spawning grounds in Willapa Bay are located on the east side of the Long Beach peninsula and approximately 7 miles south of North Cove (Bargmann 1998). Surf smelt and sand lance spawn on beaches in Washington in the November-February time frame. Surf smelt and sand lance spawning has not been documented on Graveyard Spit.

Willapa Bay does not include any bull trout critical habitat. Critical habitat for bull trout in Pacific Ocean marine areas does not extend south of Point Brown, which is the northern edge of the Grays Harbor entrance, and is about 20 miles north of North Cove.

### *7.8.2. Conservation Measures for Bull Trout*

To protect bull trout, in-water work would not occur between February 16 and July 15 of any calendar year. This work window prohibits dredging during months when bull trout are most likely to occur in marine waters in the project vicinity.

### *7.8.3. Effects of the Proposed Action on Bull Trout and its Critical Habitat*

Elements of the proposed activities with potential effects on bull trout include the dredging, placement of dredged material in intertidal areas, and relocation of the southern channel from North Cove. Mechanisms for these potential effects include exclusion of bull trout from their habitat through a reduction in water quality, and the loss of prey resources

through habitat disturbance and entrainment. The Corps does not expect any potential effect on bull trout from extension of the flood berm since this work will occur on uplands and will not affect elements of the marine habitat utilized by bull trout.

In-water work will be restricted to periods of time when sub-adult and adult bull trout are unlikely to occur in the project area, so direct disturbance to individual bull trout during the work is unlikely.

Most forage fish species are expected to avoid the dredging areas or they primarily occur in nearshore areas out of the immediate vicinity of the dredge. Habitat conditions for most forage fish species may be temporarily degraded by turbidity associated with dredging operations, but will return to baseline conditions when dredging stops.

Sand lance will likely be entrained by the dredging. McGraw and Armstrong (1990) found that Pacific sand lance get entrained and killed by hydraulic dredges at a rate of 594 fish per 1000 cy dredged. On average, up to 360,000 sand lance may be killed by the dredging, depending on the abundance and distribution of sand lance during dredging. No comprehensive biological studies of outer coast sand lance stocks have been undertaken to determine if this mortality rate has a significant affect on the population dynamics of sand lance in Willapa Bay, but the Corps expects that cumulative impacts to the forage fish resource will be relatively minor given the temporary nature of the dredging and the limited geographic extent of the borrow sites.

The Corps has determined that the proposed project is **not likely to adversely affect** bull trout. Bull trout are highly unlikely to be in the project area during the time construction would be scheduled to occur (determined by fish closure periods specified by USFWS). Effects to the bull trout prey base are expected to be discountable. There would be no effects to bull trout spawning habitat or behaviors. Since critical habitat does not occur in the vicinity of the action area, the proposed project will have **no effect** on bull trout critical habitat.

## 7.9. SOUTHERN GREEN STURGEON

The southern distinct population segment of green sturgeon was listed as a threatened species in 2006.

### *7.9.1. Occurrence in Project Area*

In North America, green sturgeon are anadromous, with documented spawning in several California and Oregon rivers. The southern distinct population segment of green sturgeon consists of coastal and Central Valley populations of green sturgeon south of the Eel River, with the only known population originating from the Sacramento River. In marine waters, the green sturgeon ranges from Mexico to at least Alaska in marine waters, and forages in estuaries and bays ranging from San Francisco Bay to British Columbia.

Although no spawning occurs in Washington, Willapa Bay, along with the Columbia River and Grays Harbor, is one of the coastal estuaries where green sturgeon concentrate in

summer (Adams *et al.* 2002). Genetic studies indicate that about 75 percent of green sturgeon in Willapa Bay originate from the Sacramento River (James, pers. comm. 2006).

Catch records of green sturgeon indicate that the numbers of sturgeon entering coastal estuaries in Washington peak in August. Most of the fish found in Washington estuaries are immature.

Catches in Willapa Bay have declined from 3,000 to 4,000 fish per year in the 1960s to few or none in recent years. Much of the observed decrease is probably due to reduced size limits and seasonal and area closures (Adams *et al.* 2002).

### *7.9.2. Effects of the Proposed Action on Green Sturgeon*

Given that green sturgeon move into Willapa Bay in the summer, they are likely to be in the action area during the proposed dredging window. Elements of the proposed activities with potential effects on green sturgeon include the dredging, placement of dredged material in intertidal areas, and relocation of the southern outlet channel. Mechanisms for these potential effects include exclusion of green sturgeon from their habitat through a reduction in water quality, and the loss of prey resources through habitat disturbance and entrainment. The Corps does not expect any potential effect on green sturgeon from extension of the flood berm since this work will occur on uplands and will not affect elements of the marine habitat utilized by sturgeon.

Green sturgeon are highly mobile and will likely avoid areas of in-water work during periods of activity. Effects during construction work will likely result in displacement of sturgeon rather than in direct injury. The in-water portions of the project area are not unique within the Willapa Bay area, so displacement of sturgeon is not expected to result in more than inconsequential effects.

Green sturgeon are opportunistic predators that eat a variety of prey and switch foods as prey availability changes (Turner 1966). Sturgeon generally feed on benthic invertebrates, such as shrimp, crabs, worms, mollusks, and epibenthic crustaceans. Adult green sturgeon caught in Washington had preyed on sand lance and callianassid shrimp (P. Foley, University of California, Davis, unpublished data, as cited in Moyle *et al*. 1992). Habitat conditions for most forage species may be temporarily degraded by turbidity associated with dredging operations, but will return to baseline conditions when dredging stops. Sand lance will likely be entrained by the dredging. McGraw and Armstrong (1990) found that Pacific sand lance get entrained and killed by hydraulic dredges at a rate of 594 fish per 1000 cy dredged. On average, up to 360,000 sand lance may be killed by the dredging, depending on the abundance and distribution of sand lance during dredging, but the Corps expects that cumulative impacts to the forage fish resource will be relatively minor given the temporary nature of the dredging and the limited geographic extent of the borrow sites. Furthermore, monitoring in the Fraser River found rapid recruitment of sand lance into dredged sites after disturbance (Fraser River Estuary Management Program, 2006). Effects to the sturgeon prey base would therefore be discountable given the small portion of their foraging range impacted, the rapid recovery of forage fish, and the wide variety of prey utilized by this species.

The Corps has determined that the proposed project is **not likely to adversely affect** green sturgeon since sturgeon will likely avoid work areas with insignificant adverse consequences, the work is temporary and localized, and there will be no lasting adverse impacts on green sturgeon or their forage species.

## 7.10. LEATHERBACK, LOGGERHEAD, GREEN, AND OLIVE RIDLEY SEA TURTLES

Leatherback turtles were listed as endangered in 1970. Loggerhead, green, and olive ridley sea turtles were listed as threatened in 1978.

### *7.10.1. Occurrence in Project Area*

Leatherback turtle nesting grounds occur between 40°N and 35°S (Plotkin 1995), so no nesting areas are located in Washington. While this species may use oceanic areas off the coast of Washington as foraging grounds during the summer and fall months, aerial surveys indicate that when off the U.S. Pacific coast leatherbacks usually occur in continental slope waters (NMFS and USFWS 1998a).

The nesting areas of loggerhead turtles are also located in the subtropics, though primarily in the western Pacific (NMFS and USFWS 1998b). It is thought that eastern Pacific waters may be used as foraging grounds and migratory corridors. During the summer months, occasional sightings are reported off the coast of Washington, but most records are of juveniles off the coast of California (NMFS and USFWS 1998b).

Primary nesting sites for the green turtle are located in Mexico and the Galapagos Islands, although a resident population is present in San Diego Bay (NMFS and USFWS 1998c). Beach strandings and gillnet captures have been reported off the Washington coast, but is it has been suggested that these individuals were vagrants that strayed northward with El Nino currents (NMFS and USFWS 1998c). No regular occurrences off the coast of Washington were noted in a 1998 draft recovery plan for this species.

Olive ridley turtles occur in tropical and warm temperate ocean waters, and eastern Pacific populations nest in southern Mexico and northern Costa Rica (NMFS and USFWS 1998d). There is evidence that they undergo regular migrations from breeding areas to feeding areas in the south. However, El Nino events may cause olive ridley turtles to migrate northward, where they "cold stun" once they encounter colder water (NMFS and USFWS 1998d).
Effects of the Proposed Action on Sea Turtles
All of these sea turtles may occur sporadically in waters offshore of Washington. They are extremely unlikely to occur in action area and do not rely on resources within the action area in any way. The project will not cause any short- or long-term effects that will directly or indirectly affect these turtles, their food sources, or their habitat. Accordingly, the Corps has determined that proposed work will have **no effect** on leatherback, loggerhead, green, or olive ridley sea turtles.

## 7.11. OREGON SILVERSPOT BUTTERFLY

The Oregon silverspot butterfly was listed as threatened and critical habitat was designated in 1980.

### *7.11.1. Occurrence in Project Area (including critical habitat)*

The Oregon silverspot butterfly was historically found along the coastal zone of southern Washington and central and northern Oregon. Currently, one small population occurs in Washington on the Long Beach Peninsula in Pacific County (Larsen *et al.* 1995). The Oregon silverspot butterfly occupies grassland habitats, including stabilized dunes as found at the Long Beach Peninsula, that contain early blue violets, the caterpillar host plant, and adult nectar sources in proximity to violet populations. Due to the dynamic nature of Graveyard Spit area, suitable habitat for Oregon silverspot butterflies likely does not occur in the action area. Designated critical habitat is limited to a portion of Lane County, Oregon.

### *7.11.2. Effects of the Proposed Action on Oregon Silverspot Butterfly and its Critical Habitat*

Grassland habitat containing early blue violets does not exist in the action area for the proposed work. Accordingly, the proposed work has no potential for effect on Oregon silverspot butterflies since it will occur in areas that are not used by or suitable for use by this species. The Corps has determined that the proposed project will have **no effect** on Oregon silverspot butterflies or its designated critical habitat.

## 7.12. STELLER SEA LION

The Steller sea lion was listed as a threatened species in November 1990. In 1997, the North Pacific's population of Steller sea lions was separated into two distinct stocks, Western and Eastern. The Eastern population, which includes the population inhabiting the waters of the Washington coast, is listed as threatened. The Western population, which occurs on Alaska, is listed as endangered. Critical habitat for Steller sea lions was designated in 1999.

### *7.12.1. Occurrence in Project Area (including critical habitat)*

Steller sea lions may be observed along the Washington coast year round, but they are most abundant during March-April and August-November, and least abundant during breeding season in May-July (Gearin and Jeffries, 1996). No breeding rookeries have been identified in Washington waters; however, in 1992 a single pup was born about 90 miles north of the project site on Carroll Island (WDFW, 1993).

The majority of Washington's Steller sea lion haul-out sites are located along the northern outer coast. Major haul-out sites are concentrated at large rock complexes including Tatoosh Island, Cape Alva, Carroll Island, Split/Willoughby rocks, and the Columbia River South Jetty (Gearin and Jeffries, 1996). The Willapa Bay entrance has many documented haul-out areas used regularly by harbor seals, but there is no indication that these sites are used regularly by Steller sea lions (Jeffries *et al.*, 2000). The closest identified Steller sea lion haulout locations to the project area are at the mouth of the Columbia River to the south and of the mouth of the Quinault River to the north.

Since they are wide-ranging, Steller sea lions are likely occasionally present in marine portions of the action area as they forage or migrate.

No designated critical habitat occurs within Washington State. The closest critical habitat is located in Oregon more than 200 miles south of the project site.

### *7.12.2. Effects of the Proposed Action on Steller Sea Lion and its Critical Habitat*

In the vicinity of Willapa Bay, rookery areas do not exist and major haul-out areas for Steller sea lions have not been identified. Dredging activities will have no effect on breeding habitat or behavior. Noise and disturbance associated with dredging operations may have an effect on foraging or migration behavior by potentially displacing nearby sea lions. Since sea lions are highly mobile and the dredging area does not appear to provide unique resources for sea lions, temporary displacement during dredging operations would likely have inconsequential effects on sea lions.

None of the proposed actions would result in a long-term reduction in the abundance and distribution of Steller sea lion prey items. Increases in turbidity associated with maintenance work could reduce visibility in the immediate vicinity of dredging activities, thereby reducing foraging success for any animals in the area. Any reduction in availability of food would be highly localized and would subside rapidly upon completion of the dredging and disposal operations.

Graveyard Spit or the mainland shoreline are not likely used as haul-out sites, so placement of the sand and construction of the flood berm will not affect Steller sea lions. Likewise, the potential for long-term or indirect impacts to Steller sea lions from the dune restoration or the flood berm is minimal.

In summary, potential impacts to Steller sea lions are expected to be highly localized relative to this species' foraging range and minor in degree. Accordingly, the Corps has determined that the proposed project is **not likely to adversely affect** the Steller sea lions. All activities occur a great distance from critical habitat units; thus the project will have **no effect** on designated critical habitat for Steller sea lions.

## 7.13. HUMPBACK WHALE

In 1970 the humpback whale was listed as an endangered species under Endangered Species Conservation Act of 1969. The humpback is currently listed as endangered under the Endangered Species Act of 1973, as amended.

### *7.13.1. Occurrence in Project Area*

Humpbacks are a highly migratory species. Two types of migrations are distinguished: within-season movements through a portion of the summer range, presumably to find or follow concentrations of prey, and long-distance migrations between summering and wintering areas (NMFS 1991). The summer range of humpbacks extends from subtropical waters to the arctic and the species winters in tropical waters, where mating and calving occur. During the summer, North Pacific humpbacks feed in coastal areas; the greatest numbers generally occur off the Aleutian Islands and California coast. The primary prey item of humpback whales is euphausiids, but they also feed on schooling fish such as anchovies, herring, sand lance, capelin, sardines, cod, and juvenile salmonids (Nitta and Naughton 1989). When not migrating, they occur very close to shore. Humpbacks visit

coastal and inside waters more often than other large whale species, with the exception of the gray whale. At one time humpbacks were one of the most frequently sighted whales in Washington's inside waters.

Barlow (1994) identified four relatively separate migratory populations in the North Pacific: the coastal California/Oregon/Washington-Mexico stock, the Mexico offshore island stock, the central North Pacific stock (Hawaii/Alaska), and the western North Pacific (Japan) stock. The coastal California/Oregon/Washington-Mexico stock ranges from Costa Rica to southern British Columbia, but is most common in coastal waters off California in the summer/fall and Mexico in the winter/spring (Barlow et al. 1997). In 1996, the minimum population estimate for this population was 563; the coastal California/Oregon/Washington-Mexico stock appears to be increasing in abundance (Barlow et al. 1997).

Based on aerial and shipboard surveys between 1975 and 1994, humpbacks are the second most abundant (after the gray whale) large whale off of Washington and Oregon (Barlow et al. 1997). The summer distribution of humpbacks is linked to local distribution of prey, which is driven by physical oceanographic conditions; factors such as upwelling and converging currents, which are characteristic of fjords, channels, continental shelves, offshore banks, and the edges of continental shelves, affect the abundance and availability of prey items (NMFS 1991).

### *7.13.2. Effects of the Proposed Action on Humpback Whales*

Potential effects to humpbacks as a result of the proposed work largely relate to possible sound disturbance caused by delivery of sand for the dune restoration and dredging and filling associated with re-alignment of the North Cove channel. Whale responses to sound disturbance may include avoidance, startle, annoyance, and slowed rate of travel (Calambokidis *et al.* 1987). None of the proposed work is expected to result in a long-term reduction in the abundance and distribution of prey items since the work will occur either in uplands or in naturally dynamic areas that will return to pre-dredging conditions quickly after cessation of work. Short-term impacts of any disturbance related to dredging or channel relocation activities could result a discountable chance of displacement of humpback whales rather than injury. The potential for long-term or indirect impacts of the proposed work to humpbacks is minimal.

Accordingly, the proposed project is **not likely to adversely affect** the humpback whale due to discountable likelihoods of sound disturbance or impacts to water quality and prey abundance.

## 7.14. SPERM, SEI, FIN, AND BLUE WHALES

### *7.14.1. Occurrence in Project Area*

The preferred habitat for all of these whale species is the open ocean, not coastal waters. Sperm whales, while commonly present off the coast of Washington, typically inhabit deep waters and seldom venture close to coastal areas (Barlow et al. 1997). Sei whales inhabit areas along the continental slope, and rarely enter semi-enclosed marginal seas or gulfs (Reeves et al. 1998a). North Pacific fin whale concentrations generally form along frontal

boundaries or mixing zones between coastal and oceanic waters; no regular occurrences off the coast of Washington were noted in a 1998 draft recovery plan for this species (Reeves et al. 1998a). Blue whales may feed on the continental shelf off of Washington and Oregon during the summer months, however the species is most abundant off the coast of California (Reeves et al. 1998b).

#### *7.14.2. Effects of the Proposed Action on Sperm, Sei, Fin, and Blue Whales*

These whales occur in offshore waters, have high mobility, and are extremely unlikely to occur in action area. The project will not cause any short- or long-term effects that will directly or indirectly affect these whales, their food sources, or their habitat. Accordingly, the Corps has determined that proposed work will have **no effect** on sperm, sei, fin, or blue whales.

### 7.15. SOUTHERN RESIDENT KILLER WHALE

The Southern Resident killer whale distinct population segment was listed as an endangered species in 2005 and critical habitat was proposed in June 2006.

#### *7.15.1. Occurrence in Project Area (including proposed critical habitat)*

The Southern Resident killer whales are composed of the J, K, and L pods (Krahn *et al.*, 2004), together considered a stock. They occupy a variety of marine habitats and are not constrained by water depth, temperature, or salinity (Baird, 2001). During the spring, summer, and fall, the stock can be found in the inland waterways of Puget Sound, the Strait of Juan de Fuca, and the Southern Georgia Strait. They have also been documented in the coastal waters of Washington, Oregon, California, Vancouver Island, and the Queen Charlotte Islands.

Movements of Southern Residents in the winter season are largely unknown, but they appear to range widely from the outer coast of British Columbia to the central California coast. There have been several sightings of Southern Resident whales off Grays Harbor and one 2002 stranding on the Long Beach peninsula (Krahn *et al.*, 2004). Verified sightings of Southern Residents off the outer coast of Washington and Oregon have occurred on March, April, and September. Of the three pods comprising the Southern Residents, L Pod has been observed most frequently off the Pacific Coast (Krahn *et al.*, 2004).

Critical habitat proposed for Southern Resident Killer Whales includes only U.S. waters east of Cape Flattery at the mouth of the Strait of Juan de Fuca and south of the Canadian border in the Strait of Georgia and Puget Sound. Areas off the outer Washington coast, including the project area, are not proposed as critical habitat for Southern Resident killer whales.

#### *7.15.2. Conservation Measures for Southern Resident Killer Whales*

In-water work for dredging would occur during the summer and fall, periods of time when killer whales tend to aggregate in inland waters of Washington and British Columbia and are thus unlikely to occur in the project area.

### *7.15.3. Effects of the Proposed Action on Southern Resident Killer Whales and its Proposed Critical Habitat*

Potential effects to Southern Resident killer whales as a result of the proposed work largely relate to possible sound disturbance caused by dredging and disposal. Whale responses to sound disturbance may include avoidance, startle, annoyance, and slowed rate of travel (Calambokidis *et al.* 1987). Given their documented ranges and seasonal movements, Southern Resident killer whales appear to be most likely to occur in the project area in the spring when in-water work would not occur. In the event that Southern Residents were to use the project vicinity during dredging in the summer or fall, short-term impacts of any disturbance related to dredging activities would likely result in displacement of animals from the immediate vicinity with little or any potential for adverse effects. Work on the flood berm or placement of sand on Graveyard Spit has little potential for affecting killer whales. The potential for long-term or indirect impacts of the proposed work to Southern Resident killer whales is inconsequential since there will be no lasting adverse impacts on whale habitat or habitat for their forage species.

In summary, potential impacts to Southern Resident killer whales are expected to be rare, highly localized relative to this species' foraging range, and minor in degree. Accordingly, the Corps has determined that the proposed project is **not likely to adversely affect** the Southern Resident killer whales. All activities occur a great distance from proposed critical habitat; thus the project will have **no effect** on proposed critical habitat for Southern Resident killer whales.

## 8. INDIRECT EFFECTS

Indirect effects are those that are caused by or result from the proposed action and are later in time but still reasonably certain to occur. Indirect effects from the proposed action include changes in the sediment-transport and tidal dynamics in the North Cove area. The objective of the project is to forestall erosion of Graveyard Spit to allow it to protect the mainland shoreline from storm waves and surges. By restoring a continuous barrier and re-aligning the southern outlet to North Cove, sediment transport and tidal flows will be altered in North Cove, which will likely decrease deposition of sand into North Cove by reducing overwash of Graveyard Spit, promote flushing of sediment from North Cove, maintain the substrate composition and elevation of the existing intertidal areas in North Cove, and minimize erosion of fast land along the mainland near the southern outlet. By restoring natural processes of sediment transport and tidal fluctuations in the North Cover area, all of these effects are expected to provide long-term benefits to the surrounding areas in terms of both ecosystem function and storm damage reduction.

Maintenance of the restored dune is expected to be required in about 10 years in order to maintain its function as a coastal barrier. Maintenance activities will likely be similar to the actions proposed for construction of the dune. Effects on threatened and endangered species would be re-evaluated at the time such maintenance is proposed.

## 9. INTERRELATED AND INTERDEPENDENT ACTIONS

Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are actions having no independent utility apart from the proposed action. No interrelated or interdependent actions are expected to occur.

## 10. CUMULATIVE EFFECTS

For ESA purposes, cumulative effects are future non-federal actions that are reasonably certain to occur within the action area. This definition applies only to analyses under Section 7 of the ESA and should not be confused with broader use of this term in the National Environmental Policy Act or other environmental laws.

Substantial development on the Shoalwater Reservation would likely be subject to Section 7 consultation triggered by full or partial funding of such actions by the Bureau of Indian Affairs, a federal agency. Shoreline activities associated with State Route 105 would similarly be subject to Section 7 consultation triggered by funding of such actions by the Federal Highways Administration (i.e. Federal Highways Administration was the lead agency for consultation for shoreline and coastal structures associated with State Route 105 that was performed in the late 1990s). In-water work for navigation or coastal engineering purposes would be subject to Section 7 consultation by the Corps of Engineers pursuant to the Clean Water Act or the Rivers and Harbors Act.

Agricultural activities in the North Cove area, most notably cultivation of cranberries, would continue under the proposed action. Runoff of pesticides and agricultural chemicals from cranberry bogs into tributaries to the Pacific Ocean would also continue unaffected by the proposed action.

The proposed action would connect Graveyard Spit with the mainland, thus providing uninterrupted access to the spit. Potential use of the spit for recreational activities, including bird watching, clam digging, or all terrain vehicle use could increase the level of disturbance in sensitive dune areas. Any increased use would likely be seasonally concentrated in the summer and early fall when recreational use of the Washington coast peaks. Increased use would increase the potential for disturbance of birds, including brown pelicans, snowy plovers, and streaked horned larks.

## 11. ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act (16 USC 1801 et seq), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with the NMFS on activities that may adversely affect essential fish habitat (EFH). The project action area (see Section 5) is designated as EFH for various life stages of 24 species of groundfish, five coastal pelagic species, and two species of Pacific salmon (PFMC 1998, PFMC 2003, PFMC 2004).

### 11.1. EFFECTS OF THE PROPOSED ACTIONS ON EFH

The proposed action may impact EFH of Pacific coast groundfish, coastal pelagic species, and Pacific salmon by:

- temporarily reducing the suitability of the dredging area footprint for settlement and recruitment of early life history stages;
- affecting fish and their prey resources through temporary decreases in dissolved oxygen;
- reducing the quality of habitats adjacent to the navigation project footprint through temporary increases in turbidity; and
- reducing the availability of prey resources through disturbance to the benthic invertebrate community.

The Corps has determined that the proposed actions **may adversely impact** EFH.

### 11.2. EFH CONSERVATION MEASURES

The Corps has incorporated the following conservation measures into the proposed actions to reduce potential impacts to EHF:

- The current dredging schedule reflects the current windows in accordance with guidance, policies, and regulations pursuant to the Endangered Species Act (to protect bull trout) and Washington Hydraulic Code (to protect juvenile salmonids).
- All provisions of the Washington Department of Ecology's Section 401 Water Quality Certification and the Washington Department of Fish and Wildlife's Hydraulic Project Approval (HPA) will be implemented to minimize turbidity and dissolved oxygen impacts, as well as impacts to commercially important species.
- Dredged sediments will remain within the coastal environment, which will allow coastal processes to continue to form habitat for EFH species and their food sources.

## 12. CONCLUSIONS

The effect determinations for the species potentially occurring in the project vicinity are summarized below in Table 3.

**Table 3. Effect Determination Summary**

| Species | Effect Determination | Critical Habitat Determination |
|---|---|---|
| Bald Eagle | Not likely to adversely affect | Not applicable |
| Brown Pelican | Not likely to adversely affect | Not applicable |
| Marbled Murrelet | Not likely to adversely affect | No effect |
| Western Snowy Plover | Not likely to adversely affect | Not likely to adversely affect |
| Northern Spotted Owl | No effect | No effect |
| Short-tailed Albatross | No effect | Not applicable |
| Streaked Horned Lark | Candidate Species- Not Applicable | Not applicable |
| Coastal-Puget Sound Bull Trout | Not likely to adversely affect | No effect |
| Green Sturgeon | Not likely to adversely affect | Not applicable |
| Leatherback, Loggerhead, | No effect | Not applicable |

| | | |
|---|---|---|
| Green, and Olive Ridley Sea Turtles | | |
| Oregon Silverspot Butterfly | No effect | No effect |
| Steller Sea Lion | Not likely to adversely affect | No effect |
| Humpback Whale | Not likely to adversely affect | Not applicable |
| Sperm, Sei, Fin, and Blue Whales | No effect | Not applicable |
| Southern Resident Killer Whale | Not likely to adversely affect | No effect |

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# Appendix C: USFWS and NOAA NMFS Concurrence Letters

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# United States Department of the Interior

FISH AND WILDLIFE SERVICE

Western Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

In Reply Refer To:
**13410-2007-0420**

AUG 3 0 2007

Mark Ziminske, Chief Environmental Resources
Seattle District, Corps of Engineers
ATTN: Regulatory Branch (Rutherford, Babcock)
P.O. Box 3755
Seattle, Washington 98124-3755

Dear Ms. Walker:

Subject: COE # Shoalwater Bay Shoreline Erosion Project

Your June 1, 2007, letter requested our concurrence with your determination of "may affect, not likely to adversely affect" for the bull trout (*Salvelinus confluentus*), bald eagle (*Haliaeetus leucocephalus*), brown pelican (*Pelecanus occidentalis*), marbled murrelet (*Brachyramphus marmoratus*), and the Pacific-coast population of the western snowy plover (western snowy plover) (*Charadrius alexandrinus nivosus*) for the restoration of a deteriorated barrier dune system and an extension of an existing shoreline flood berm to protect the Shoalwater Bay Indian Reservation in Pacific County, Washington. Your letter and Biological Evaluation were received in our office on June 4, 2007. We requested additional information on June 18 and July 17, 2007, and received additional information on June 19 and 22, and July 10 and August 13, 2007. We completed and sent a final Fish and Wildlife Coordination Act Report to your office on August 23, 2006. This informal consultation has been conducted in accordance with section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act).

The U.S. Army Corps of Engineers (Corps) proposes to place approximately 600,000 $yd^3$ of sand onto Graveyard and Empire Spits that form the southern boundary of North Cove to rebuild and maintain the deteriorated dune system formed by these spits. The dune system provides partial erosion protection for the shoreline and terrestrial portions of the Shoalwater Bay Indian Reservation that lie to the north of the North Cove. The restored dune would be 12,500 ft in length, and would be graded and partially planted with native dune species to provide additional erosion protection. Placement of sand would occur to facilitate enhanced nesting habitat for western snowy plovers on the waterward side of the dune system. The borrow site for the sand to be used in the project is located in the adjacent Willapa Bay entrance and channel in areas that have been continuously accreting. No hard structures (groins, dikes, seawalls, etc.) would be placed in North Cove or Willapa Bay in association with the placement of the sand.

The Corps also proposes to extend the existing flood berm along the northern shoreline of North Cove 4,000 ft northward and 2,770 ft southward. The extensions will be similar to the existing structure (core material and placement of riprap), and will result in a total structure length of 8,470 ft. The extensions will then be covered with sand, regraded, and planted with native vegetation suitable for the site.

The bald eagle was removed from the Federal List of Threatened and Endangered Wildlife, effective August 8, 2007. Given that your project will be implemented after that date, consultation under section 7(a)2 of the Act is not required. We have therefore not provided concurrence on your effect determination for the bald eagle.

Based on the information provided in your letters, Memoranda for the Services, Biological Evaluation, and addenda, we have concluded that effects to the federally listed bull trout, brown pelican, marbled murrelet, and western snowy plover associated with the proposed project would be insignificant and discountable. Therefore, we concur with your "may affect, not likely to adversely affect" determination these resources. Specifically, our concurrence is based on the following rationale.

*Bull Trout*

- The proposed in-water work will occur during the recommended work window of July 16 and February 15, when bull trout and juvenile salmonids, prey species of bull trout, are not likely to be present in the project area or exposed to potential impacts from the project construction. Therefore, direct effects to bull trout from construction are expected to be discountable.

- The proposed project is also not expected to significantly impact forage fish resources for bull trout over the long-term, although some localized entrainment of prey may occur during sand excavation and/or deposition. Therefore, indirect effects to bull trout from the proposed action via their prey resources are expected to be insignificant.

*Brown Pelican*

- The brown pelican is not expected to nest in the action area of the proposed project, and the proposed project is not expected to significantly impact food resources for nesting or wintering brown pelicans. The proposed project is also not expected to significantly impact roosting or foraging habitat for nesting or wintering brown pelicans. Furthermore, any brown pelicans present in Willapa Bay during construction would be expected to avoid the project area during construction, and would access other parts of the bay, without experiencing significant effects to foraging behavior. Therefore, direct and indirect effects to brown pelicans from the proposed action are expected to be insignificant and discountable.

*Marbled Murrelet*

- The marbled murrelet is not expected to nest in the action area of the proposed project, and the proposed project is not expected to significantly impact food resources for nesting or foraging marbled murrelets. The proposed project is also not expected to

significantly impact forage fish resources for marbled murrelets over the long-term, although some localized entrainment of prey may occur during sand excavation and/or deposition. Furthermore, any marbled murrelets present in Willapa Bay during construction would be expected to avoid the project area during construction, and would access other parts of the bay, without experiencing significant effects to foraging behavior. Therefore, direct and indirect effects to marbled murrelets from the proposed action are expected to be insignificant and discountable.

*Western Snowy Plover*

- The Corps will coordinate with Washington Department of Fish and Wildlife and U.S. Fish and Wildlife Service staff to conduct nesting surveys for western snowy plovers at the project site prior to construction. The construction timing and implementation will be adjusted as necessary to avoid impacts to nesting western snowy plovers based on these survey results and coordination with these two agencies. Therefore, direct effects to nesting western snowy plovers from the proposed action will be discountable.

- As part of the sand placement portion of the project, the COE will create and enhance suitable nesting habitat for western snowy plovers on the waterward side of the dune system in the project area, which is expected to benefit the population. During the past two years, western snowy plovers have begun using the project site in addition to other nesting areas in the vicinity of the Willapa Bay (e.g., Long Beach Peninsula, Midway Beach, etc.). Creation and enhancement of suitable nesting habitat in the project area is expected to benefit western snowy plovers over the long-term.

This concludes informal consultation pursuant to the regulations implementing the Act (50 CFR 402.13). This project should be reanalyzed if new information reveals effects of the action that may affect listed species or critical habitat in a manner, or to an extent, not considered in this consultation. The project should also be reanalyzed if the action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this consultation, and/or a new species is listed or critical habitat is designated that may be affected by this project.

If you have any questions about this letter or our joint responsibilities under the Act, please contact Karen Myers at (360) 753-9098 or Tom McDowell at (360) 753-9426, of this office.

Sincerely,

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

cc:
WDFW, Region 6
WDOE, Lacey (L. Ochoa)

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**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

NMFS Tracking No.:
2007/03532

December 12, 2007

Jeff Laufle
Corps of Engineers, Seattle District
Environmental Resources Section
Post Office Box 3755
Seattle, Washington 98124-3755

Re: Endangered Species Act Section 7 Informal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Shoalwater Bay Shoreline Erosion Project, Pacific County, Washington (4th Field HUC 17100106, Willapa Bay)

Dear Mr. Laufle:

This correspondence is in response to your request for consultation under the Endangered Species Act (ESA) of 1973, as amended, 16 U.S.C. 1531. Additionally, this letter serves to meet the requirements for the consultation under the Magnuson-Stevens Fishery Conservation and Management Act (MSA, 16 U.S.C. 1855). The National Marine Fisheries Service (NMFS) has reviewed the Biological Evaluation (BE) received from the U.S. Army Corps of Engineers (COE) on June 5, 2007, for the proposed shoreline protection project near the Shoalwater Indian Reservation in Pacific County, Washington. NMFS requested additional information on June 18 and June 27, 2007, and the COE addressed these requests on July 30 and October 3, 2007, respectively. Subsequently, the COE provided a revised project description on November 7, 2007. The COE has requested concurrence with its finding of "may affect, but not likely to adversely affect" for the threatened Southern distinct population segment (DPS) of North American green sturgeon (*Acipenser medirostris*), the threatened Steller sea lion (*Eumetopias jubatus*), the endangered humpback whale (*Megaptera novaeangliae*), and the endangered Southern Resident population of killer whale (*Orcinus orca*). Critical habitat has not been designated or proposed for the Southern DPS of green sturgeon or the humpback whale, and there is no designated critical habitat near the project area for the Steller sea lion or the Southern Resident population of killer whale.

## Project Description

The project area is located on the north side of the entrance to Willapa Bay, adjacent to the Shoalwater Bay Indian Reservation, and slightly west of Tokeland, Pacific County, Washington. The purpose of the project is to provide coastal erosion protection for the reservation, reducing flood hazards to the upland areas, and reducing erosion and associated degradation to the tideflats and marshes in North Cove. Erosion and lowering of the barrier dune that extends southward on Graveyard Spit and Empire Spit is exposing the Shoalwater Bay Indian Reservation and the Tokeland Peninsula shoreline to increased flooding from storm waves

during periods of extreme high tides. The COE proposes to dredge approximately 600,000 cubic yards (CY) of sand from the Willapa Bay entrance and channel and rebuild 12,500 feet of the barrier dune system with that sand. The sand would be graded and planted with native dune grass on the dune crest and North Cove side.

Sand for the dune restoration would be pumped from the borrow site(s) by a large pipeline dredge, probably a hydraulic cutterhead dredge. The primary borrow site is located on the north side of the Willapa North Channel, approximately 3500 feet southwest of Graveyard Spit. A secondary borrow site is located across North Channel from the primary borrow site and approximately 7500 feet southwest of Graveyard Spit. Following initial construction, maintenance requirements are assumed to be 250,000 CY at 5-year intervals for dune maintenance. However, maintenance of the dune is not part of the proposed action.

Spill response kits would be on site during construction, and fueling would occur away from water. Equipment that would be used near the water would be cleaned prior to construction, and would be checked regularly for drips or leaks. The proposed timing window for in-water work is July 15 through February 15. The action area for the proposed project includes the immediate project areas of the mainland shoreline (including access areas between Graveyard Spit and State Route 105) and up to 0.25 miles from their boundaries, North Cove (situated between the dune restoration area and the mainland), Graveyard Spit and up to 1,000 feet waterward of shoreline of the dune restoration area, the borrow areas and up to 0.25 miles from their boundaries, and the pipeline corridor extending from the borrow areas to the dune restoration area.

## Endangered Species Act

### Species Determination – Green Sturgeon

The Southern DPS of North American green sturgeon consists of coastal and Central Valley populations south of the Eel River, California, with the only known spawning population occurring in the Sacramento River. Green sturgeon migrate from their natal streams, after rearing for up to 3 years, and spend several years in the ocean prior to returning to their natal streams. During late summer and early fall, subadult and adult green sturgeon congregate in coastal bays and estuaries, with particularly large concentrations in the Columbia River estuary, Willapa Bay, and Grays Harbor. A genetic analysis was conducted on samples from 98 green sturgeon collected from a Willapa Bay test fishery in July through September of 2003, and approximately 75 percent of the green sturgeon were from the Southern DPS (Israel and May 2006).

Green sturgeon are benthic feeders on invertebrates including shrimp, mollusks, amphipods, and small fish. In Washington estuaries, known green sturgeon prey include sand lance (*Ammodytes hexapterus*), callianassid shrimp, and burrowing thalassinidean shrimp. Opportunistic collection of gut contents from 8 green sturgeon in Willapa Bay indicated that these fish primarily fed on burrowing shrimp (*Neotrypaea californiensis*) (personal communication, Brett Dumbauld, USGS).

Adult and subadult green sturgeon are known to occur in the action area from June through October, and thus would be exposed to any direct effects of the proposed action. The potential effects of the project to green sturgeon may result from: (1) entrainment from the pipeline dredge; (2) exposure to contaminants from the dredge material; and (3) reduction in prey base.

Entrainment

Entrainment of juvenile white sturgeon (*A. transmontanus*) by a hydraulic pipeline dredge has been reported in a study conducted on the Columbia River near Portland, Oregon. The removal of 700,000 CY of sand during 9 days of dredging at a depth of 60 to 80 feet resulted in the entrainment of approximately 2,000 juvenile sturgeon, and much smaller numbers of other fish species (Buell 1992). The great majority of white sturgeon entrained came from a small proportion of the area dredged, the edge of a localized high concentration of juvenile sturgeon or "sturgeon hole," and most sturgeon entrained were between 30 and 50 cm fork length. The behavior or movement of green sturgeon near dredging activities has not been documented; however, work with white sturgeon in the Columbia River has shown that they typically do not disperse from areas where dredging occurs and some fish move toward the disturbance (personal communication, Michael Parsley, USGS). A study of the response of white sturgeon to pipeline and hopper dredge operations on the lower Columbia River found that while white sturgeon were attracted to the area of dredging, none were entrained. Sturgeon tagged for that study were all larger than 50 cm in length.

Green sturgeon have been detected in the vicinity of the proposed borrow sites during late summer and early fall (Moser and Lindley 2007). However, green sturgeon collected from Willapa Bay are much larger than 50 cm in length and are not expected to be vulnerable to entrainment. There are no reports from Willapa Bay of green sturgeon smaller than 100 cm, either by Moser and Lindley (2007) or the Washington Department of Fish and Wildlife (WDFW). Test fisheries conducted by WDFW in Willapa Bay have caught many white sturgeon that were less than 90 cm in length, but the majority of green sturgeon caught were approximately 140 cm in length (personal communication, Olaf Langness, WDFW). In addition, the dredging action would take place in a broad, non-constricted area where any sturgeon present would have ample opportunity to avoid the dredge.

Contaminants

Green sturgeon and their prey may be exposed to potential contaminants released from the dredge material. The proposed borrow sites for dredge material are in a highly dynamic coastal area with high-energy waves and currents. Sediment samples collected from the vicinity of the borrow sites were predominately fine sand with very low fines content (less than 2 percent fines), and therefore are expected to be free from any chemical, biological, or other pollutants. In addition, the proposed dredged material borrow sites are far from any known sources of contamination.

Prey Base

Placement of dredged material for dune restoration may cover or temporarily disturb burrowing shrimp habitat. Given the variety of prey utilized by green sturgeon, very abundant population of burrowing shrimp in Willapa Bay, and the small portion of the estuary that would be affected by the project, this effect is expected to be insignificant.

Therefore, the overall potential effects of the proposed project to green sturgeon are insignificant and NMFS agrees that the effects of the project are not likely to adversely affect the threatened Southern DPS of green sturgeon.

**Species Determination – Marine Mammals**

**Steller Sea Lions**

NMFS listed the Steller sea lion as threatened under the ESA on November 26, 1990 (55 FR 49204) across their entire range. Continued declines in the western portion of the population led to a listing of the western stock as endangered on May 5, 1997 (62 FR 24345) however the eastern stock remained listed as threatened. Steller sea lions in Washington are from the eastern stock. The draft recovery plan (58 FR 45269) identified factors having the potential to impact the recovery of the eastern stock. The potential effects of the project to Steller sea lions relate to the following factors identified in the recovery plan: 1) disturbance; 2) reduced prey availability; and 3) contaminants.

Disturbance

Steller sea lions of the eastern DPS can occur along the Washington coast year round, however there are no breeding rookeries in Washington. The haulout locations nearest the proposed project are 25 miles to the south (Columbia River South Jetty) and 45 miles to the north (Split Rock) (Jeffries et al. 2000). The proposed project would not disturb breeding or haulout activities. Steller sea lions are extremely unlikely to be present near the project; therefore, disturbance from construction is discountable. In the unlikely event that Steller sea lions were in the vicinity of the project, proposed use of a hydraulic cutterhead dredge would be audible to Steller sea lions at sound pressure levels (100 to 110 $dB_{peak}$) below the sound exposure threshold for behavioral disturbance (160 $dB_{RMS}$ re: 1μPa) from broad band impulse. Thus, effects of sound from dredging are insignificant.

Prey Availability

Steller sea lions are opportunistic predators, and generally prey on fish and invertebrates that are seasonally and locally abundant. Important prey species for sea lions generally inhabit deep water and are unlikely to be in close proximity to the project site. Pacific sandlance will likely be entrained by proposed dredging, yet no measurable effects to the total available prey for Steller sea lions are expected. Therefore, as Steller sea lions are unlikely to occur in the vicinity of the project, and the project would not measurably affect prey availability, effects on Steller sea lion prey are discountable and insignificant.

Contaminants

As described above, sediment in areas of proposed dredging are expected to be free from any chemical, biological, or other pollutants. In addition, the proposed dredged material borrow sites are far from any known sources of contamination. Thus, it is unlikely that potential prey of Steller sea lions could be exposed to release of contaminants from dredge material.

Potential adverse effects to Steller sea lions are discountable and insignificant. NMFS concurs that the effects of this project are not likely to adversely affect the threatened eastern DPS of Steller sea lions.

**Humpback Whales**

The humpback whale was listed as endangered under the ESA on June 2, 1970 (35 FR 8491). The eastern North Pacific Stock, which includes humpback whales in the waters of Washington State, is located along coastal Central America during winter/spring, and migrates to the coast of California north to southern British Columbia during the summer (NMFS 2005). This project may cause disturbance from anthropogenic noise which was identified as a potential limiting factor in the humpback whale recovery plan,

Disturbance

Although humpback whales migrate through offshore waters in the vicinity of the project area, this species is not commonly seen within 15 km of shore in Washington waters (Shelden et al. 2000). Additionally, sound from proposed dredging would be below the threshold of disturbance for whales (160 $dB_{RMS}$ re: 1μPa), and sound attenuated at distance offshore from the project site where humpback whales would potentially occur (>15 km) would be almost inaudible. The occurrence of humpback whales in the project area is highly unlikely, and project effects are therefore discountable. Sound from the proposed project is below disturbance threshold at the source and insignificant offshore where whales may be present.

Potential adverse effects to humpback whales are discountable and insignificant. NMFS concurs that the proposed action is not likely to adversely affect endangered humpback whales.

**Southern Resident Killer Whales**

The Southern Resident killer whale DPS composed of J, K, and L pods was listed as endangered under the ESA on November 18, 2005 (70 FR 69903). The draft recovery plan (71 FR 69101) identifies potential threats to Southern Resident killer whales. The potential effects of the project relate to the following threats identified in the recovery plan: 1) sound disturbance; 2) prey availability; and 3) environmental contaminants (NMFS 2006).

The known range of Southern Resident killer whales extends from central California to the Queen Charlotte Islands off northern British Columbia, which includes the project area. From late spring to early autumn, Southern Resident killer whales spend considerable time in the Georgia Basin with concentrated activity in the inland waters of Washington around the San Juan Islands and move south into Puget Sound in early autumn. Pods make frequent trips to the outer

coast of Washington during this season. Sightings are limited for the Washington coast, however, there are no documented sightings in Willapa Bay or the project area, and the few sightings proximate to the project area are over 15 miles to the north (three sightings, Grays Harbor/Westport) and 30 miles to the south (one stranding, Long Beach) (NMFS 2006). Although Southern Resident killer whales have potential to occur in the project vicinity, the likelihood of whales being present during most of the work window is low.

Sound Disturbance

Southern Resident killer whales are unlikely to occur in the project area. In the unlikely event that Southern Resident killer whales were in the project vicinity during dredging activities, sound from proposed dredging would be below disturbance threshold at the source, and almost inaudible at short distance from the source. Thus, effects of sound from the proposed project are insignificant.

Prey Availability

The main prey of Southern Resident killer whales is adult salmon (Ford et al. 1998). In-water construction will occur between July 16 to February 15, which would avoid potential disturbance to out migrating juvenile salmonids, as well as adult migration for spawning stocks of winter steelhead into the Willapa Bay system (WIRA 24 – Willapa, WDFW 2002). Adult migration for Chinook, coho, and chum stocks in the Willapa Bay system would overlap with in-water construction (WDFW 2002). In general, adult salmonids are highly mobile and dredging action would take place in a broad, non-constricted area where any adult salmon present would have ample opportunity to avoid the dredge. As a result, effects on the prey resources for Southern Resident killer whales will be at insignificant levels.

Contaminants

As described above, sediment in areas of proposed dredging are expected to be free from any chemical, biological, or other pollutants. In addition, the proposed dredged material borrow sites are far from any known sources of contamination. Thus, it is unlikely that potential prey of Southern Residents could be exposed to release of contaminants from dredge material.

Potential adverse effects to Southern Resident killer whales are insignificant. NMFS concurs that the effects of this project are not likely to adversely affect the endangered Southern Resident killer whale DPS.

Critical habitat for Southern Resident killer whales was designated in three specific areas: 1) Summer Core Area in Haro Strait and waters around the San Juan Islands; 2) Puget Sound; and 3) the Strait of Juan de Fuca on November 29, 2006 (71 FR 69054). The proposed action does not occur in designated critical habitat, and the project activities will not result in adverse effects to critical habitat.

**Conclusion**

This concludes informal consultation pursuant to the regulations implementing the ESA, 50 CFR 402.13.

The COE must reinitiate this ESA consultation if new information reveals effects of the action that may affect listed species or designated critical habitat in a way not previously considered, the actions are modified in a manner that causes an effect to the listed species or designated critical habitat that was not previously considered, or a new species is listed, or critical habitat designated, that may be affected by the identified action.

**Magnuson-Stevens Fishery Conservation and Management Act**

Federal agencies are required, under section 305(b)(2) of the MSA and its implementing regulations (50 CFR 600 Subpart K), to consult with NMFS regarding actions that are authorized, funded, or undertaken by that agency that may adversely affect Essential Fish Habitat (EFH). The MSA section 3 defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." If an action would adversely affect EFH, NMFS is required to provide the Federal action agency with EFH conservation recommendations (MSA section 305(b)(4)(A)). This consultation is based, in part, on information provided by the Federal action agency and descriptions of EFH for Pacific coast groundfish, coastal pelagic species, and Pacific salmon contained in the Fishery Management Plans developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce.

The proposed action is described above and in the BE and supporting documents. The project action area is designated as EFH for various life stages of 24 species of groundfish, five coastal pelagic species, and two species of Pacific salmon.

*Essential Fish Habitat Conservation Recommendations*: Because the conservation recommendations that the COE included as part of the proposed action to address ESA concerns are also adequate to avoid, minimize, or otherwise offset potential adverse effects to the EFH of the species, conservation recommendations pursuant to MSA section 305(b)(4)(A) are not necessary. Since NMFS is not providing conservation recommendations at this time, no 30-day response from the COE is required (MSA section 305(b)(4)(B)).

This concludes consultation under the MSA. If the proposed action is modified in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS EFH conservation recommendations, the COE will need to reinitiate consultation in accordance with the implementing regulations for EFH at 50 CFR 600.920(1).

NMFS appreciates your efforts to comply with requirements under the ESA and MSA. If you have questions, please contact Tami Black (Tami.Black@noaa.gov, (360) 753-6042) at the Washington State Habitat Office. If you have questions about the marine mammal analyses please contact Alison Agness (Alison.Agness@noaa.gov, (206) 526-6152).

Sincerely,

D. Robert Lohn
Regional Administrator

cc: Nicolle Rutherford, COE
Alison Agness, PRD

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# Appendix D: Clean Water Act Section 404(b)(1) Evaluation

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**Shoalwater Bay Erosion Control Project**

**Pacific County, Washington**

**Substantive Compliance for**

**Clean Water Act Section 404 and Rivers and Harbors Act**

## 1. INTRODUCTION

The purpose of this document is to record the U.S. Army Corps of Engineers (Corps) compliance evaluation of the Shoalwater Bay Erosion Control project pursuant to the Clean Water Act (CWA). Specifically, Section 404 of the CWA requires an evaluation of impacts for work involving discharge of fill material into the waters of the U.S., and evaluation guidance can be found in the CWA 404(b)(1) Guidelines [40 CFR §230.12(a)].

The main body of this document summarizes the information presented in Attachment A and includes relevant information from the Environmental Assessment for the project prepared pursuant to the National Environmental Policy Act (NEPA) of 1969 [42 USC §4321 et seq.]. Attachment A provides the specific Corps analysis of compliance with the CWA 404(b)(1).

## 2. PROJECT BACKGROUND

The Shoalwater Reservation has a recent history of flooding and storm damage. On March 3, 1999, a combined storm and high tide caused severe flooding of the Shoalwater Reservation shoreline and surrounding community. The Reservation also experienced severe flooding and debris damage from winter storms in February 2006 and December 2007. The flooding is believed to be a direct result of the erosion and breaching of the barrier dune on Empire Spit that fronts the Tokeland Peninsula. With continued coastal erosion, the limited wave protection currently afforded by the eroded barrier dune will continue to decrease, and flooding of the Shoalwater Reservation and adjoining lands will occur at increasingly frequent intervals.

## 3. PROJECT NEED

Historically, the Graveyard Spit and Empire Spit dune system protected the Shoalwater Reservation uplands from shoreline wave attack during extreme high tide storms. However, the barrier dune system in North Cove has eroded and two breaches have developed through the barrier dune that comprises Empire Spit.

The Shoalwater Tribe is making significant investments in infrastructure and facilities to better serve the needs of its growing population. Tribal uplands, upon which development must take

place, exist only as a narrow band of land along the shoreline, including State Route 105 which traverses the Reservation. Due to significantly diminished dune protection, the Shoalwater Reservation uplands, which total only 440 acres, are increasingly vulnerable to shoreline erosion and flooding associated with storm-generated ocean waves due to erosion of the barrier dune, particularly during periods of elevated water conditions. Erosion of the barrier dune also exposes the Shoalwater Reservation uplands to shoreline erosion due to storm overwash of the eroded dune and resultant wave run-up and overtopping of the low-lying tribal uplands. What has until recently been only nuisance flooding (resulting in approximately one foot of water on roads, parking lots and yards) and deposition of logs and debris, is now predicted to be serious flooding with damage to tribal facilities and potential for loss of life. With each winter storm, the eroded barrier dune offers diminishing wave protection to North Cove and the Shoalwater Reservation.

In addition to the safety and flooding issues posed by erosion of the barrier dune, the productive subsistence shellfish growing and harvesting habitat of North Cove, representing 700 acres (61 percent) of the Shoalwater Reservation, is rapidly being lost to in-filling with sand due to storm waves overwashing the eroding barrier dune and depositing sand in the North Cove embayment. The degradation of the North Cove habitat also adversely affects the ability of the cove to support harvest of local native plant species traditionally used by tribal members for tribal crafts and for cultural and spiritual uses.

## 4. PROJECT PURPOSE

The purpose of the project is to reduce coastal erosion and the resulting flooding and coastal storm damage to the Shoalwater Reservation and to the Shoalwater Bay Indian Tribe (Shoalwater Tribe) on Willapa Bay, Washington, in a manner that is cost-effective; environmentally acceptable and technically feasible; and that will improve the economic and social conditions of the Shoalwater Bay Tribe.[1] The Shoalwater Reservation includes a portion of the barrier dune along North Cove, intertidal areas in North Cove, and areas landward of the high tide line of North Cove.

[1] Ecosystem restoration was not added as a project purpose until the original authorization contained in Section 545 of WRDA 2000 was amended by Section 5153 of WRDA 2007 on November 10, 2007. Due to the imminent danger to the continued existence of the Shoalwater Reservation from winter coastal storms, the current project purpose focuses on the component of the project authorization dealing with coastal erosion protection. There will be no irreversible commitment of resources in implementing the project for coastal erosion protection which would foreclose ecosystem restoration opportunities. Barrier dune restoration is, in fact, a prerequisite for consideration of ecosystem restoration opportunities in the Tribe's North Cove embayment. A separate effort will be conducted to formulate an ecosystem restoration plan, in accordance with applicable guidance and in compliance with relevant environmental laws and regulations.

# 5. PROPOSED ACTION AND ALTERNATIVES

## 5.1. NO ACTION

The "No Action" alternative assumes that no measures will be undertaken to address the ongoing erosion of the barrier dune located in North Cove fronting the Tokeland Peninsula. This alternative also recognizes that, although the northern migration of the North Willapa Channel has halted seaward of the Shoalwater Reservation, tidal currents and – to a greater extent – storm waves will continue to erode the barrier dunes which have afforded protection to the Shoalwater Reservation and Tokeland Peninsula. Material that erodes from the dune will continue to be carried into the inter-tidal area behind the dunes, eventually filling and significantly altering the ecosystem in what remains of the North Cove embayment. Continued narrowing and lowering of the dune will expose the Shoalwater Reservation shoreline to increasing shoreline erosion (though not particularly significant) and increasing frequency of flooding of uplands due to storm-generated ocean wave overwash during periods of elevated water conditions.

## 5.2. BARRIER DUNE RESTORATION (PREFERRED ALTERNATIVE)

Narrowing and lowering of the barrier dune that extends southward on Empire Spit is exposing the Shoalwater Bay Indian Reservation and the Tokeland Peninsula shoreline to increased flooding due to storm wave run-up and overtopping of the shoreline during periods of extreme high tides. The barrier dune restoration alternative is intended to rebuild, and maintain the now deteriorated dune system with sand dredged from a nearby borrow source in Willapa Bay.

For both construction and maintenance, the sand will be dredged from borrow areas that are located southwest of the project, on either side of the northern Willapa Bay channel. A similar dredging site was used for the Washington State Department of Transportation in 1998 for the SR 105 Emergency Stabilization Project.

The restored dune would be 12,500-feet-long, with a top elevation of +25 feet MLLW, a top width of 20 feet, and a side slope of 1V on 5H. The dune footprint would be about 47 total acres. The dune restoration would be constructed along the crest of the now deteriorated dune. The initial dune restoration would require the placement of approximately 600,000 cubic yards (cy) of sand dredged from the entrance to Willapa Bay. The dredged sand would be graded and, on the dune crest and North Cove side, planted with native dune grass. The ocean side of the restored dune would remain unplanted to provide habitat for Western snowy plover, a threatened bird species.

The Corps plans to conduct a survey to obtain updated topography data just prior to construction in order to adjust the alignment of the restored dune to account for changes in landform that have occurred since 2003. Adjustments to the dune alignment would be done so as to avoid impacting high salt marsh or other wetlands to the maximum practicable extent.

### *5.2.1. Maintenance Requirements*

Although the migration of the Willapa channel appears to have halted, other littoral process will not be altered. Erosion by storm waves and currents will continue, and the restored barrier dune will require maintenance on a regular basis. Maintenance requirements for the dune restoration were estimated by using topographic surveys of the dune to compute the sand loss that occurred between 2000 and 2002. Based on the 2000-2002 erosion rates, the Corps estimates the annual loss of sand from the dune (above +6 feet MLLW) at about 50,000 cy per year.

Under this alternative, maintaining the dune to its design dimensions would be critical, and the dune could not be allowed to deteriorate to a point that waves could overtop the structure and place the Shoalwater Reservation at renewed risk of erosion and flooding due to wave run-up and overtopping of the shoreline. To replace sand lost to coastal erosion and maintain the barrier dune width and height necessary to protect the Shoalwater Reservation from coastal flooding and erosion, the Corps would maintain the barrier dune approximately every five years by dredging approximately 250,000 cy from the Willapa Bay channel and placing the dredged material on the restored dune. The dune alignment on the spit can be readjusted to the most effective alignment on Graveyard Spit each time periodic nourishment is required. To the extent possible, the renourishment placement would be located to avoid covering areas planted with dune grass through locating the new sand toward the waterward side of the barrier dune. In the event that planted areas cannot be avoided, the Corps would salvage dune grass and replant it on the North Cove side following sand placement. The program of grading and planting for the initial sand placement would be repeated with each periodic nourishment cycle for the barrier dune.

Barrier dune restoration will protect tribal uplands from storm-related coastal erosion and flooding. It is a cost-effective means of providing coastal erosion protection and storm damage reduction, is environmentally acceptable, and is technically feasible.

## 5.3. DUNE RESTORATION, FLOOD BERM EXTENSION, AND CHANNEL RE-LOCATION

The dune restoration, flood berm extension, and channel relocation alternative combines restoration of the now deteriorated barrier dune system with an extension of a shoreline flood berm that the Corps constructed in 2001 to protect the Shoalwater Reservation. The restored barrier dune would provide primary protection from storm waves, but the presence of the flood berm allows for an additional level of flood protection and lengthens the intervals between required barrier dune maintenance actions. This alternative also proposes to relocate the channel at the southern end of North Cove to reduce bank erosion in this area.

### *5.3.1. Dune Restoration*

Under this alternative, the dune would be restored in a similar fashion to the dune restoration alone. The restored dune dimensions, the material quantities, and the construction methods would be the same as described in Section 5.2.

### *5.3.2. Flood Berm Extension*

In addition to the dune restoration, this alternative includes the construction of an extension of the existing flood berm northward 4,000 feet and southward 2,770 feet. The flood berm extension would utilize a design that is similar to the existing flood berm. It would be constructed of graded riprap with a top elevation of +17 feet MLLW, a top width of 16 feet, and a side slope of 1V on 1.5H. Combined with the existing 1700-foot-long berm, the 4,000-foot-long north flood berm extension and 2,770-foot-long south flood berm extension would form a continuous protective structure that would have a total length of 8,470 feet. The north extension of the flood berm would require approximately 35,000 tons of graded riprap and 14,000 tons of core material. Approximately 15,000 cy of sediment would be excavated to make way for the north extension core material. The south extension of the flood berm would require approximately 25,000 tons of graded riprap and 15,000 tons of core material. Approximately 10,000 cy of sediment would be excavated to make way for the south extension core material. All construction materials for the flood berm extension would be brought to the construction site by truck, and access to the site would be along the structure itself. The 10,000 cy of excavated sediment would be re-graded over the flood berm and planted with native vegetation.

The footprint of the northern flood berm would be 4.66 acres, including 4.5 acres of estuarine marsh. The footprint of the southern flood berm would be 3.42, including 2.51 acres of estuarine marsh. The total planned area of material placed below Mean Higher High Water (MHHW) is approximately 350 square feet (150 square feet on reservation land for the north flood berm extension and 200 square feet on non-reservation land for the south flood berm extension).

A portion of the flood berm extension would extend along the shoreline, beyond the Shoalwater Reservation boundary, requiring a perpetual easement be acquired from affected Dexter property owners. If the easement could not be acquired from Dexter property owners, the project would likely proceed with a limited design only on Reservation lands.

### *5.3.3. Relocation of North Cove Channel*

Over the last ten years, coastal processes have profoundly affected the channel that flows into North Cove. In 1994, the dune formed a continuous barrier separating North Cove from Willapa Bay and a single, well-defined channel entered the southern end of the cove. The tidal flow in this channel was likely strong enough to scour away sand that was being carried southward on the ocean side of the spit. In 1995 erosion of the dune resulted in the formation of a breach. This additional entrance and exit for tidal flows, combined with the reduction in the cove volume due to infilling, resulted in a diminished flow through the channel. The flow through the North Cove channel was no longer strong enough to resist the southward encroachment of the spit, and the channel began migrating to the southeast. In 2003, a second breach developed in the spit decreasing the channel flow even further. Restoration of the barrier dune will close the breaches, which will result in an increase in the flow through the channel.

Tribal members have expressed concerns that the increased flow could exacerbate erosion along the Tokeland Peninsula shoreline. Under this alternative, this potential problem would be addressed by relocating the North Cove channel 1,000 feet westward, to the approximate location it occupied in 1994. Relocation of the channel would require excavating approximately 100,000 cy of sand. The excavated material will be relocated to the area presently occupied by the existing channel. The plan areas (below MHHW) for the relocated channel and for the fill would be adjusted to balance each other so that there will be no net change in intertidal area.

#### *5.3.4. Maintenance Requirements*

The maintenance requirements for this alternative are assumed to be placement of 500,000 cy of sand at 10-year-intervals for dune maintenance, replacement of 25 percent of the flood berm riprap at 25-year intervals, and replacement of 5,000 cy of the sand covering the seaward face of the flood berm at 25-year-intervals. However, the "backup" protection provided by the flood berm would allow considerable flexibility in the maintenance schedule for the dune restoration, allowing the maintenance interval to increase to at least 10 years versus every five years for the dune restoration only alternative. This flexibility alleviates some of the concerns regarding availability and timing of funding for dune maintenance, and scheduling of relatively scarce dredging equipment, and the short four-month-long dredging "window" within which dredging equipment can safely operate in the severe wave climate at Willapa Bay.

Although this alternative would also protect tribal uplands from storm-related coastal erosion and flooding and is cost-effective and technically feasible, it has considerable environmental impacts associated with it. Specifically, the construction of the flood berm would impact approximately 7 acres of estuarine wetland. At this time, the Corps is not actively pursuing this alternative.

### 5.4. DUNE RESTORATION AND FLOOD BERM EXTENSION

The dune restoration and flood berm extension alternative would be the same as the previous alternative except for omission of the re-location of the channel at the southern end of North Cove.

### 5.5. SEA DIKE

This alternative would construct a sea dike, which would be a 12,500-foot-long rock structure that is intended to replace the wave protection that was once afforded by the now deteriorated dune system. The structure would have a top elevation of +20 feet MLLW, a top width of 14 feet, and a side slope of 1V on 2H. The dike would require approximately 213,000 tons of underlayer and quarry stone, and 203,000 tons of armor stone, and would be constructed along the crest of the deteriorated dune. Approximately 200,000 CY of sand would be excavated to make way for the dike stone. The excavated sand would be re-graded over the dike, and planted with native dune grass. While the sea dike itself would be designed to resist erosion by waves and currents, the sand covering the rock on the seaward side of the dike probably would be eroded, and would require maintenance on a regular basis.

The dike stone would be brought to the construction site by truck. Access to the site would require construction of a one mile haul road from SR 105. The haul road would be removed at the completion of construction. The maintenance requirement for the sand covering the seaward face of the dike is assumed to be 100,000 cy at two-year-intervals. Replacement of 50 percent of the dike armor stone would likely be required at 25-year intervals.

The sea dike alternative was eliminated from further evaluation because it is not environmentally acceptable to resource and regulatory agencies, based on feedback during the plan formulation phase of the project development. This alternative was also not supported by the Shoalwater Tribe. The sea dike would transform a natural sand dune feature to a rock structure, eliminating shellfish habitat as well as habitat of other organisms dependant on the sand dune habitat. The sea dike alternative assumes that the northward migration of the Willapa channel has halted seaward of the Shoalwater Reservation. Since the dike would not be intended to address the channel migration, further channel encroachment could undermine and destroy the dike. Another major disadvantage of this alternative is that the dike alignment would be fixed at the time of construction, and could not easily accommodate even a minor change in the channel location without a major reconstruction effort.

### 5.6. FLOW DIVERSION STRUCTURES

When evaluating this alternative, four representative flow diversion structures, or training dikes, were modeled at the Corps' Coastal and Hydraulics Laboratory, using the ADCIRC hydrodynamic model. The dimensions and orientation of the structures were adjusted until an obvious change in the flow regime of the channel occurred. The results of the model investigation found that extremely massive structures would be required to make a significant change in the flow regime of the Willapa channel. Estimated initial construction volumes for individual structures varied from 640,000 to 1,800,000 tons. Assuming an "in place" unit cost of $50/ton, the initial construction costs probably would range from $32 million to $90 million. The drawback of the high construction cost was compounded by high maintenance costs and the risk for unanticipated, and potentially adverse, consequences to the hydrodynamics and ecology of Willapa Bay.

This alternative was eliminated from further consideration because it did not appear to be either cost effective or environmentally acceptable, or verifiable as to the beneficial effect in reducing the flood and coastal storm damage threat to the Shoalwater Bay Indian Reservation.

### 5.7. SHORELINE REVETMENT

The revetment alternative consists of constructing an 8,470-foot-long rock structure that would be intended to provide protection from coastal flooding due to wave overtopping during periods of high tides. The revetment would be designed for wave conditions that would result as the barrier dune continues to erode (i.e., is not restored) and lowers to the elevation of the surrounding inter-tidal area (approximately +8 feet MLLW). The revetment would have a top elevation of +21feet MLLW, a top width of 8 feet, and a side slope of 1V

on 1.5H. Construction of the revetment would require placing approximately 55,000 tons of graded riprap and 64,000 tons of armor stone along the existing shoreline. The graded riprap and revetment stone would be brought to the construction site by truck, and access to the site would be along the structure itself. Approximately 24,000 cy of sediment would be excavated to make way for the revetment stone. The excavated sediment along with approximately 40,000 cy of imported sand would be re-graded to create a shoreline cover over the revetment. The sand cover would then be planted with native vegetation.

While the revetment itself would be designed to resist erosion by storm waves, some of the sand covering the rock on the seaward side of the revetment probably would be eroded during extreme tide events. Maintenance requirements for the revetment are assumed to be a replacement of 25,000 cy of sand covering the seaward face of the revetment every 10 years, and replacement of 25 percent of the revetment armor stone at 25-year intervals.

The revetment alternative abandons any attempt to preserve the existing barrier dune structure and does not address potential loss of the remaining Shoalwater Reservation intertidal habitat within North Cove. This alternative protects only the small upland portion of the Shoalwater Reservation. It was screened out because, unlike other available solutions, it fails to fully meet the project purpose and the criteria specified in the project authorization. For these reasons, the shoreline revetment is also not acceptable to the Shoalwater Tribe.

### 5.8. ALTERNATIVE EVALUATION

The Corps rejected the No Action alternative (Section 5.1 above) because it would not meet the project purpose or address the project need. The Corps rejected the alternative that includes Dune Restoration, Flood Berm Extension, and Channel Re-location (Section 5.3), Dune Restoration and Flood Berm Extension (Section 5.4), the Sea Dike alternative (Section 5.5), and the flow diversion structure (Section 5.6) because of their extensive environmental impacts and/or because they are not cost-effective. The shoreline revetment alternative (Section 5.7) was rejected because it does not meet the project purpose.

## 6. POTENTIALLY ADVERSE EFFECTS (INDIVIDUALLY OR CUMULATIVELY) ON THE AQUATIC ENVIRONMENT

### a. Effects on Physical, Chemical, or Biological Characteristics of the Aquatic Ecosystem

1. **Evaluate Impacts on Ecosystem Function.** Intertidal and subtidal habitats on and adjacent to Empire Spit will be disturbed by the barrier dune restoration (beach nourishment). The Corps has assessed potential impacts from the dredging operations and the barrier dune restoration and determined that they will generally be highly localized in nature, short in duration, and minor in scope (see the Shoalwater Bay Erosion Control Project Biological Evaluation, May 2007 and Shoalwater Bay Erosion Control Project Environmental Assessment, April 2009). Impacts of the work on salmonids will be reduced and/or avoided through implementation of timing restrictions. Due to these measures, impacts to these important resources should not be significant either individually or cumulatively.

2. **Evaluate Impacts on Recreational, Aesthetic and Economic Values.** Restoration of the dune would maintain recreational access to the dune, and will likely increase recreational opportunities in the project area. Because the project would provide increased flood protection to the neighboring communities, it would allow for continued recreational access to Shoalwater Bay Reservation during storm events where access to the community otherwise might be limited. Aesthetically, views of the ocean from the Shoalwater Bay Reservation and in the Dexter-by-the-Sea community will be limited or non-existent once the barrier dune is restored to its historic height. However, ocean views did not exist prior to the erosion of the barrier dune; as such, the implementation of the project will not adversely affect aesthetic values. Because restoration of the barrier dune is expected to reduce flooding and storm damage to the Reservation lands and surrounding areas, the economic and social conditions on the Shoalwater Bay Reservation and in the Dexter-by-the-Sea community should improve through continued economic growth and development in the area. No significant adverse effects on recreation, aesthetics, or the economy are anticipated.

3. **Findings.** The Corps has determined that there would be no significant adverse impacts to aquatic ecosystem functions and values.

## 7. ALL APPROPRIATE AND PRACTICABLE MEASURES TO MINIMIZE POTENTIAL HARM TO THE AQUATIC ECOSYSTEM

**a. Impact Avoidance Measures.** Potential impacts of the proposed work on salmonids will be avoided through the implementation of timing restrictions. No work waterward of MHHW will occur during the juvenile outmigration period, March 1 through June 14. For the protection of bull trout, a species listed as threatened under the Endangered Species Act, no work waterward of MHHW will occur between February 16 and July 15.

**b. Impact Minimization Measures.**

**1.** All provisions of the Washington Department of Ecology's and EPA's Section 401 Water Quality Certifications will be implemented to minimize turbidity and dissolved oxygen impacts, as well as impacts to commercially important species.

**2.** To reduce entrainment and the generation of turbidity, the hydraulic dredge will only be operated with the intake at or below the surface of the material being removed, and the intake will only be raised a maximum of three feet above the bed for brief periods of purging or flushing of the intake system.

**3.** Dredged sediments will remain within the coastal environment, which will allow coastal processes to continue to form habitat for aquatic species and their food sources.

**4.** The Corps will coordinate with WDFW and USFWS staff to conduct nesting surveys for western snowy plovers at the project site prior to construction. The construction timing and implementation will be adjusted as necessary to avoid

impacts to nesting western snowy plovers based on these survey results and coordination with these two agencies.

**5.** As part of the dune restoration, the Corps will create and enhance suitable nesting habitat for western snowy plovers on the waterward side of the dune system in the project area.

**6.** The Corps will consult with the Shoalwater Tribe and work with the USFWS to develop a western snowy plover monitoring plan for future monitoring on the barrier dune.

**7.** Planting of the barrier dune will occur with native vegetation, but only on the backside of the dune to allow approximately 12 acres of the barren nesting conditions preferred by Western snowy plovers on the front slopes of the dunes.

**8.** Prior to and/or concurrent with the proposed dredging action, including periodic renourishment, the Corps will conduct studies to determine abundance and distribution of Dungeness crabs within the project area . Collected crab abundance data will provide a basis for adaptive management to minimize impacts to crab populations as discussed in Section **Error! Reference source not found.**.

**c. Compensatory Mitigation Measures.** The barrier dune restoration activity is considered to be self-mitigating.

**Findings.** The Corps has determined that all appropriate and practicable measures have been taken to minimize potential harm.

## 8. OTHER FACTORS IN THE PUBLIC INTEREST.

**a. Fish and Wildlife.** The Corps has coordinated with State and Federal agencies to assure careful consideration of fish and wildlife resources. The Corps prepared a Biological Evaluation in accordance with the Endangered Species Act. The Corps will assure full compliance with the Endangered Species Act prior to project implementation.

**b. Water Quality.** The Corps has prepared and submitted a Joint Aquatic Resources Project Application (JARPA) to the Washington Department of Ecology (Ecology) and to the Environmental Protection Agency (EPA) as application for a Section 401 Water Quality Certification. The Corps will not begin the proposed project until Ecology and EPA have issued Water Quality Certifications. Water Quality Certifications from both agencies are necessary because the project encompasses Tribal Reservation lands held in Federal trust as well as public lands. The Corps will abide by the conditions of the Federal and State-issued Water Quality Certifications to ensure compliance with Federal and State water quality standards.

**c. Historic and Cultural Resources.** To comply with Section 106 of the NHPA, a cultural resources investigation has been completed. The project Area of Potential Effect (APE)

consists of the dune restoration area. The cultural resources investigation included a search of the Washington Department of Archaeology and Historic Preservation (DAHP) electronic Historic Sites Inventory Database, background and archival research, consultation with the Shoalwater Tribe, pedestrian surveys of all three areas, and excavation of 43 shovel tests in the two flood berm extension APEs. No historic properties listed in the National Register of Historic Places (NRHP) were found to be located in or near the APEs. One cultural resource is listed in the Washington State inventory where it is shown located near one of the APEs. To further identify historic properties, Section 106 of the National Historic Preservation Act (NHPA; 36 CFR 800.4[a][3]) requires Federal agencies to seek information from tribes likely to have knowledge of, or concerns with, historic properties within the project APEs. Because the project is partially located on Shoalwater Indian Reservation lands the Corps archaeologist has been consulting with the tribe to identify properties that may be of religious or cultural significance, including Traditional Cultural Properties (TCP), and that may be eligible for the NRHP.

Section 106 of the National Historic Preservation Act (36 CFR PART 800) requires that the effects of proposed actions on sites, buildings, structures, or objects included or eligible for the National Register of Historic Places must be identified and evaluated. As required under Section 106 of the NHPA, the Corps coordinated with the Washington State Department of Archeology and Historic Preservation (DAHP) and the Shoalwater Bay Indian Tribe. On June 14, 2006, The DAHP concurred with the Corps' finding of No Historic Properties Affected for the original proposed project of the dune restoration combined with flood berm extension. The DAHP was contacted via email on October 31, 2007 regarding the change in project scope (dune restoration only), and that same day concurred that the Corps revised project scope would also not affect historic properties.

**d. Activities Effecting Coastal Zones.** The proposed action will restore the barrier dune to its historic height and condition that existed prior to the depletion of the its feeder sand supply and the subsequent breaching of the barrier dune. The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner which is consistent to the maximum extent practicable with the enforceable policies of the approved Washington Coastal Zone Management Program. Pursuant to Chapter 90.58 of the Revised Code of Washington, which has been adopted and further defined by the Pacific County Board of County Commissioner's resolution number 2000-039, the Corps determined that the portions of this proposal that will occur off the Shoalwater Reservation[2] are consistent to the maximum extent practicable with the Pacific County Shoreline Master Program. Reference the Corps' Coastal Consistency Determination dated February 2008 for additional details.

[2] The Shoalwater Reservation is excluded from the State's coastal zone per 15 CFR Sec. 923.33 (Excluded lands), which states:

> (a) The boundary of a State's coastal zone must exclude lands owned, leased, held in trust or whose use is otherwise by law subject solely to the discretion of the Federal Government, its officers or agents. To meet this requirement, the program must describe, list or map lands or types of lands owned, leased, held in trust or otherwise used solely by Federal agencies.

**e. Environmental Benefits.** The proposed barrier dune restoration project would protect the habitat of the North Cove embayment from further degradation due to storm wave overwash of the Empire Spit barrier dune. The erosion and breaching of the barrier dune has resulted in a severe degradation of the habitat diversity and productivity of the Shoalwater Reservation's North Cove embayment. Winter storm waves at high tide frequently overtop the eroded dune, resulting in infilling of the tide flats with sand eroded from the dune. Due to storm overwash of the eroded and lowered barrier dune and the resulting infilling of North Cove with sand, the habitat in the cove is being transformed into high salt marsh. There has been a significant loss of habitat that previously supported Tribal subsistence shellfish growing and harvesting upon which the Tribe has relied heavily, both historically and in recent times. The barrier dune restoration will reduce the transport of sand into North Cove and the resultant infilling and conversion of the area to high salt marsh.

**f. Navigation.** Navigation may experience temporary and minor inconveniences during the actual dredging process, but no long-term adverse effects to navigation will occur as a result of the proposed work.

**Findings.** The Corps has determined that this project is within the public interest.

9. **CONCLUSIONS**.

Based on the analyses presented in project NEPA documents, as well as the following 404(b)(1) evaluation and general policies for the evaluation of permit applications analysis, the Corps finds that this project complies with the substantive elements of Section 404 of the Clean Water Act.

## Potential Impacts on Physical and Chemical Characteristics (Subpart C)

1. **Substrate [230.20] The existing surface substrate consists of sand.** The source of material for the barrier restoration will be sand dredged from the entrance to Willapa Bay and therefore, similar in character to the material currently comprising the barrier dune. Sediments from the proposed dredge borrow sites have been tested and characterized as suitable for beneficial uses such as this barrier dune restoration. The results of the testing have been forwarded to the appropriate agency representatives. The **e**xisting subtidal habitat in the North Channel borrow site(s) would be dredged to a greater depth than that which currently exists, but the sediment remaining after the proposed dredging would be generally similar to that which would be removed. The area of the primary borrow site, just offshore of Empire Spit is currently shoaling with sand at a rate of greater than one million cubic yards/year, or almost 20 times the rate required to provide a supply of sand for the dune construction and periodic nourishment. Therefore, the proposed dredging would not alter the sediment quality in the dredged areas. Re-distribution of sediment during dredging activities is expected to be minimal and localized.

2. **Suspended Particulate/Turbidity [230.21]** Turbidity is not expected to increase substantially above ambient conditions due to the predominately sandy nature of the dredged material, and the large quantities of suspended sand currently transported via longshore drift in the project area. Any sediment plumes attributable to the project would be temporary, localized, and equivalent to those created by natural sediment transport processes.

3. **Water Quality [230.22]** No significant water quality effects are anticipated (see number 2. above).

4. **Current Patterns and Water Circulation [230.23]** Closing the breaches in the barrier dune (Empire Spit) will alter the flow of surface waters in North Cove. Potential impacts to North Cove hydraulics as a result of the breach fills were modeled by the Corps using the ADvanced CIRCulation (ADCIRC) numerical model. That analysis determined that the inlet between Graveyard Spit and the center Empire Spit Island was well developed and essential to circulation in the western portion of the embayment. In addition, well defined inlets located at the southeastern and northwestern edges of the embayment will be left intact. Circulation in the intertidal area is not expected to be adversely affected.

   The barrier dune nourishment will restore the dune similar to the 1994 configuration prior to the breaches through the Empire Spit islands. The configuration prior to 1994 resulted in a relatively stable and self maintaining inlet into North Cove. With this configuration, currents through the two North Cove inlets were large enough to scour the sediment supplied to the southeast via littoral drift. Following the breaches, tidal velocities through the eastern North Cove inlet became too weak to scour the sediment on the distal end of the eastern island.

This caused sand to accumulate and forced the North Cove entrance channel to migrate toward the shoreline. The southeastern inlet has decreased in width ever since the breaches developed in Empire Spit. Reduced current velocities are not capable of scouring newly deposited sands transported via littoral drift. When these breaches are filled, the conveyance and current velocity through the eastern inlet will increase. An existing revetted shoreline and pile dike structure on the Tokeland Peninsula side of the eastern inlet will likely cause the inlet to progress toward the Empire Spit side of the channel as the system re-equilibrates.

5. **Normal Water Fluctuations [230.24]** The discharge of the barrier dune restoration materials will not impede normal tidal fluctuations except through the breaches that will be filled. See number 4 above.

6. **Salinity Gradients [230.25]** The discharge of nourishment materials will not affect salinity gradients. The flows into and out of North Cove (behind the barrier dune) will be maintained through tidal channels that existed prior to the 1995 barrier dune breach.

**Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D)**

1. **Threatened and Endangered Species [230.30]** Pursuant with Section 7 of the Endangered Species Act, the Corps prepared a Biological Evaluation (BE) to assess the potential impacts of the proposed work on species protected under the Act. The BE was submitted to the NMFS and USFWS for review. The BE determined that the dune restoration, flood berm extension, and channel relocation would not have any major effects on the listed species currently found in the project area. A summary of the effect determinations can be found in Table 1.

**Table 1. Effect determination summary.**

| Species | Effect Determination | Critical Habitat Determination |
|---|---|---|
| Brown Pelican | Not likely to adversely affect | Not applicable |
| Marbled Murrelet | Not likely to adversely affect | No effect |
| Western Snowy Plover | Not likely to adversely affect | No effect |
| Northern Spotted Owl | No effect | No effect |
| Short-tailed Albatross | No effect | Not applicable |
| Streaked Horned Lark | Candidate Species[3] | Not applicable |
| Coastal-Puget Sound Bull Trout | Not likely to adversely affect | No effect |
| Green Sturgeon | Not likely to adversely affect | Not likely to adversely modify proposed critical habitat |
| Leatherback, Loggerhead, Green, and Olive Ridley Sea Turtles | No effect | Not applicable |
| Oregon Silverspot Butterfly | No effect | No effect |
| Steller Sea Lion | Not likely to adversely affect | No effect |
| Humpback Whale | Not likely to adversely affect | Not applicable |
| Sperm, Sei, Fin, and Blue Whales | No effect | Not applicable |
| Southern Resident Killer Whale | Not likely to adversely affect | No effect |

On 30 August, 2007, the Corps received concurrence from USFWS on the project alternative that included the barrier dune, flood berm, and channel relocation. Subsequently, the Corps decided to reduce the project scope to address only the barrier dune restoration. The Corps advised USFWS and NMFS of the change in project scope in October 2007. NMFS concurred with the Corps' effect determinations for the modified project scope on December 12, 2007. USFWS determined that no further consultation was necessary as the impacts

[3] No determination of effect is made for candidate species. However, the Corps does not anticipate negative impacts to Streaked Horn Lark by project implementation. After project completion the restored barrier dune may increase available habitat for streaked horned larks.

associated with the modified project scope are similar to those previously described in the BE.

**2. Fish, crustaceans, mollusks and other aquatic organisms in the food web [230.31]**

Organisms in the benthic community are important prey items for a variety of aquatic species, including salmonids and crabs. Given the magnitude of the sediment movement at the borrow sites, the benthic community that exists is likely to be one that responds quickly to disturbance events. Based on the results of studies (McCauley *et al.* 1977, Swartz *et al.* 1980, Albright and Borithilette 1981, Romberg *et al.* 1995, Wilson and Romberg 1996, Jones and Stokes 1998, all in Pacific International Engineering and Pentec Environmental 1999), the subtidal benthic community within the dredge footprint is expected to recover within 1 to 3 years following dredging. The reproductive biology of this community provides for some spawning in all seasons. Re-colonization by some species will occur immediately following the dredging activity. Adjacent undisturbed habitat will provide a continuing source of organisms to colonize the newly disturbed subtidal substrate through migration and spawning (Pacific International Engineering and Pentec Environmental 1999).

Impacts from the dune restoration would likely include the initial burial of sessile or slow-moving epibenthic and infaunal organisms in the immediate placement areas. Re-colonization of these sites is expected to be relatively rapid (about 1-2 years) as they can be easily accessed and colonized by nearby species. Most of the organisms that exist on the face of the barrier dune should be acclimated to a high energy, sand-shifting environment, so that these species should quickly recolonize the new dune face. Finally, no net change to the quality or quantity of available habitat is expected as a result of the sand placement. Dredged sand placed on the intertidal beach will be similar in composition to sand that currently comprises the dune construction beach area. Although greater than 9 acres of area below MHHW will be covered as a result of the sand placement, the beach profile will simply be shifted further to the west as wave action reshapes the beach. Consequently a similar benthic community to that existing at present is expected to be present within 1-3 years following the initial dune construction.

Forage fish are important prey items for a variety of wildlife, including commercially fished salmonid species. The placement of sand for the barrier dune restoration is not expected to impact forage fish spawning. Surf smelt and sand lance spawning has not been documented on Empire Spit. During dredging and pumping activities, fish would likely re-locate to other areas of Willapa Bay, with negligible impacts to their fitness or survival. The work would be done with a hydraulic dredge, and some fish are likely to be entrained, or suctioned into the dredge with the sediment slurry. In a review of ten years (1979-1989) of entrainment data from Grays Harbor, McGraw and Armstrong (1990) identified twenty-eight species of fish in entrainment samples. Pacific sand lance were entrained at the highest rate (between 1 and 594 fish per 1000 cy dredged), followed by Pacific staghorn sculpin (between 7 and 92 per 1000 cy) and Pacific sanddab (between 3 and 76 per 1000 cy).

Accordingly, dredging would likely entrain relatively large numbers of staghorn sculpin, flatfish, and sand lance. The rate of entrainment of other species would likely be lower based

on their observed abundance (Hunt *et al.*, 2009) and vulnerability to entrainment in the hydraulic dredge. The maximum observed rate of entrainment of sand lance in Grays Harbor of 594 per 1000 cy would likely not be sustained throughout the entire dredging period, if it is met at all; a more typical entrainment rate would be less than 100 per 1000 cy. Entrainment rates for sand lance would be highest between dusk and dawn, as they burrow into sandy sea floor habitat at night to hide from predators then emerge to feed during daylight (Hobson, 1986). McGraw and Armstrong (1990) found that sand lance entrainment rates in Grays Harbor display some seasonality, increasing during the summer months and declining in the fall and winter. An entrainment study on the Columbia River found that the average number of sand lance entrained was low in the month of May, increased in the summer months to a peak in August, then declined to near zero during October (Larson and Moehl, 1988). This seasonality is confirmed by the observed fish densities during the 2008 trawling, with the relatively high fish densities at the borrow sites from July through September (with peak densities in August) and lower densities in October.

Although no comprehensive biological studies of outer coast sand lance stocks have been undertaken to determine if the observed mortality rates have a significant effect on the population dynamics of sand lance in Willapa Bay, the Corps expects that cumulative impacts to the forage fish resource will be relatively minor given the temporary nature of the dredging and the limited geographic extent of the borrow sites. Furthermore, a 2004 study in the Fraser River found no consistent sand lance catch rate differences between control and dredge sites before and after dredging activities, indicating that population effects are short term, with rapid recruitment into the dredged sites after disturbance (Fraser River Estuary Management Program, 2006).

Conditions for most forage fish species may be temporarily degraded by turbidity associated with dredging and disposal operations, but will likely return to baseline conditions upon completion of the dredging work.

The placement of sand for the barrier dune restoration is not expected to impact forage fish spawning. Surf smelt and sand lance spawning has not been documented on Empire Spit. The closest documented herring spawning grounds in Willapa Bay are located on the east side of the Long Beach peninsula and approximately 7 miles south of North Cove (Bargmann 1998). In addition, surf smelt and sand lance spawn on beaches in Washington in the November-February time frame; the project dredging will be conducted between July and October. Finally, no net change to the quality or quantity of available spawning habitat is expected as a result of the sand placement. Dredged sand placed on the beach will be similar to sand that currently comprises the beach. Although greater than 9 acres of area below MHHW will be covered as a result of the sand placement, the beach profile will simply be shifted further to the west. Wave action will quickly reshape the face of the dune to natural slopes.

The proposed dredging would occur between July and October. In 2008, the Corps completed trawling during the July-October dredging period to determine crab densities. Additional trawls may be conducted just prior to and/or concurrent with the proposed

dredging action to obtain real-time data on the abundance and distribution of Dungeness crab within the project area at the time the work is performed.

Based on the 2008 data, crab abundance appears similar to what would be expected for coastal bar habitats at Grays Harbor and the Columbia River (in contrast to relatively lower crab abundance expected in inner harbor areas). The 2008 data indicate that various life stages from recently settled crab larvae through adults occur in the borrow areas throughout the proposed dredging window. To the extent possible, the timing of dredging within the window will be adjusted to minimize impacts to Dungeness crab. Unavoidable impacts of the dredging on Dungeness crabs will be evaluated in coordination with tribal, state, and Federal agencies to minimize impacts through adaptive management. Impact avoidance measures may include timing the dredging to occur during periods of least crab abundance, use of equipment that minimizes potential crab entrainment during dredging, and actions intended to increase crab productivity in the area such as placing oyster shell on intertidal mud flats or estuarine restoration in Willapa Bay to improve survival of larval and juvenile crabs. This method is currently used by the Corps in Grays Harbor to compensate for the loss of crab from dredging activities in the Federal navigation channel in Grays Harbor (Corps 2006b). The Corps is also investigating the potential for minimizing or avoiding future impacts to crabs through potential placement of some dredged material near the shore in areas north of the project, which may provide a sediment source for the barrier dune system and thereby increase the interval between maintenance events.

The analysis of the borrow areas will consider the relative impacts of dredging at either site on Dungeness crabs as a factor in the decision process to select the borrow site. Until construction, the Corps will continue to evaluate sediment availability, dredging logistics, and biological impacts at either borrow site in an effort to optimize the benefits and minimize the impacts of the dredging for initial construction and subsequent maintenance events.

Finally, indirect effects to forage fish are also not anticipated as NOAA-sponsored studies have shown that the epibenthic fauna which will be impacted by material placement do not appear to constitute a significant fraction of these species' diet.

The proposed action is not expected to have a significant effect on the aquatic food web.

3. **Wildlife [230.32]** Noise associated with the dredging, pumping, and sand placement operations may have an effect on birds and marine mammals in the project vicinity. The impacts of any sound disturbance would likely result in displacement of animals rather than injury. Project operations are not expected to result in a long-term reduction in the abundance and distribution of any prey items. In summer of 2007, there were three snowy plover nests on Empire Spit. The Corps will coordinate with WDFW and USFWS staff to conduct nesting surveys for western snowy plovers at the project site prior to construction. The construction timing and implementation will be adjusted as practicable to avoid impacts to nesting western snowy plovers based on these survey results and coordination with these two agencies. As part of the dune restoration, the Corps will create and enhance suitable nesting habitat for western snowy plovers on the waterward side of the dune system in the

project area. In addition, the barrier dune will be planted with native vegetation, but only on the backside of the dune to allow approximately 12 acres of the barren nesting conditions preferred by Western snowy plovers on the front slopes of the dunes. Finally, the Corps will consult with the Shoalwater Tribe and work with the USFWS to develop a western snowy plover monitoring plan for future monitoring on the barrier dune.

## Potential Impacts to Special Aquatic Sites (Subpart E)

1. **Sanctuaries and Refuges [230.40]** The proposed project will not impact any designated sanctuary or refuge area.

2. **Wetlands [230.41]** There may be some minor fill of some interdunal tidal marsh wetland "fingers" on the north end of the restoration site. It is the Corps' intent to avoid these areas to the greatest extent possible by adjusting the alignment of the dune restoration footprint waterward as necessary. Many of these wetland fingers have developed as a result of the barrier dune erosion.

3. **Mudflats [230.42]** There will be no discharge of material in mudflat areas. The project will return the inundation patterns of nearby mudflats to those that existed prior to the development of breaches through the barrier dune.

4. **Vegetated Shallows [230.43]** No vegetated shallows will be impacted by the proposed project.

5. **Coral Reefs [230.44]** Not applicable.

6. **Riffle and Pool Complexes [230.45]** Not applicable.

## Potential Effects on Human Use Characteristics (Subpart F)

1. **Municipal and Private Water Supplies [230.50]** Not applicable.

2. **Recreational and Commercial Fisheries [230.51]** The proposed dredging will likely entrain some crabs from the borrow sites. The Corps is currently analyzing the crab abundance data to estimate loss to crab during proposed dredging activities. Unavoidable impacts of the dredging on Dungeness crabs will be evaluated in coordination with tribal, state, and Federal agencies to minimize impacts through adaptive management. Impact avoidance measures may include timing the dredging to occur during periods of least crab abundance, use of equipment that minimizes potential crab entrainment during dredging, and actions intended to increase crab productivity in the area such as placing oyster shell on intertidal mud flats or estuarine restoration in Willapa Bay to improve survival of larval and juvenile crabs. This method is currently used by the Corps in Grays Harbor to compensate for the loss of crab from dredging activities in the Federal navigation channel in Grays Harbor (Corps 2006b). Accordingly, the work is not expected to adversely affect the quantity or quality of the crab fishery.

Organisms in the benthic community are important prey items for a variety of aquatic species, including salmonids and crabs. Based on the results of studies (McCauley *et al.* 1977, Swartz *et al.* 1980, Albright and Borithilette 1981, Romberg *et al.* 1995, Wilson and Romberg 1996, Jones and Stokes 1998, all in Pacific International Engineering and Pentec Environmental 1999), the subtidal benthic community within the dredge footprint is expected to recover within 1 to 3 years following dredging. The reproductive biology of this community provides for some spawning in all seasons. Re-colonization by some species will occur immediately following the dredging activity. Adjacent undisturbed habitat will provide a continuing source of organisms to colonize the newly disturbed subtidal substrate through migration and spawning (Pacific International Engineering and Pentec Environmental 1999). Likewise, the epibenthic and infaunal populations in the immediate placement areas to restore the barrier dune are expected to re-colonize the area quickly. Re-colonization of these sites is expected to be relatively rapid (about 1-2 years) as they can be easily accessed and colonized by nearby species.

Forage fish are important prey items for a variety of wildlife, including commercially fished salmonid species. The placement of sand for the barrier dune restoration is not expected to impact forage fish spawning. Surf smelt and sand lance spawning has not been documented on Empire Spit. No impact to the commercial salmon fishery is expected as a result of project implementation.

No other recreational or commercial fisheries will be impacted by the implementation of the proposed project.

3. **Water-Related Recreation [230.52]** Use of the barrier dune will be precluded during construction for safety reasons. However, these impacts will be temporary and highly localized, so no significant adverse effects on recreation are anticipated. Restoration of the dune would maintain recreational access to the dune.

4. **Aesthetics [230.53]** Localized, temporary increases in noise and turbidity will occur while equipment is operating. Views of the ocean from the Shoalwater Bay Reservation and in the Dexter-by-the-Sea community will be limited or non-existent once the barrier dune is restored to its historic height. However, ocean views did not exist prior to the erosion of the barrier dune; as such, the implementation of the project will not adversely affect aesthetic values. The impact of the project on aesthetics is therefore not expected to be significant.

5. **Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves [230.54]** Not Applicable.

**Evaluation and Testing (Subpart G)**

1. **General Evaluation of Dredged or Fill Material [230.60]** The fill material will be composed of sand from borrow sources located directly offshore of the barrier dune.

2. **Chemical, Biological, and Physical Evaluation and Testing [230.61]** Sediments from the proposed dredge borrow sites have been tested and characterized as suitable for beneficial uses such as this barrier dune restoration. The results of the testing have been forwarded to the appropriate agency representatives.

**Action to Minimize Adverse Effects (Subpart H)**

1. **Actions Concerning the Location of the Discharge [230.70]** The effects of the discharge will be minimized by placing the dredged materials along the remaining crest of the existing barrier dune, minimizing the encroachment of the project footprint to the greatest extent practicable into the intertidal and subtidal areas. The discharge will result in the closure of two breaches through the barrier dune through which tidal waters flow. Closing the breaches in the barrier dune (Empire Spit) will alter the flow of surface waters in North Cove. Potential impacts to North Cove hydraulics as a result of the breach fills were modeled by the Corps using the ADvanced CIRCulation (ADCIRC) numerical model. That analysis determined that the inlet between Graveyard Spit and the center Empire Spit Island was well developed and essential to circulation in the western portion of the embayment. In addition, well defined inlets located at the southeastern and northwestern edges of the embayment will be left intact. Circulation in the intertidal area is not expected to be adversely affected. The discharge will not create standing bodies of water. The substrate of the stockpile area is similar to that being discharged. The location and timing of the proposed discharge has been planned to minimize impacts to marine organisms.

2. **Actions Concerning the Material to be Discharged [230.71]** All appropriate chemical and biological testing has been applied to the sediment proposed to be dredged. The proposed dredged material is suitable for beneficial use. No treatment substances nor chemical flocculates will be added to the dredged materials before placement on the barrier dune. The dredged materials are similar in composition to those that currently comprise the barrier dune. Any suspended sediments are expected to quickly drop out of suspension due to the coarse grain size.

3. **Actions Controlling the Material after Discharge [230.72]** Methods for reducing the potential for erosion, slumping, or leaching will not be employed, as the intent of the action is to restore and maintain a naturally occurring barrier dune and associated coastal processes.

4. **Actions Affecting the Method of Dispersion [230.73]** Dredged material will be pumped directly onto the beach and shaped with bulldozers. Because the material is sand and is similar to that comprising the beach, turbidity increases associated with the material placement are expected to be minor. Any suspended material will quickly drop out of suspension.

5. **Actions Related to Technology [270.74]** Appropriate machinery and methods of transport of the material for discharge will be employed. All machinery will be properly maintained and operated to minimize the risk of releasing contaminants such as fuel and lubricants into the aquatic environment.

6. **Actions Affecting Plant and Animal Populations [270.75]** The Corps has coordinated construction activities through consultation with the Shoalwater Tribe and coordination with state and federal resource agencies to ensure that minimal impacts to fishery and wildlife resources will occur. The project will take place between July 16 and February 15, to avoid adverse impacts to fish, particularly bull trout and outmigrating juvenile salmonids. Portions of the existing barrier dune are well vegetated with dune grass, primarily European dune grass (*Ammophila arenia)* but with some American dune grass *(Elymus mollis)*intermixed. The overwash area between the high portions of the dune is unvegetated. The barrier dune restoration will result in approximately 11 acres of sand placement above the OHWM; the majority of this area is vegetated as described above. The proposed dune restoration will bury any existing vegetation; however, the finished restored dune would be planted in selected areas with the native [American] dune grass, *Elymus mollis*. Similar plantings of native dune grass at the South Jetty near Westport, WA have been very successful and robust and function to limit wind-driven erosion as well as provide increased wildlife habitat

7. **Actions Affecting Human Use [230.76]** The restoration of the barrier dune will eliminate or at a minimum, reduce ocean views from the Shoalwater Bay Reservation and in the Dexter-by-the-Sea community. However, ocean views did not exist prior to the erosion of the barrier dune; as such, the implementation of the project will not adversely affect aesthetic values. The impact of the project on aesthetics is therefore not expected to be significant. The discharge will not increase incompatible human activity in remote fish and wildlife areas. The dredging and sand placement are not expected to adversely affect human uses of the area. During the dredging and sand placement process, access to portions of the barrier dune will be limited for safety reasons. However, any closures will be temporary. Upon completion of the project, full access to the barrier dune will be restored

8. **Other Actions [230.77]** Not applicable.

## General Policies for the Evaluation of Permit Applications [33 CFR §320.4]

1. **Public Interest Review [320.4(a)]** The Corps finds these actions to be in compliance with the 404(b)(1) guidelines and not contrary to the public interest.

2. **Effects on Wetlands [320.4(b)]** There may be some minor fill of some interdunal tidal marsh wetland "fingers" on the north end of the restoration site. It is the Corps' intent to avoid these areas to the greatest extent possible by adjusting the alignment of the dune restoration footprint waterward as necessary. Many of these wetland fingers have developed as a result of the barrier dune erosion.

3. **Fish and Wildlife [320.4(c)]** U.S. Fish and Wildlife Service and the National Marine Fisheries Service were consulted to ensure that direct and indirect loss and damage to fish and wildlife resources attributable to the proposed barrier dune restoration will be minimized.

4. **Water Quality [320.4(d)]** The Corps will abide by the conditions of the Section 401 Water Quality Certifications issued by the EPA and Washington Department of Ecology to ensure compliance with Federal and State water quality standards.

5. **Historic, Cultural, Scenic, and Recreational Values [320.4(e)]** No wild and scenic rivers, historic properties, National Landmarks, National Rivers, National Wilderness Areas, National Seashores, National Recreation Areas, National Lakeshores, National Parks, National Monuments, estuarine and marine sanctuaries, or archeological resources will be affected by the proposed maintenance work. The existing recreation values will be maintained by the restoration of the barrier dune.

6. **Effects on Limits of the Territorial Sea [320.4(f)]** The proposed maintenance work will not alter the coastline nor baseline from which the territorial sea is measured for the purposes of the Submerged Lands Act and international law.

7. **Consideration of Property Ownership [320.4(g)]** All entry rights will be obtained prior to project implementation.

8. **Activities Affecting Coastal Zones [320.4(h)]** The proposed work complies with the policies, general conditions, and general activities specified in the Pacific County Shoreline Management Master Plan and Washington Administrative Code to the maximum extent practicable.

9. **Activities in Marine Sanctuaries [320.4(i)]** Not applicable.

10. **Other Federal, State, or Local Requirements [320.4(j)]**

**a. National Environmental Policy Act.** An Environmental Assessment (EA) has been prepared to satisfy the documentation requirements of NEPA.

**b. Endangered Species Act.** In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species. A Biological Evaluation (BE) was submitted to NMFS and USFWS on June 1, 2007. Letters concurring with the determinations made in the BE were received on December 12, 2007 (NMFS) and August 30, 2007 (USFWS).

**c. Clean Water Act.** The Corps must demonstrate compliance with the substantive requirements of the Clean Water Act. This document records the Corps' evaluation and findings regarding this project pursuant to Section 404 of the Act. A Joint Aquatic Resources Permit Application (JARPA) will be sent to the Washington Department of Ecology and to the EPA for Section 401 Water Quality Certifications. Water Quality Certifications from both agencies are necessary since the project occurs partially on Reservation lands and partially on publicly owned lands. The Corps will not begin the proposed project until Ecology and EPA have issued Water Quality Certifications. The Corps will abide by the conditions of the Water Quality Certifications to ensure compliance with State and Federal water quality standards.

**d. Coastal Zone Management Act.** The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner which is consistent to the maximum extent practicable with the enforceable policies of the approved Washington Coastal Zone Management Program. Only the portions of the proposed project that will occur off the Shoalwater Reservation are subject to the Washington Coastal Zone management program.[4] Pursuant to Chapter 90.58 of the Revised Code of Washington, which has been adopted and further defined by the Pacific County Board of County Commissioners resolution number 2000-039, the Corps determined that the portions of the proposal subject to it are consistent to the maximum extent practicable with the Pacific County Shoreline Master Program.

**e. Rivers and Harbors Act.** Navigation may experience temporary and minor inconveniences during the actual dredging process, but no long-term adverse effects to navigation will occur as a result of the proposed work. Accordingly, the work complies with the Rivers and Harbors Act.

**f. National Historic Preservation Act.** The National Historic Preservation Act (16 USC 470) requires that the effects of proposed actions on sites, buildings, structures, or objects included or eligible for the National Register of Historic Places must be identified and

[4] The Shoalwater Reservation is excluded from the State's coastal zone per 15 CFR Sec. 923.33 (Excluded lands), which states:

> (a) The boundary of a State's coastal zone must exclude lands owned, leased, held in trust or whose use is otherwise by law subject solely to the discretion of the Federal Government, its officers or agents. To meet this requirement, the program must describe, list or map lands or types of lands owned, leased, held in trust or otherwise used solely by Federal agencies.

evaluated. As required under Section 106 of the NHPA, the Corps coordinated with the Washington State Department of Archeology and Historic Preservation (DAHP) and consulted with the Shoalwater Bay Indian Tribe. On June 14, 2006, The DAHP concurred with the Corps' finding of No Historic Properties Affected for the original proposed project of the dune restoration combined with flood berm extension. The DAHP was contacted via email on October 31, 2007 regarding the change in project scope (barrier dune restoration only), and that same day concurred that the Corps revised project scope would also not affect historic properties.

**g. Fish and Wildlife Coordination Act.** The Fish and Wildlife Coordination Act (16 USC 470) requires that wildlife conservation receive equal consideration and be coordinated with other features of water resource development projects. This goal is accomplished through Corps funding of U.S. Fish and Wildlife Service (USFWS) habitat surveys evaluating the likely impacts of proposed actions, which provide the basis for recommendations for avoiding or minimizing such impacts. A Fish and Wildlife Coordination Act Report was prepared by the USFWS in August 2006 for the proposed project.

**11. Safety of Impoundment Structures [320.4(k)]** Not applicable.

**12. Floodplain Management [320.4(l)]** The proposed maintenance work will not directly alter any floodplain areas. Executive Order 11988 requires federal agencies to evaluate the potential effects of actions on floodplains and to avoid undertaking actions that directly or indirectly induce growth in the floodplain or adversely affect natural floodplain values. This Executive Order also directs that proposed projects consider how natural moderation of floods may be attained and promotes the restoration of environmental features that act to modify floods (e.g. wetlands). The proposed project may enable additional development of the Shoalwater Reservation because it will result in less severe flooding of the low-lying areas. However, the barrier dune will only be rebuilt to its historic height. The Corps will not be providing additional protection beyond the historic level that it offered in its pre-eroded state. In addition, the restoration of the barrier dune is a "natural" method of moderating the flood hazard on the Shoalwater Reservation and in the nearby Dexter-by-the-Sea community. Therefore, the project is in compliance with this order.

**13. Water Supply and Conservation [320.4(m)]** Not applicable.

**14. Energy Conservation and Development [320.4(n)]** Not applicable.

**15. Navigation [320.4(o)]** Navigation may experience temporary and minor inconveniences during the actual dredging process, but no long-term adverse effects to navigation will occur as a result of the proposed work.

**16. Environmental Benefits [320.4(p)]** The proposed barrier dune restoration project would protect the habitat of the North Cove embayment from further degradation due to storm wave overwash of the Empire Spit barrier dune. The erosion and breaching of the barrier dune has

resulted in a severe degradation of the habitat diversity and productivity of the Shoalwater Reservation's North Cove embayment. Winter storm waves at high tide frequently overtop the eroded dune, resulting in infilling of the tide flats with sand eroded from the dune. Due to storm overwash of the eroded and lowered barrier dune and the resulting infilling of North Cove with sand, the habitat in the cove is being transformed into high salt marsh. There has been a significant loss of habitat that previously supported Tribal subsistence shellfish growing and harvesting upon which the Tribe has relied heavily, both historically and in recent times. The barrier dune restoration will reduce the transport of sand into North Cove and the resultant infilling and conversion of the area to high salt marsh.

17. **Economics [320.4(q)]** Section 545 of the Water Resources Development Act (WRDA) of 2000 (Public Law 106-541), as amended by Section 5153 of WRDA 2007 (Public Law 110-114), authorized a study and authorized a project, subject to Secretarial approval, for coastal erosion protection and ecosystem restoration for the tribal reservation of the Shoalwater Bay Indian Tribe. The Congressional authorization specifically cites that the selected project should be a cost-effective means of providing erosion protection. Through the Corps planning process, it has been determined that barrier dune restoration is the most cost-effective means of providing coastal erosion protection to the Shoalwater Reservation.

18. **Mitigation [320.49(r)]** As a restoration project, the Corps considers the action to be self-mitigating. However, potential impacts of the proposed project on salmonids will be avoided through implementation of timing restrictions. For the protection of these species, work will occur between July 16 and February 15. The use of material (sand) of similar size and composition to the substrate presently on the beach will minimize habitat impacts of the proposed action.

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# Appendix E: Coastal Zone Management Act Consistency Determination

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**Shoalwater Bay Shoreline Erosion Project**
**Pacific County, Washington**

**Shoalwater Bay Indian Reservation**
**Flood and Coastal Storm Damage Reduction**
**Pacific County, Washington**

**Coastal Zone Management Act Consistency Determination**

The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner which is consistent to the maximum extent practicable with the enforceable policies of the approved state Coastal Zone Management (CZM) Programs. The Shoreline Management Act of 1972 (RCW 90.58) is the core of authority of Washington's CZM Program. Primary responsibility for the implementation of the SMA is assigned to local government.

The proposed project is intended to rebuild and maintain the deteriorated dune system that extends southward on Empire Spit with sand dredged from the adjacent Willapa Bay entrance and channel. The restored dune would be 12,500-feet-long, with a top elevation of +25 feet MLLW, a top width of 20 feet, and a side slope of 1V on 5H. The dune footprint would be about 47 total acres. The dune restoration would be constructed along the crest of the now deteriorated dune. The initial dune restoration would require the placement of approximately 600,000 cubic yards (cy) of sand dredged from the entrance to Willapa Bay. The dredged sand would be graded and, on the dune crest and North Cove side, planted with native dune grass. The ocean side of the restored dune would remain unplanted to provide habitat for Western snowy plover, a threatened bird species. Please see the attached EA for a more detailed description of the proposed project.

The determination of this action's consistency with the Coastal Zone Management Act is based upon review of the Washington's CZMP, *Managing Washington's Coast: Washington State's Coastal Zone Management Program* (Ecology Publication 00-06-029, February 2001); the Washington Administrative Code (WAC) Shoreline Management Act Titles; and the policies and standards of the adopted Pacific County Shoreline Management Master Program. Applicable sections of these documents are presented below, with the Corps' consistency indicated in ***bold italics***.

## 3. PACIFIC COUNTY SHORELINE MANAGEMENT MASTER PROGRAM

Pacific County implemented the SMA through the preparation of a Shoreline Master Program (SMP). Their shoreline policies are contained in the 2000 Pacific County Shoreline Master Program (County Resolution No. 2000-039). Applicable sections of the Pacific County SMP are presented below, with the project's consistency indicated in bold italics.

**SECTION 2 – DEFINITIONS**

**A. 4. Coastal Waters** – Coastal waters are waters of the Pacific Ocean seaward from Cape Flattery south to Cape Disappointment, from mean high tide seaward two hundred miles. For Pacific County, coastal waters include from mean high tide seaward three miles; the waters of Willapa Bay;…***A portion of the project area lies within the coastal waters of Pacific County. Two breaches in a deteriorated barrier dune system through which coastal waters flow will be filled as part of the barrier dune restoration. In addition, 600,000 cy of sand will be dredged from the Willapa Bay entrance and channel.***

**A. 9. Development** – means a use consisting of the construction or exterior alteration of structures; dredging; drilling; dumping; filling; removal of any sand, gravel, or minerals bulkheading; driving of piling; placing of obstructions; or any project of a permanent or temporary nature which interferes with the normal public use of the surface of the waters overlying the lands to this master program at any state of water level. ***The proposed project includes dredging approximately 600,000 cubic yards (cy) of sand to be used for barrier dune restoration. The dredged material will be placed on the crest of the now deteriorated barrier dune to restore it to its historical height and function.***

**A. 17. Mean Higher High Tide** – means the elevation determined by averaging each day's highest tide over a period of 18.6 years. ***The proposed project will result in a minimum of 9.4 acres of sand placement below mean higher high water (MHHW).***

**A. 21. Ocean Environment** – The purpose of this designation is to protect the unique characteristics of the ocean environment by managing use activities and assuring compatibility between shoreland and ocean uses…The Ocean Environment are waters of the Pacific Ocean from Cape Disappointment north to the border between Pacific County and Grays Harbor County; and from mean high tide, seaward three miles. ***A portion of the project area lies within the Ocean Environment of Pacific County. Two breaches in a deteriorated barrier dune system through which coastal waters flow will be filled as part of the barrier dune restoration. In addition, 600,000 cy of sand will be dredged from the Willapa Bay entrance and channel.***

**A. 23. Ocean Mining** – Mining of metals, minerals, sand, and gravel resources from submerged lands in the Ocean Environment. ***The proposed project includes dredging approximately 600,000 cubic yards (cy) of sand from the Ocean Environment to be used for barrier dune restoration.***

**A. 30. Ordinary High Water Mark –** shall have the meaning defined by RCW 9058030(2)(b) and WAC 173-16-030(10). ***Approximately 24.21 acres of the proposed project falls below the OHWM. The project area below OHWM consists of sand beach and shallow subtidal (breaches).***

**A. 34. Shorelands or Shoreland Areas** – means those lands extending landward for two hundred feet in all directions as measured on a horizontal plane from the ordinary high water mark…***Of the proposed project, approximately 7.3 acres of fill associated with the barrier dune restoration extends shoreward above the ordinary high water mark.***

**A. 33. Tidal Wetlands –** means those tidal marshes, tidal mudflats and other tidelands which are inundated by the normal extreme high tide (high water elevation) as defined in official tide tables…***As this definition includes "other tidelands which are inundated by the normal extreme high tide," the proposed project will require filling in tidal wetlands. Based on the last topographic survey (2002), approximately 6.9 acres of the proposed project lies below the MHHW line. Because the rate of erosion of the barrier dune is so severe, a larger amount of the dune restoration area will lie below MHHW by the time the project is implemented. The Corps will conduct a new topographic survey just before the dune restoration begins to better quantify the extent of the impact. Of this area, two tidal channels that have formed in the breached barrier dune system will be filled as part of the proposed project. There may also be some minor fill of some interdunal tidal marsh wetland "fingers" on the north end of the restoration site. It is the Corps' intent to avoid these areas to the greatest extent possible by adjusting the alignment of the dune restoration footprint waterward as necessary.***

**A. 36. Shorelines of StateWide Significance –** shall have the meaning defined by RCW 90.58.030(2)(e). ***The proposed project will occur on a shoreline of StateWide Significance.***

**B. 2. Aquatic Areas –** Aquatic areas include the tidal waters and wetlands of the estuary and non-tidal sloughs, streams, and wetlands within the shoreland areas. ***The proposed project will require filling in aquatic areas. Please see A 33 Tidal Wetlands for additional information.***

**B. 4. Beach –** Zone of unconsolidated material extending landward from the low water line to the seaward edge of shoreland vegetation. ***See A.34, A.30, and A.17 above.***

**B. 10. Fill –** Fill is the placement by man of sediment or other material in an aquatic area to create new shorelands or on shorelands to raise the elevation of the land. ***The proposed project is intended to rebuild and maintain the deteriorated dune system that extends southward on Empire Spit with sand dredged from the adjacent Willapa Bay entrance and channel. The restored dune would be 12,500-feet-long, with a top elevation of +25 feet MLLW, a top width of 20 feet, and a side slope of 1V on 5H. The dune footprint would be about 47 total acres, of which approximately 31.5 lies outside of the Shoalwater Reservation. Of this 31.5 acres, approximately 24 acres lie below the OHWM and approximately 6.9 acres lie below the MHHW line. Please see definition A. 33 Tidal Wetlands for more information regarding the placement of material below MHHW. The dune restoration would be constructed along the crest of the now deteriorated dune. The initial dune restoration would require the placement of approximately 600,000 cubic yards (cy) of sand dredged from the entrance to Willapa Bay.***

**B. 22. Mitigate –**To alleviate the negative impacts of a particular action. ***Because this is a restoration project, the Corps considers the action to be self-mitigating. This is consistent with the interpretation applied by the Corps Regulatory Branch for similar projects.***

**B. 31. Restoration –** Replacing or restoring original attributes or amenities such as natural biological productivity and esthetic or cultural resources which have been diminished or lost by past alterations, activities or catastrophic events. Active restoration involves the use of specific remedial actions such as removing dikes or fills…***The proposed project is consistent with Pacific County's definition of active restoration.***

## SECTION 3 – INTRODUCTION TO POLICIES AND REGULATIONS

### B. Shoreline Policies

### 1. GENERAL SHORELINE USE

a. Maintain areas within the shoreline jurisdiction with unique attributes for specific long-term uses, including agricultural, commercial, industrial, residential, recreational, and open space uses. ***Fishing, bird watching, and beach combing are major outdoor recreational activities conducted within the project area. The preferred alternative would likely increase recreational opportunities in the project area. Restoration of the dune would maintain recreational access to the dune. The site does not have attributes conducive to commercial, industrial, or residential uses.***

b. Ensure that proposed shoreline uses are distributed, located and developed in a manner that will maintain or improve the health, safety and welfare of the public when such uses occupy shoreline areas. ***The Shoalwater Reservation has a recent history of flooding and storm damage. On March 3, 1999, a combined storm and high tide caused severe flooding of the Shoalwater Reservation shoreline and surrounding community. The Reservation also experienced severe flooding and debris damage from winter storms in February 2006. The flooding is believed to be a direct result of erosion and breaching of the barrier dune on Graveyard Spit that fronts the Tokeland Peninsula. The limited wave protection currently afforded by the eroded barrier dune will continue to decrease, and flooding of the Shoalwater Reservation and adjoining lands will occur at increasingly frequent intervals unless the proposed project is implemented. The primary purpose of the project is to provide coastal erosion protection and to reduce associated storm event flooding and damage for the tribal reservation of the Shoalwater Bay Tribe on Willapa Bay, Washington. Implementation of the proposed project will improve the safety and welfare of the residents of the Shoalwater Reservation as well as in the Dexter-by-the-Sea community.***

c. Ensure that activities and facilities are located on the shorelines in such a manner as to retain or improve the quality of the environment***. The proposed project consists of a restoration of a deteriorated barrier dune system. In the last ten years, the erosion of the barrier dune has profoundly affected the channel that flows into North Cove. In 1994, the dune formed a continuous barrier separating North Cove from Willapa Bay and a single, well-defined channel entered the southern end of the cove. The tidal flow in this channel was strong enough to scour away sand that was being carried southward on the ocean side of the spit. In 1995, erosion of the dune resulted in the formation of a breach. This additional entrance and exit for tidal flows, combined with the reduction in the cove volume due to infilling, resulted in a diminished flow through the channel. The flow through the North Cove channel was no longer strong enough to resist the southward encroachment of the spit, and the channel began migrating to the southeast. In 2003, a second breach developed in the spit decreasing the channel flow even further. 2003 and 2006 aerial photographs clearly show that the migrating channel is now eroding the southern Tokeland Peninsula shoreline. Rehabilitation of the barrier dune will close the breaches, which will result in an increase in the flow through the channel and decreased infilling of the tide flats and marsh habitat in North Cove.***

T***he restored barrier dune will provide primary protection from storm waves.***

d. Ensure that proposed shoreline uses do not infringe upon the rights of others or upon the rights of private ownership. ***Restoration of the dune would maintain recreational access to the dune. If necessary, easements on all real estate necessary to complete the project will be obtained prior to construction.***

e. Minimize the adverse impacts of shoreline uses and activities on the environment during all phases of development (e.g., design, construction, management and use). ***The design of the project centered on maximizing environmental benefits while reducing the impacts of construction. Chemical testing has been conducted to ensure the suitability of materials dredged for use on the barrier dune restoration. The proposed dune restoration will bury any existing vegetation; however, the finished restored dune will be planted in selected areas with native dune grass, Elymus mollis. Similar plantings of native dune grass at the South Jetty Breach Fill near Westport, WA have been tremendously successful and robust and function to limit wind-driven erosion as well as provide increased wildlife habitat. Finally, construction will occur in accordance with the Washington Department of Fish and Wildlife approved construction windows to minimize impacts to wildlife species during sensitive life stages.***

**4. CONSERVATION**

a. Develop and implement management practices that will ensure a sustained yield of renewable resources of the shorelines while preserving, protecting, enhancing and restoring unique and nonrenewable shoreline resources, environments, or features. ***The proposed project will restore the barrier dune system that historically protected the Shoalwater Reservation and portions of the Tokeland peninsula from erosive and damaging stormwaves.***

b. Reclaim and restore areas which are biologically and aesthetically degraded to the greatest extent feasible. ***A primary intent of the proposed project is to restore a biologically degraded area.***

c. Preserve scenic vistas, aesthetics, and vital estuarine areas for fisheries and wildlife protection. ***The proposed dune restoration will restore the eroded barrier dune to its historic height of +25 feet MLLW. At this height, it is not possible to view the ocean waves entering the bay. Therefore, there will be a reduction in ocean views from some of the associated properties that fall within the project area. However, these views did not exist prior to the erosion of the barrier dune.***

**5. PUBLIC ACCESS**

a. Ensure that developments, uses, and activities on or near the shoreline do not impair or detract from the public's access to the water. Where practicable, public access to the shoreline should be enhanced. ***The proposed project will not alter the public's ability to utilize the barrier dune and to access the beach and water.***

b. Design public access projects such that they provide for public safety and minimize potential impacts to private property and individual privacy. ***The barrier dune restoration will improve***

***the level of safety during storm events for the residents of the Shoalwater Reservation and the Dexter-by-the-Sea community.***

**6. RECREATION**

a. Optimize recreational opportunities now and in the future in the future in shoreline areas. ***Fishing, bird watching,, and beach combing are major outdoor recreational activities conducted within the project area. The proposed project would maintain recreational access to the dune.***

**7. HISTORIC/CULTURAL/SCIENTIFIC/EDUCATIONAL**

a. Identify, protect, preserve, and restore important archaeological, historical, and cultural sites located in shorelands. ***The Shoalwater Bay Indian Tribe is the project sponsor and proponent. The Shoalwater Tribe has worked to secure funding for the project, and has been an active participant on the design and evaluation team. Tribal leadership and their consultants contributed to the initial choice and assessment of alternatives. Tribal biological and cultural resources staff have supported field surveys and provided documentation in support of the analyses of environmental and cultural effects of the proposed action. The Washington Department of Archaeology and Historic Preservation (DAHP) concurred with the Corps' finding of No Historical Properties Affected on June 14, 2006. The DAHP was contacted via email on October 31, 2007 regarding the change in project scope, and concurred with the Corps revised project scope that same day.***

c. Prevent public or private uses and activities from destroying or damaging any site having historic, cultural, scientific or educational values without appropriate analysis and mitigations. ***The recreational uses which will occur on the barrier dune are not expected to destroy or damage the restoration site.***

**8. WETLANDS**

a. Preserve and protect wetlands to prevent their continued loss and degradation. ***Please see A.33 Tidal Wetlands for a discussion of tidal wetlands that will be impacted through the implementation of this project. Although there will be placement of fill in tidal wetlands, this project is designed to minimize the amount of wetland fill to the greatest extent possible while still meeting the project goal to protect the Shoalwater Reservation from coastal erosion, increased flooding, and storm damages associated with the erosion of the barrier dune and combined extreme high tide/storm events.***

b. Identify wetland areas and boundaries according to established identification and delineation procedures. ***A wetland delineation was conducted by the Corps using the procedures set forth in the Washington State Wetlands Identification and Delineation Manual (1997). Specific survey points were set in the northwestern portion of the alignment to facilitate an office delineation with the use of survey, infra-red aerial photographs, and topography maps. Wetlands near the dune alignment footprint were Class I estuarine or developing interdunal wetlands. Wetlands were categorized according to the Washington State Department of Ecology Wetland Rating System (2004).***

***c.*** Provide adequate mitigation for disturbance of wetlands and buffers in the shoreline environment. ***Because this is a restoration project, the Corps considers the action to be self-mitigating. This is consistent with the interpretation applied by the Corps Regulatory Branch for similar projects.***

**10.0 BEACH EROSION**

a. Encourage the design and use of naturally regenerating systems and/or constructed engineering solutions for prevention and control of beach erosion where:

i. The length and configuration of the beach will accommodate such systems; and

ii. Such protection is a reasonable solution to the needs of the specific site. ***The project will restore 12,500 feet of barrier dune in front of the Shoalwater Bay Indian Reservation and the Tokeland Penisula. The barrier dune functions to absorb storm wave energy during periods of extreme high tides and storm events. Restoring the dune to its historic heights represents a complete engineering solution to the storm/extreme high tide event coastal flooding that the Shoalwater Reservation currently experiences, and eliminates the potential for coastal erosion at the Reservation's upland boundary. It also negates the need to pursue alternatives that are more destructive to the natural environment and that may have unintended and negative consequences.***

**11. VEGETATION MANAGEMENT**

b. Invasive, noxious weeds causing irreparable damage to the shoreline environment should be removed with all due diligence. ***Portions of the restored barrier dune will be planted with native plants to reduce the likelihood of the establishment of invasive species.***

**12. WATER QUALITY**

a. Locate, design, construct, and maintain shoreline uses and activities to minimize adverse impacts to water quality and fish and wildlife resources. ***Short-term impacts to water quality, primarily turbidity, will result during dredging activities at the borrow site. A variety of "best management practices" will be implemented to reduce the potential for harm (e.g., most grading and material placement will occur above the MHHW, and construction will occur during a time of the year when sensitive species are not present). To reduce the generation of turbidity, the hydraulic dredge will only be operated with the intake at or below the surface of the material being removed, and the intake will only be raised a maximum of three feet above the bed for brief periods of purging or flushing of the intake system.***

**15. CONSERVANCY ENVIRONMENT**

c. Prohibit activities or uses which would strip the shoreline of vegetative cover, cause substantial erosion or sedimentation, or adversely affect wildlife or other aquatic life. ***The proposed project is intended to reduce erosion of the barrier dune system. Construction of the dune restoration could have minor, short-term impacts to wildlife due to increased noise and turbidity in the project area. However, construction will occur in accordance with the Washington Department of Fish and Wildlife approved construction windows to minimize impacts to wildlife species during sensitive life stages. Impacts from the dune restoration would likely include the initial burial of sessile or slow-moving aquatic organisms in the water column and at or beneath the surface of the substrate. Re-colonization of these sites is***

***expected to be relatively rapid as these sites can be easily accessed by nearby individuals. In addition, most of the organisms that exist on the face of the barrier dune should be acclimated to a high energy, sand-shifting environment. Please reference the enclosed EA for a more detailed description of impacts expected from implementation of the proposed project.***

f. Ensure that developments within the Conservancy environment are compatible with uses and activities in adjacent (including aquatic) environments. ***See response to 13.0 d above.***

**17. AQUATIC ENVIRONMENT**

a. Prohibit structures which are not water-dependent and uses which will substantially degrade the existing character of the area. ***The proposed project will restore the barrier dune to historic conditions and will not substantially change the character of the area.***

**28. SHORELINE MODIFICATION**

a. Allow location, design, and construction of riprap and other bank stabilization measures primarily to prevent damage to existing development or to protect the health, safety, and welfare of Pacific County residents. ***The Shoalwater Reservation has a recent history of flooding and storm damage. On March 3, 1999, a combined storm and high tide caused severe flooding of the Shoalwater Reservation shoreline and surrounding community. The Reservation also experienced severe flooding and debris damage from winter storms in February 2006. The flooding is believed to be a direct result of erosion and breaching of the barrier dune on Graveyard Spit that fronts the Tokeland Peninsula. Without the proposed project, the limited wave protection currently afforded by the eroded barrier dune will continue to decrease, and flooding of the Shoalwater Reservation and adjoining lands will occur at increasingly frequent intervals.***

d. Encourage development of an integrated erosion control strategy that balances structural and non-structural solutions to reduce shoreline damage in an environmentally sensitive manner. ***Although the restoration of the barrier dune is a structural solution to reducing shoreline damage and flooding at the Shoalwater Reservation, it is an environmentally sensitive approach. The barrier dune restoration will allow for natural coastal processes to occur while still providing protection to the nearby shoreline. Multiple structural alternatives were examined, including the construction of sea dikes, flow diversion structures, and shoreline revetments, but all other alternatives would result in extensive environmental impacts. The barrier dune restoration will return the eroded barrier dune to its historic height of +25 feet MLLW and will result in less flooding and associated storm damages like shoreline erosion that occurs during combined high tides and storm events on the Shoalwater Reservation and in the Dexter-by-the-Sea community.***

**30.0 DREDGING**

a. Site and regulate dredging and dredge material disposal in a manner which minimizes adverse effects on natural resources. ***Dredged material for the barrier dune restoration will come from the entrance to Willapa Bay. The area immediately seaward of the dune restoration site is shoaling at a rate of greater than one million cy/yr, or almost 20 times the rate required to provide a supply of sand for the dune construction and periodic nourishment. As long as the natural accretion of sand at this location rapidly replaces the material being removed for***

***periodic nourishment of the dune, this area appears to be an excellent (primary) borrow site for the dune restoration alternative. The primary borrow site is located on the north side of the North Channel. However, the shoaling patterns are extremely variable. Monitoring of the borrow site will be required to ensure that this is the optimum borrow site location over time, and that the volume of material being removed does not significantly alter the tidal flow patterns or change the general trend of the channel thalweg movement away from the North Cove area.***

***Material will not be removed from the primary site if bathymetric surveys indicate that the rate of natural accretion has decreased significantly. In the event that material cannot be obtained from the primary borrow site, an alternate (secondary) borrow site is located on the south side of the North Channel. Sediment is eroding from the vicinity of the secondary site at a rate of over 3.5 million cy/yr. Borrowing 50,000 cy/yr from this area is not expected to have any detectable effect on the ongoing sediment transport processes.***

b. Ensure that dredging operations are planned and conducted in a manner that will minimize interference with navigation and that will lessen adverse impacts to other shoreline uses. ***The primary borrow site is located immediately offshore of the proposed barrier dune restoration. A hydraulic dredge and pumping system will be used to pump dredged sand directly onto the barrier dune. Because the dredge and pipeline will be close to the shore, there should be little interference with navigation. If the secondary borrow site is utilized, the hydraulic pipeline will extend approximately 8,000 feet, across (under) the channel, and along the shore to the dune restoration site. A similar procedure was accomplished very successfully in 1998 to construct a 350,000 cy beach fill for the State Route (SR) 105 Emergency Stabilization Project which is located to the west of Graveyard Spit. The Corps will make every effort to coordinate dredging and pumping activities in such a manner as to minimize impacts to navigation and other shoreline uses to the greatest extent possible.***

**31. LANDFILL**

a. Allow landfills waterward of OHWM only when necessary to facilitate water-dependent and/or public access uses which are consistent with the master program. ***The project may be considered water-dependent because it can only be carried out in or adjacent to water as its primary function is to reduce flooding associated with combined extreme high tide/storm events. Its purpose is to provide a physical barrier to storm generated waves that currently overwash the eroded barrier dune and cause damage and flooding on the Shoalwater Reservation and a portion of the Tokeland Peninsula.. The barrier dune restoration will allow for natural coastal processes to occur while still providing protection to the nearby shoreline. Multiple structural alternatives were examined, including the construction of sea dikes, flow diversion structures, and shoreline revetments, but all other alternatives would result in extensive environmental impacts. The barrier dune restoration will return the eroded barrier dune to its historic height of +25 feet MLLW and will result in less flooding and associated storm damages like shoreline erosion that occurs during combined high tides and storm events on the Shoalwater Reservation and in the Dexter-by-the-Sea community. Please see number 10. Beach Erosion for more information. The project is consistent to the maximum extent practicable with this requirement.***

b. Design and locate shoreline fills to minimize damage to existing ecological systems. ***The dune restoration would be constructed along the crest of the now deteriorated dune.***

c. Design the perimeter of landfills to avoid or minimize erosion and sedimentation impacts. Encourage natural appearing and self-sustaining control methods over structural methods. ***The dune restoration would be constructed along the crest of the now deteriorated dune, but the restored dune will extend below MHHW. Localized turbidity will be generated, but is anticipated to be temporary and short lived in duration. Immense volumes of sand are moved by tidal currents in the vicinity of the Willapa bar and entrance, and it is likely that background turbidity levels are high The turbidity generated by the sand placement should quickly blend to background levels.. Refer to the enclosed EA for a more detailed description of sediment dynamics in Willapa Bay and anticipated project impacts.***

***The dredged sand would be graded and, on the dune crest and North Cove side, planted with native dune grass. The ocean side of the restored dune would remain unplanted to provide habitat for Western snowy plover, a threatened bird species. The finished restored dune would be planted in selected areas with native dune grass, Elymus mollis. Similar plantings of native dune grass at the South Jetty near Westport, WA have been very successful and robust and function to limit wind-driven erosion as well as provide increased wildlife habitat.***

**33.0 OCEAN DUNES**

a. Recognize the value of dunes in protecting inland areas from damaging inundation caused by a combination of high tides and storms, from the harmful effects of windblown sand, and from the flooding losses***. The proposed project will restore 12,500 linear feet of barrier dune. Erosion and lowering of the barrier dune that extends southward on Graveyard Spit and Empire Spit is exposing the Shoalwater Bay Indian Reservation and the Tokeland Peninsula shoreline to increased flooding from storm waves during periods of extreme high tide***s.

b. Recognize the importance of dunes in providing open space that has economic, aesthetic, and ecological value. ***The proposed project recognizes the importance of barrier dune systems. Restoration of approximately 12,500 linear feet of barrier dune will provide protection to the Shoalwater Reservation and Tokeland Peninsula shoreline from erosive storm generated waves.***

d. Limit modification of the dunes and vegetation to comply with state and federal law, and to the minimum extent necessary to protect views and property values. ***Due to erosion by storm waves and currents, the restored barrier dune will require maintenance on a regular basis. The cost of mobilizing a large dredge to the project site is a major consideration, and the lowest life-cycle cost is obtained by maximizing the dune maintenance interval. For this reason, the initial dune dimensions maximize the volume of sand that is placed within the available plan area of the existing spit. The barrier dune will be restored to a height of approximately +25 feet MLLW, which approximates the elevation of the dune over the last several decades when the dune was still being fed by sand from the northwest (prior to the mid-1990s). Maintenance requirements for the dune restoration were estimated by using topographic surveys of the dune to compute the sand loss that occurred between 2000 and 2002. Based on the 2000-2002 erosion rates, the annual loss of sand from the dune (above +6***

***feet MLLW) is estimated to be 50,000 cubic yards (cy) per year. These erosion rates were recently reconfirmed utilizing 2006 topographic and Lidar data. The maintenance requirements for this project are assumed to be 250,000 cy at 5-year-intervals for dune maintenance.***

g. Acknowledge that all information is not available to determine the future of dunal accretion and/or erosion activity, and commit to amending land use policies that respond to refinements in technical research. ***The Corps is committed to providing coastal erosion protection that is cost-effective; environmentally acceptable, and technically feasible. When it becomes necessary to conduct maintenance of the barrier dune system, the Corps will reevaluate the state of the science to determine the best path forward.***

**38. CLEARING AND GRADING**

b. Avoid negative environmental and shoreline impacts of clearing and grading wherever possible through site planning, construction timing, bank stabilization, and the use of erosion and damage control methods. ***See response to 12a. above.***

**40. SALTWATER HABITAT**

a. Protect critical saltwater habitats, including critical rearing and nursery areas for valuable recreational and commercial species. Protect habitat for ecologically important marine plants, fish and animals. ***Western Snow Plovers are known to utilize the eroded barrier dune. The Corps will coordinate with WDFW and USFWS staff to conduct nesting surveys for western snowy plovers at the project site prior to construction. The construction timing and implementation will be adjusted as necessary to avoid impacts to nesting western snowy plovers based on these survey results and coordination with these two agencies. In addition, the Corps will create and enhance suitable nesting habitat for western snowy plovers on the waterward side of the dune system in the project area by shaping the barrier dune face to slopes suitable for snowy plover nesting. No vegetation will be planted on the front side of the barrier dune in order to allow approximately 12 acres of the barren nesting conditions preferred by Western snowy plovers on the front slopes of the dunes. Therefore, restoration of the barrier dune may further attract snowy plovers to nest on the dune in subsequent years after completion of the project. The Corps will work with USFWS and WDFW to develop a snowy plover monitoring plan to determine plover use of the restored dune. In addition, future maintenance placements of sand will be timed to avoid the snowy plover nesting season, should the birds begin to utilize the barrier dune.***

***The Corps will conduct crab trawls prior to and/or concurrent with the proposed dredging action to determine the abundance and distribution of Dungeness crab within the project area. Collected crab abundance data will provide a basis for estimation of loss to crab during dredging activities by using the Dredge Impact Model that the Corps uses in Grays Harbor to enumerate crab impacts, enabling a determination to be made regarding the level of any necessary mitigation. If substantial impacts to crab populations are identified, the method that will be used to mitigate Dungeness crab loss from dredging will most likely involve placing oyster shell on intertidal mud flats.***

***Restoration of approximately 12,500 linear feet of barrier dune will provide protection to the Shoalwater Reservation and Tokeland Peninsula shoreline from erosive storm generated waves, and will slow the degradation of the tide flats and marsh habitat in North Cove. In the absence of a project, North Cove is expected to continue its transformation from historic tidal flats to a high salt marsh through erosion of the existing dune materials into the cove during storm events that overtop the spit. In the absence of the proposed project, aquatic and wildlife species that are dependant upon current habitat conditions would likely continue to be impacted by existing and future eroding conditions (USFWS 2006).***

b. Ensure that developments within or adjacent to critical saltwater habitats do not directly or indirectly change the composition of the beach and bottom substrate. Habitat enhancement and restoration projects may change beach or bottom substrate when appropriate to restore or enhance habitats. ***The material used for the barrier dune restoration will not differ significantly from the material that currently comprises the dune, beach, and associated subtidal area.***

c. Design and construct activities and structures that affect critical salt-water habitats to minimize adverse environmental impacts. ***See responses to sections 1e., 8c., 12a., and 15c. above.***

SECTION 16 – LANDFILL AND DREDGING

B. Conservancy Environment
1. Dredging operation or landfills shall be prohibited on tidal wetlands. ***Although the proposed activity is prohibited on tidal wetlands in the Conservancy Environment, the Corps believes that the project is consistent with the intent of the Federal Coastal Zone Management Act (CZMA) and the State Shoreline Management Act (SMA). There are six stated national policies associated with the CZMA, including that 1) "It is the national policy to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations;" and that 2) "…coastal programs should at least: protect wetlands, floodplains, estuaries, beaches, dunes, barrier islands, coral reefs, and fish and wildlife habitat; manage coastal development to minimize the loss of life and property caused by…the destruction of natural protective features such as beaches, dunes, wetlands, and barrier islands." The SMA enunciates the following:***

> ***It is the policy of the state to provide for the management of the shorelines of the state by planning for and fostering all reasonable and appropriate uses. This policy is designed to insure the development of these shorelines in a manner which...will promote and enhance the public interest. This policy contemplates protecting against adverse effects to the public health, the land and its vegetation and wildlife, and the waters of the state and their aquatic life..."***

***Multiple structural alternatives were examined, including the construction of sea dikes, flow diversion structures, and shoreline revetments, but all other alternatives would result in extensive environmental impacts. Therefore the chosen alternative of barrier dune restoration directly supports the first priority of the SMA for Shorelines of State Wide Significance by***

***recognizing and protecting the state wide interest over local interest. The project serves to protect the functions and values of the shoreline environment by restoring a naturally occurring, but severely eroded protective off-shore feature (the barrier dune) that protects the upland shoreline from extreme wave action associated with combined high tide/storm events. This action preserves the natural character of the shoreline, the second priority outlined in the SMA's preferred uses of Shorelines of State Wide Significance. The extreme wave action results in flooding and storm damages to existing improvements along the shoreline and has the potential to erode the upland shoreline. Restoration of the barrier dune will provide a physical barrier to storm generated waves that currently overwash the eroded barrier dune and cause damage and flooding on the Shoalwater Reservation and a portion of the Tokeland Peninsula, thus minimizing "the potential for loss of life and property caused by…the destruction of natural protective features such as beaches, dunes, wetlands, and barrier islands." as directed in the CZMA. The barrier dune restoration also provides long term ecological benefits by allowing natural coastal processes to occur while still providing protection to the nearby shoreline, thus meeting the third and fourth priorities of the SMA for Shorelines of State Wide Significance which are to encourage projects that result in long term benefits over short term and to protect the resources and ecology of the shoreline.***

***The barrier dune restoration will return the eroded barrier dune to its historic height of +25 feet MLLW and will result in less flooding and associated storm damages like shoreline erosion that occurs during combined high tides and storm events on the Shoalwater Reservation and in the Dexter-by-the-Sea community. Please see number 10. Beach Erosion for more information. The project is consistent to the maximum extent practicable with this requirement.***

2. Dredging operations or landfills allowed under Subsection 16.B.1 shall comply with all applicable standards and regulations given under Subsections 16.D.2 and 16.D.3 below.

D. Rural Environment
2. all dredging or spoil disposal operations shall be subject to the following regulations:
a. Dredging operations shall conform to the operating standards on any federal and state permits required for such operations…***The Corps will obtain a Clean Water Act Section 401 permit from the Washington State Department of Ecology prior to conducting dredging or filling activities. The Corps will also demonstrate compliance with Section 404 of the Clean Water Act. In order to comply with the Endangered Species Act, the Corps has requested and received concurrence from both the National Marine Fisheries Service and the U.S. Fish and Wildlife Service on the proposed action.***

b. Dredge spoils exceeding the Environmental Protection Agency criteria for toxic sediments shall be disposed of on land. The results of chemical and physical analysis of the spoil material shall be forwarded to the Administrator prior to the beginning of dredging operations**.** ***Sediments from the proposed dredge borrow sites have been tested and characterized as suitable for beneficial uses such as this barrier dune restoration. The results of the testing have been forwarded to the appropriate agency representatives.***

3. All landfills shall be subject to the following standards and regulations:

a. The "Criteria Governing the Design of…Landfills … for Protection of Fish and Shellfish Resources," adopted by the Washington State Department of Fish and Wildlife and applied to that region of the State which includes Pacific County, which criteria are incorporated herein by reference, shall be complied with. ***The Corps consulted with a broad spectrum of Federal, State, and Local agencies, including the Washington State Department of Fish and Wildlife (WDFW) in the selection and the design of the preferred alternative. The proposed project is protective of fish and shellfish resources to the maximum extent practicable, and WDFW is supportive of its implementation.***

b. Landfills shall consist of clean materials with a minimum potential for degrading water quality. ***The sediments for the barrier dune restoration will come from the North Channel directly offshore of the barrier dune restoration site. The sediments will be comprised of clean sand that will quickly drop out of suspension. Water quality impacts will be limited in extent and duration.***

c. Landfills shall be protected against erosion with retaining walls or similar structures or by vegetation established, if possible, during the first growing season following completion of the landfill. ***Native vegetation will be planted in some areas on the crest and the backside of the restored barrier dune. In order to comply with conditions imposed by the USFWS under the Endangered Species Act, the face of the barrier dune will not be planted in order to maintain appropriate habitat for use by snowy plovers, a threatened species.***

**SECTION 22 – TIDAL WETLANDS OF WILLAPA BAY**

A. Diking and filling of tidal wetlands are substantial developments regardless of their fair market value. Proposals for diking and/or filling shall secure a substantial development permit. ***As a federal agency, the Corps does not apply for Pacific County permits.***

B. Diking and/or filling shall be confined to wetlands where one of the following circumstances exist:

3. The purpose of the landfill and/or dike is to repair and maintain a private road or dike which serves to protect existing improvements from damage by flood waters. ***Upon consultation with representatives of Pacific County and Ecology, the Corps determined that while this project will not repair a private road or dike, it will restore a severely eroded barrier dune that serves to protect existing improvements both on the Shoalwater Reservation and in the Dexter-by-the-Sea community from flood waters associated with combined extreme high tides and storm events. Therefore, the project is consistent with the intent of this regulation.***

**SECTION 24 - ADMINISTRATION**

**14. Federal Agency Review**

Whenever a project conducted on the shorelines of Pacific County requires review and approval by Federal agencies, or otherwise involves a Federal agency, Pacific County shall follow the requirements of WAC 173-27-050 and WAC 173-27-060. ***Please see applicable portion of the referenced WAC titles below.***

WAC 173-27-060 Applicability of chapter 90.58 RCW to Federal lands and agencies.

(1) Within Coastal Counties

***Direct Federal agency actions and projects shall be consistent to the maximum extent practicable with the approved Washington State coastal zone management program subject to certain limitations set forth in the Federal Coastal Zone Management Act, 16 U.S.C. 1451 et seq. (CZMA) and regulations adopted pursuant thereto. Other applicable Federal law governing the Federal agency actions may determine whether the permit system of chapter 90.58 is applicable. The Corps will not obtain a shoreline permit from Pacific County because applicable Federal law prohibits application of the permit system to Federal agencies. The Federal government cannot be regulated or required to obtain a permit by a State or local government unless the Federal government has waived its sovereign immunity (reference Supremacy Clause of the U.S. Constitution, article VI, clause 2). The Coastal Zone Management Act (CZMA) does not contain such a waiver.***

***Based on the above evaluation, the Corps has determined that the proposed project complies to the maximum extent practicable with the policies, general conditions, and general activities specified in the Pacific County SMP.***

## 4. OTHER WASHINGTON CZMP ENFORCEABLE POLICIES

### State Environmental Policy Act

The Corps has prepared an Environmental Assessment pursuant to the National Environmental Policy Act and determined that the proposed project will not have a significant adverse impact on the natural or human environments.

### Ocean Resources Management Act

Not applicable.

### Clean Water Act

To satisfy the substantive requirements of Section 404 of the Clean Water Act, the Corps has prepared a 404(b)(1) evaluation. The 404(b)(1) evaluation is available from the Seattle District upon request.

The Corps will submit a Joint Aquatic Resources Permit Application (JARPA) for the proposed barrier dune restoration to Ecology for a 401 certification. The Corps will not proceed with the project until 401 Water Quality Certifications have been issued by the Department of Ecology and the EPA (for the Reservation portion of the project).

### Clean Air Act

The proposed project does not involve a new regulated source requiring an air operating permit, and the project site is not located in a non-attainment area.

### Washington State Energy Facility Site Evaluation Council

Not applicable.

## 5. STATEMENT OF CONSISTENCY

Based upon the preceding evaluation, the Corps considers the proposed Federal activities consistent to the maximum extent practicable with the State of Washington Coastal Zone Management Program.

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# Appendix F: Washington State Department of Archaeology and Historic Properties Concurrence Letter

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STATE OF WASHINGTON
**DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION**
*1063 S. Capitol Way, Suite 106 • Olympia, Washington 98501*
*Mailing address: PO Box 48343 • Olympia, Washington 98504-8343*
*(360) 586-3065 • Fax Number (360) 586-3067 • Website: www.dahp.wa.gov*

June 14, 2006

Mr. Mark Ziminske
Environmental Resources Section
Seattle District, Corps of Engineers
PO Box 3755
Seattle, Washington 98124-3755

Re: Proposed Shoalwater Bay Shoreline Erosion Project
Log No: 061406-05-COE-S

Dear Mr. Ziminske:

Thank you for contacting our department. We have reviewed the materials you provided for the proposed Shoalwater Bay Shoreline Erosion Project on Willapa Bay, Pacific County, Washington.

We concur with the Mr. Kent's professional recommendations and your finding of No Historic Properties Effected. We also concur with the proposed permit conditions for professional archaeological monitoring. We look forward to receiving a copy of the monitoring report when available.

We also would appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on the behalf of the State Historic Preservation Officer in conformance with Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800. Should additional information become available, our assessment may be revised. Thank you for the opportunity to comment on this undertaking and a copy of these comments should be included in subsequent environmental documents.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360) 586-3080
email: rob.whitlam@dahp.wa.gov

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past. Shape the Future

**Rutherford, Nicolle R NWS**

**From:** Kent, Ronald J NWS
**Sent:** Tuesday, December 11, 2007 1:33 PM
**To:** Rutherford, Nicolle R NWS
**Subject:** FW: New preferred alternative for the Shoalwater Bay Shoreline Erosion Project: U.S. Army Corps of Engineers now accepting comments

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**From:** Whitlam, Rob (DAHP) [mailto:Rob.Whitlam@DAHP.WA.GOV]
**Sent:** Wednesday, October 31, 2007 3:58 PM
**To:** Kent, Ronald J NWS
**Subject:** RE: New preferred alternative for the Shoalwater Bay Shoreline Erosion Project: U.S. Army Corps of Engineers now accepting comments

Ron:

Thanks for the update on the revision. We concur...

regards,

Rob

---

**From:** Kent, Ronald J NWS [mailto:Ronald.J.Kent@usace.army.mil]
**Sent:** Wednesday, October 31, 2007 2:41 PM
**To:** Whitlam, Rob (DAHP)
**Subject:** FW: New preferred alternative for the Shoalwater Bay Shoreline Erosion Project: U.S. Army Corps of Engineers now accepting comments

Re: Proposed Shoalwater Bay Shoreline Erosions Project
Log No. 061406-05-COE-S

Rob,
For your information, the Corps has revised the scope of work for the Shoalwater Bay project. Originally, there was going to be archaeological monitoring on the reservation of the northern extension of the shoreline flood berm, but that part of the project has been dropped. There was no archaeological monitoring recommended for the barrier dune restoration portion of the project, which is the only portion of the original plans that will be built.

Regards,
Ron Kent

---

**From:** Lewis, Evan R NWS
**Sent:** Wednesday, October 31, 2007 12:27 PM
**Cc:** Babcock, Steven D NWS; Rutherford, Nicolle R NWS
**Subject:** New preferred alternative for the Shoalwater Bay Shoreline Erosion Project: U.S. Army Corps of Engineers now accepting comments

Dear Interested Party,
The U.S. Army Corps of Engineers' Seattle District (Corps) is accepting comments through Nov. 30, 2007 on the impacts of a change in the Shoalwater Bay Shoreline Erosion Project preferred alternative. The project is located at North Cove on the north side of the entrance to Willapa Bay near Tokeland, Wash., in Pacific County, and is adjacent to the Shoalwater Bay Indian Tribe's Reservation on the northern edge of Willapa Bay, between Cape Shoalwater/Washaway Beach and Toke Point. Designed to provide coastal erosion protection for the tribal reservation of the Shoalwater Bay Indian Tribe, the project is authorized by Section 545 of the Water

Resources Development Act of 2000.

Please refer to the attached Notice of Preparation of a final environmental assessment, a document which will reflect the change in the scope of the preferred alternative. The Notice of Preparation is also available on-line under "Shoalwater Bay Erosion Project" at http://www.nws.usace.army.mil/ers/doc_table.cfm. Comments submitted in response to the Notice of Preparation will be considered in the final environmental assessment.

<<NoticeofEAPrepShoalwater-final.pdf>>
The submission of factual comments on the impacts of the change in project scope need to be sent to the Environmental Resources Section, Attn: Nicolle Rutherford (PM-PL-ER), P.O. Box 3755, Seattle, WA 98124-3755, *no later than Nov. 30*. Comments may also be e-mailed to nicolle.r.rutherford@usace.army.mil.

The new preferred alternative was selected as a result of new information and issues identified in comments on the draft Environmental Assessment, which was circulated for review and comment earlier this year.

The new preferred alternative would involve only work to restore the barrier dune that forms the southwestern edge of North Cove. The project would place approximately 600,000 cubic yards (cy) of sand dredged from the entrance to Willapa Bay along the crest of the existing dune offshore of the Shoalwater Reservation. The sand placement is intended to rebuild and maintain the now-deteriorated dune system. The restored dune would be 12,500-feet-long with dredged sand that would be graded and, on the dune crest and North Cove side, planted with native dune grass. The ocean side of the restored dune would remain unplanted to provide habitat for Western snowy plover, a threatened bird species.

The Corps would maintain the barrier dune approximately every five years by dredging approximately 250,000 cy from the Willapa Bay entrance and placing the dredged material on the restored dune. Each time maintenance is required, the dredged material would be placed in an alignment corresponding to the dune crest at that time.

Unlike the preferred alternative in the draft EA, the new preferred alternative would not include flood berm extensions along the shoreline of the Shoalwater Reservation or the Tokeland Peninsula. It also would not include relocation of the North Cove channel. For reference, the draft EA is available on the web under "Shoalwater Bay Erosion Project" at http://www.nws.usace.army.mil/ers/doc_table.cfm.

Because the new preferred alternative would not include an extended flood berm along the shoreline, dune maintenance would be more frequent. Increased maintenance frequency would replace sand lost to coastal erosion and maintain the barrier dune width and height necessary to protect the Shoalwater Reservation from coastal flooding and erosion.

Requests for additional information should be directed to Mr. Babcock, Plan Formulation Section, at (206) 764-3651 or steven.d.babcock@usace.army.mil, or Ms. Rutherford at (206)764-6716 or nicolle.r.rutherford@usace.army.mil.

Regards,

**Evan Lewis**
Fish Biologist
Seattle District, Corps of Engineers
Street: 4735 E. Marginal Way S., Seattle WA 98134-2385
Mailing: P.O. Box 3755, Seattle, WA 98124-3755
Phone 206-764-6922
FAX 206-764-4470
evan.r.lewis@usace.army.mil

**Evan Lewis**
Fish Biologist
Seattle District, Corps of Engineers
Street: 4735 E. Marginal Way S., Seattle WA 98134-2385
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Phone 206-764-6922
FAX 206-764-4470

2/26/2008

evan.r.lewis@usace.army.mil

2/26/2008

# Appendix G: Fish and Wildlife Coordination Act Report

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# United States Department of the Interior

FISH AND WILDLIFE SERVICE

Western Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

Colonel Michael McCormick, District Engineer
Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, Washington 98124-2255

AUG 2 3 2006

Attention: Rustin Director, Project Manager

Dear Colonel McCormick:

Enclosed is the final Fish and Wildlife Coordination Act Report for the Shoalwater Reservation Coastal Erosion Project authorized by Section 545 of the Water Resources Development Act of 2000, as amended. This report is to aid your staff in completing the U.S. Army Corps of Engineers' (Corps) biological assessment and provides our comments and technical assistance for this project.

Our comments have been prepared under the authority of and according to the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended 16 U.S.C. 661, *et seq.*) and fulfills section 2(b) of this Act. We have based our comments and recommendations on documents prepared by the Corps, an on-site visit, conversations with resource agency personnel, and resource information available from our files and library. The recommendations included in the report are provided to assist you in meeting your obligation, under sections 7(a)(1) and 2(c) of the Act, to use your authorities to promote the conservation of listed species and their habitats.

We appreciate the direction the Corps has taken with this project and the coordination to select the least environmentally damaging action alternative. We look forward to continued coordination with you on future aspects of this project. For further information, please contact Karen Myers at (360)753-9098 or Tom McDowell at (360)753-9426.

Sincerely,

Pamela Kepp

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

TAKE PRIDE® IN AMERICA

cc:
Shoalwater Bay Tribe (J. May, S. Spencer)
WDOE (G. Kaminsky)
WDFW (D. Molenaar, L. Ochoa, S. Pearson)
NMFS (D. Guy)

Enclosure

# Assessment of the Shoalwater Reservation Coastal Erosion Project

## Fish and Wildlife Coordination Act Report

**Prepared for:**

**U.S. Army Corps of Engineers**
**Seattle District**
**Seattle, Washington 98124-3577**

**Prepared by:**

**U.S. Fish and Wildlife Service**
**Western Washington Fish and Wildlife Office**
**Lacey, Washington 98503**

**Preparer: Karen Myers**

**August 2006**

## TABLE OF CONTENTS

# Fish and Wildlife Coordination Act Report
# For the Shoalwater Reservation Coastal Erosion Project

## INTRODUCTION

This Fish and Wildlife Coordination Act Report (CAR) presents the conclusions of the U.S. Fish and Wildlife Service (Service) on the effects of the proposed U.S. Army Corps of Engineers' (Corps) Shoalwater Reservation Coastal Erosion Project (project), in Willapa Bay near Tokeland, Pacific County, Washington. The report is based on several draft and final documents (Morton et al. 2002, Corps 2004a, Corps 2004b, Hoffman and Sievers 2005, Corps 2005) provided by the Corps; discussions with staff from the Corps, U.S. Environmental Protection Agency, Washington State Department of Fish and Wildlife (WDFW), and Washington State Department of Ecology (WDOE); and input from Shoalwater Bay Tribal members. A site visit to the Shoalwater Bay project site occurred on July 15, 2003. This CAR is provided pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended: 16 U.S.C. 661, *et seq.*) and fulfills section 2(b) of this Act.

### Project Location and Setting

The proposed project site is located on and immediately adjacent to the Shoalwater Bay Tribal reservation, on State Route (SR) 105, along the north shore of the mouth of Willapa Bay, in Pacific County, Washington (Figure 1). The proposed project site is approximately 28 miles north of the mouth of the Columbia River and 17 mi south of the Grays Harbor estuary. The reservation is comprised of approximately 1,034 acres, 700 of which are intertidal or subtidal. Tribal housing, a casino, and a Tribal center occupy an area on SR 105 next to the shoreline, adjacent to an embayment called North Cove.

North Cove, which contains salt marsh and tidal flat habitats, is protected from significant wave action by a series of barrier spits which extend southeast from Cape Shoalwater, the outermost northern extent of the mouth of Willapa Bay (Figure 2). During winter storm surges, incoming flows through the tidal channel within the barrier spits, referred to collectively as "Empire Spit" or "Graveyard Spit," expose the Tribal infrastructure to flooding. Significant erosion has occurred at Cape Shoalwater, Empire Spit, and in the intertidal areas that once supported shellfish (Ray 2002), on which the Shoalwater Bay Tribe has relied heavily both historically and in recent times. Until the mid-1950s, open water and tidal flats comprised the area between Cape Shoalwater and North Cove. Prior to the mid-1950s, Empire Spit was farther offshore, longer, and more contiguous than at the present. Aerial photographs from 1942, 1963, and 1999 indicate a progressive northward retreat of the Empire Spit by approximately half a kilometer, and a decrease in the size of the spit and of North Cove (Appendix A). Morton et al. (2002) suggested that Empire Spit is likely to continue to retreat across the marsh and tidal flats of North Cove, eventually merging with the Tokeland Peninsula. Empire Spit is currently breached in two places by tidal channels, with a third channel forming in the western part of the marsh. Empire Spit is assumed to protect the uplands from flooding during high wave events caused by storms.

The habitat in North Cove appears to be shifting from tidal flat to a high salt marsh, consisting of beachgrass (e.g., *Leymus mollis*), sedges (*Carex* sp.) and rushes (*Juncus* sp.), glasswort (*Salicornia* sp.) and other salt marsh succulents, as well as smooth cordgrass (*Spartina alterniflora*), an invasive, nonnative species. The existing Willapa Bay River channel in North Cove now occupies areas that appear to have once been extensive tidal flats, used historically by the Shoalwater Bay Tribe to grow and harvest shellfish, on which, along with subsistence fisheries, they relied heavily. A drainage ditch was constructed in the early 20th century to drain overland runoff and irrigation water from nearby cranberry bogs into Willapa Bay. A report by U.S. Geological Survey and the WDOE indicates that the ditch conveyed fine sediments into portions of North Cove, contributing to the expansion of the marsh and reducing the intertidal areas that were once habitat for clams (Morton et al. 2002).

**Background and Recent History of the Project Area**

Erosion, accretion, and the location of various features (e.g., river channels, sand islands, etc.) in Willapa Bay have varied throughout history, but the degree of influence of both nearby and distant human activities on this cycle is not yet known. The Corps has been studying the erosion problem in Cape Shoalwater and nearby Washaway Beach since 1955, and has determined that much of the past and ongoing erosion of the dune and shoreline has been caused by the northward migration of the main Willapa River channel entrance into Willapa Bay. The Corps has previously examined many different alternatives to potentially solve the erosion threat at Cape Shoalwater, including revetments, jetty construction, pile diking, groin placement, and dredging to encourage channel realignment. During previous investigations, the Corps concluded that no engineering solutions were economically justifiable and that funds would be better allocated toward purchasing threatened land in the path of erosion (Terich and Levenseller 1986). In 1967, the Corps projected shoreline retreat through 1994 and concluded that erosion would continue through the dunes and areas of alluvial deposits, but that it would slow "to the east, where uplands composed of more resistant terrace deposits are located."

Until recently, the Corps was doubtful whether an alternative existed that would meet all the stated goals of the legislation which supports this project. Achievement of all of these goals—cost-effectiveness of the project, availability of an "environmentally acceptable and technically feasible" alternative, and a project that would "improve the economic and social conditions of the Shoalwater Bay Tribe"—would be necessary for the project to move forward. Based on analysis of the most recent study conducted by the U.S. Geologic Survey and WDOE, the northward channel migration appears to have slowed, stopped, or locally reversed. This change in movement may allow for the use of alternatives that would provide effective protection from erosion for this stretch of shoreline, without the need for hard structures engineered to redirect the alignment of the channel in Willapa Bay (Corps 2004a).

Several projects have been implemented in response to shoreline erosion in the area in recent years. In 1998, the Washington State Department of Transportation constructed an underwater dike, groin, and beach nourishment project as an emergency action to prevent erosion of SR 105, which is the primary route for access to and from Tokeland and the reservation. By 2003, the Willapa Bay channel entrance had migrated north into the terminal end of the rock groin, affecting the integrity of the structure. As a result of this migration of the channel, the

submerged, terminal end of the groin has collapsed, flattening out at depths of 100 feet or more, indicating subtidal erosion of the structure (P. Hoffman, personal communication, 2003). Seavey (U.S. Fish and Wildlife Service, personal communication, 2003) reported that the sand (350,000 cubic yards) used as beach nourishment quickly eroded away, and that the groin also appears to be interrupting north to south sediment transport, and may be contributing to erosion of other barrier spits to the east.

In 2000, the Corps constructed a 1,700-foot-long revetment as an emergency action to protect the Tribal infrastructure and the road to Tokeland from flooding. This action was undertaken after a combined storm and high tide event in March 1999 that resulted in severe flooding of the reservation and nearby community. This 17-foot high riprap revetment continues to protect upland areas of the reservation; however, studies of existing site and erosion conditions suggest that this structure is not sufficient for the long-term protection of reservation lands from storm waves and other erosive forces (Corps 2004a).

**Project Authority and Purpose**

The project is authorized under Section 545 of the Water Resources Development Act of 2000 (Public Law 106-541), as amended. The purpose of this project is to provide coastal erosion protection for the reservation of the Shoalwater Bay Tribe on Willapa Bay in Pacific County, Washington. The project has been proposed by the Corps at the request of the Shoalwater Bay Tribe and would be constructed if the Corps is able to demonstrate that the project: 1) would be a cost-effective means of providing flood/erosion protection that is environmentally acceptable and technically feasible and 2) would improve the economic and social conditions of the Shoalwater Bay Tribe.

**Project Description**

The Corps (Federal sponsor) has proposed a two-part preferred alternative (Appendix B) to provide coastal erosion protection for the Shoalwater Bay Tribe (Corps 2005). The Corps would: 1) restore the sand dune which makes up a portion of Empire Spit directly waterward of the shoreline on reservation lands and 2) expand the existing riprap revetment to serve as a flood berm along the shoreline. Specific objectives of the project include:

- Protection of North Cove and Tribal lands—subtidal, intertidal, and upland—from erosion by reinforcing the Empire Spit that provides wave action protection to the cove.
- Protection of Tribal lands from flooding created by overtopping waves during storm and high tide events.

The Corps has considered a variety of alternatives to address or alleviate the effects of erosion in this area. These alternatives include: 1) a no action alternative, 2) hydraulic modifications to the entrance of Willapa Bay, 3) construction of a sea dike, 4) dune restoration, and 5) extension of the existing revetment ("flood berm"). The actions (dune restoration and flood berm extension) included in the implementation of the preferred alternative would require varying amounts of future maintenance, depending on the occurrence of high tide and storm events and the degree of

damage that may result from these events. The individual actions comprising the preferred alternative are further described below.

*Restoration of Existing Dune*

Approximately 600,000 cubic yards of sand would be placed to restore the dune (Figure 3). The sand would be dredged with a pipeline dredge from the adjacent entrance to Willapa Bay and Willapa River channel and placed on the crest of the existing dune (S. Babcock, Corps, personal communication, 2006a). This borrow site is located approximately 5,000 ft from the project area (Figure 4) (Babcock, Corps, personal communication 2005). Sand would be dredged from nearby areas that have been identified as accretion areas in the bay; borrow sites would be monitored by the Corps to ensure that dredging activities do not adversely impact the sand budget in the area (Corps, personal communication, 2006b). The restored dune would have a top elevation of +25 ft Mean Low Low Water (MLLW), and would be 12,500 ft long. The top of the dune would be 20 ft wide, with a side slope of 1 (vertical) to 5 (horizontal). After placement, the sand would be graded and planted with native dune vegetation to stabilize the restored dune.

The northward migration of the Willapa River channel is believed to have slowed or locally reversed; if this is the case, erosion of the dunes and shoreline as a result of the migration will likely subside. However, high waves and storm events would continue to contribute to erosion of the dune and possibly the shoreline of the cove, requiring future routine maintenance to replenish the eroded dune. The Corps estimates that the annual loss of sand from the restored dune, based on computations of sand loss from 2000 to 2002, would be approximately 50,000 cubic yards each year (R. Director, Corps, personal communication 2006). Maintenance actions, which include placement of additional sand and additional native vegetation plantings as needed, are expected to occur on an average of every 10 years, depending on the degree of deterioration of the dune (R. Director, Corps, personal communication 2006). The Corps estimates that approximately 500,000 cubic yards would be replaced every 10 years. The amount of sand needed for maintenance can be easily adjusted over time, if necessary, and the dune can be more easily realigned if a different configuration is deemed necessary.

*Modification of Flood Berm*

The existing 1,720-foot-long flood berm (Figure 5) would be extended 2,700 ft southward and 4,000 ft northward, with no change in height from the existing structure. The extensions would be of similar design as the existing berm, with the proposed 25,000 tons of graded rip rap and 15,000 tons of armor stone as core material for the extensions. The flood berm would be +17 ft MLLW, would be 16 ft wide at the top of the structure, and have a side slope of 1 (vertical) to 1.5 (horizontal). The northward extension would require the excavation of approximately 15,000 cubic yards of sand and soil for placement of riprap. Approximately 35,000 tons of graded riprap and 14,000 tons of core material would be used to extend the northward flood berm. The excavated sand would be placed and regraded over the riprap and core material. For the southward extension, excavation of approximately 10,000 cubic yards of sand along the existing shoreline would be necessary to place the riprap for the southward extension. This excavated sand, along with an additional 15,000 cubic yards of sand, would then be placed and re-graded over the riprap (25,000 tons) and core material (15,000 tons). Native vegetation would be

planted on the augmented flood berm extensions to promote stabilization of the sand on the structure.

Maintenance of the flood berm is expected be necessary in the future: 5,000 cubic yards of sand would likely be replaced every 25 years, as well as replacement of approximately 25 percent of the flood berm riprap every 25 years. Native vegetation would also be replaced as necessary.

The Corps has indicated that this project would require long-term maintenance to sustain the benefits provided by this alternative. However, the costs associated with this project—both financially and to the ecosystem—are expected to be minimal in comparison to the costs associated with the other alternatives considered in this analysis. The preferred alternative would afford a significant potential for adaptive management. Additionally, the increased protection for Tribal infrastructure from storm events provided by the flood berm would allow for greater flexibility for the dune maintenance timeline should the Corps encounter any difficulties with funding and/or equipment mobility.

## FISH AND WILDLIFE RESOURCES

Willapa Bay is on the outer coast of Washington State between Grays Harbor to the north and the mouth of the Columbia River to the south. Willapa Bay is protected from the swells of the Pacific Ocean by the Long Beach Peninsula, a barrier spit approximately 20 mi long. The bay itself is relatively shallow, with extensive stretches of mudflat, shoals, islands, and salt marsh. Willapa Bay is the largest estuary in Washington and the third largest coastal estuary in the western United States (Proctor et al. 1980). The bay is largely undeveloped and is found within one of the most sparsely populated counties in the State. Land cover in the surrounding area is forested, pasture, and scattered residential.

Willapa Bay provides a number of important coastal habitats, including sand dunes, sand beaches, shoals, mudflats, grasslands, saltwater and freshwater marshes, and coniferous forest. Vast areas are shallow with habitats that support waterfowl, shorebirds, and raptors that forage on these birds. The estuary also provides important adult, migratory, and nursery habitats for recreationally and commercially important resources, including salmonids, shellfish, and forage fish that provide prey for other fish and wildlife.

Eelgrass (*Zostera marina*) beds, a Washington State critical habitat, are abundant in the northern portion of Willapa Bay (Hazen 1996 *in* USFWS 1997). Black brant (*Branta bernicla*) feed on eelgrass and often forage near Toke Point. The bay is a wintering ground for most of the Pacific flyway brant in the United States (Williamson 1996 in USFWS 1997). Eelgrass is used as a spawning substrate for Pacific herring (*Clupea pallasii*), an important forage fish for salmonids, marine mammals, and seabirds.

As of 1980, mudflats comprised as much as 55 percent of the estuary (Proctor et al. 1980); however, that amount has decreased due to the spread of smooth cordgrass, which accumulates sediments and transforms mudflats into higher elevation salt marsh. Nearly one third of Willapa Bay's 45,000 acres of tide flats are impacted by smooth cordgrass, one of the most significant

ecological problems in the bay. Imported as oyster packing material in 1894, smooth cordgrass has spread rapidly, from about 400 acres in 1982 to 15,000 acres in 2002 with a growth rate of 17 percent (WDOE 2003). While considered beneficial in its native range, the negative impacts to Washington ecosystems from cordgrass outweigh any potential benefits this invasive, nonnative species may provide. Clusters of smooth cordgrass plants increase deposition of sediments, thereby raising the elevation of the mudflats and converting gently sloping tidal flats to salt marsh meadows incised by tidal channels (Smith 1999). Impacts due to the smooth cordgrass invasion include displacement of native eelgrass, a nursery habitat for anadromous salmon and forage species; a reduction in available habitat for invertebrates, including shellfish; the loss of an estimated 16 to 20 percent of habitat for breeding and wintering birds; and the loss of rearing and foraging habitat for anadromous fish (WDOE 2003).

Other invasive plants, such as European beachgrass (*Ammophila arenaria*), are also creating problems in Willapa Bay and surrounding areas. Nonnative beachgrass was imported to this area in the 19th century in efforts to stabilize dunes. This invasive species has been very successful at colonizing native dune habitats, thereby changing the sand movement, plant communities, and animal habitats along Washington's southwest coast (WDOE 2003). Several Tribal members have voiced the concern that the extensive beachgrass cover in the dunes along the coast to the north of Willapa Bay has trapped sand that would have been transported south, thereby starving the northern part of Willapa Bay of sediment and contributing to erosion.

Intertidal mudflats in Willapa Bay provide habitat for a number of commercially-valuable species, including Dungeness crab (*Cancer magister*), English sole (*Parophrys vetulus*) and oysters (multiple species, see Table 1). Conflicts have arisen over the use of a carbamate pesticide (carbaryl) by the oyster industry to control populations of burrowing shrimp. The activities of this native invertebrate create bioturbation and destabilize sediments, reducing oyster survival and growth. Although carbaryl is intended to target burrowing shrimp, other species such as young-of-the-year and subadult Dungeness crab, English sole, and others may also be affected (Ray 2002). Carbaryl is also reported to affect larval razor clams (Hoffman, personal communication, 2003) and produce sub-lethal effects in coastal cutthroat trout (Davis, USFWS, personal communication, 2003).

**Fish and Wildlife in Willapa Bay**

*Marine Mammals*

Willapa Bay provides important habitats for marine mammals that frequent the region seasonally. Marine mammals found in or near the estuary include the northern (Stellar) sea lion (*Eumetopias jubatus*), harbor seal (*Phoca vitulina*), California sea lion (*Zalophus californianus*) Pacific harbor porpoise (*Phocoena phocoena*), and gray whale (*Eschrichtius robustus*). Although information on the use of the bay by most of these species is limited, it is reasonable that the three pinnepeds (northern sea lion, harbor seal, and California sea lion) might use the bay for haul-outs and/or rearing. Additionally, Willapa Bay and its sand islands are known to be pupping grounds and nursery areas for harbor seals and provides for 30 percent of the regional population of harbor seals that ranged between Netarts Bay, Oregon and Grays Harbor, Washington (Jefferies 1995 *in* USFWS 1997). Between 800 and 1,000 harbor seal pups are born

in Willapa Bay each year (USFWS 1997), and use the sand islands found in various places throughout the bay. Jeffries et al. (2000) report seasonal use of Willapa Bay by small numbers of California sea lions.

Information on the use of the bay by cetaceans is limited. The Pacific harbor porpoise may use the bay for resting or foraging. Gray whales may be present from March until July, resting or foraging in the bay during their annual migration north to their traditional summer feeding grounds.

*Fish*

The Willapa Bay estuary provides spawning, nursery, and rearing habitat for a variety of fish species (for common and scientific names of the species likely to be present in or near Willapa Bay, see Table 1 below), including salmonids, small forage fish, flatfish, sturgeon (and other fish (Proctor et al. 1980). Forage fish, such as surf smelt, Pacific sand lance, and Pacific herring, are important prey species for marine mammals, seabirds, salmonids, and other fish species found in Willapa Bay.

Willapa Bay supports hatchery and wild stocks of fall Chinook, chum, and coho salmon as well as steelhead (summer and winter) and cutthroat trout. Salmonids are highly valued and declining in Washington State, resulting in the proposal or listing of various populations under the Endangered Species Act. Washington State has imposed strict restrictions on the harvest of salmon and steelhead in an attempt to reverse the decline.

Table 1. Fish and shellfish expected or likely to be present in or near Willapa Bay.

| Common Name | Scientific Name | Common Name | Scientific Name |
|---|---|---|---|
| Pacific tomcod | *Microgadus proximus* | Pacific razor clam | *Siliqua patula* |
| English sole | *Parophrys vetulus* | Native littleneck | *Protothaca staminea* |
| Starry flounder | *Platichthys stellatus* | Horse clam | *Tresus capex* |
| Lingcod | *Ophiodon elongates* | Soft-shell clam | *Mya arenaria* |
| White sturgeon | *Acipenser transmontanus* | Bent-nose clam | *Macoma nasuta* |
| Green sturgeon | *Acipenser medirostris* | Manila clam | *Tapes philippinarum* |
| Longfin smelt | *Spirinchus thaleichthys* | Pacific oyster | *Crassostrea gigas* |
| Surf smelt | *Hypomesus pretiosus* | Olympia oyster | *Ostrea lurida* |
| Northern anchovy | *Engraulis mordax* | Heart cockle | *Clinocardium nuttalli* |
| Shiner perch | *Cymatogaster aggregate* | Blue mussel | *Mytilus edulis* |
| Pacific herring | *Clupea pallasii* | Red rock crab | *Cancer productus* |
| Pacific sand lance | *Ammodytes hexapterus* | Dungeness crab | *Cancer magister* |
| American shad | *Alosa sapidissima* | | |
| Staghorn sculpin | *Leptocottus armatus* | | |
| Chinook salmon[1] | *Oncorhynchus tshawytscha* | | |
| Coho salmon | *Oncorhynchus kisutch* | | |
| Chum salmon | *Oncorhynchus keta* | | |
| Steelhead trout | *Salmo gairdnerii* | | |
| Cutthroat trout | *Salmo clarkia* | | |
| Bull trout[1] | *Salvelinus confluentus* | | |

[1]Federally listed species (although Chinook listing is limited to certain stocks)

Most of the Willapa Bay anadromous fish stocks are considered healthy, with a few exceptions, such as the Fall River Chinook stock (WDFW 1992). Bull trout, which may forage in Willapa Bay, are listed as threatened throughout their range. Coastal cutthroat trout are a species of concern. The bay's health is crucial for all these salmonids, especially for juveniles during their out-migration or as they rear within the system. The Corps' finalized biological assessment for this proposed project should indicate how construction and maintenance activities would minimize impacts (e.g., turbidity, disturbance, displacement) to anadromous fish, especially during rearing and juvenile out-migration.

*Shellfish*

The Willapa Bay estuary is about 88,000 acres, approximately half of which is exposed at low tide, making the bay an ideal habitat for shallow water shellfish, such as oysters (Smith 1999) (for common and scientific names of the species likely to be present in or near Willapa Bay, see Table 1 above). Several bivalve species are harvested in Willapa Bay, including the Pacific razor clam, Pacific oyster, Olympia oyster, native littleneck, and heart cockle (Ray 2002). Other shellfish found in the area include the red rock crab and the commercially-important Dungeness crab; blue mussel; and Manila clam, horse clam, soft-shell clam, and bent-nose clam. Willapa Bay is an important nursery for Dungeness crab (Emmett et al. 1991; Proctor et al. 1980). Several of the shellfish species are nonnative (but commercially-harvested species), including the Pacific oyster, and the Manila and soft-shell clams.

*Birds*

The marshes, tidelands, and open waters of Willapa Bay provide important habitat for migratory birds of the Pacific Flyway. A list of migratory waterfowl and other water-associated birds that have been observed or are believed to use the area are listed below along with their common and scientific names below (Table 2). Anecdotal observations of water-associated birds (e.g., waders, shorebirds, waterfowl, etc.) of the salt marsh located south of the Shoalwater Bay Tribal Reservation include great blue herons, egrets (Ardeidae), yellowlegs, American bitterns, rails (Rallidae), and waterfowl (Kelley, Black Hills Audubon, personal communication, 2003). Although many passerines and other birds are also expected to be present in the area, the report will focus on water-associated birds, which are expected to be most affected by the project.

Willapa Bay is one of the most important sites for shorebirds on the west coast of North America, and is used during spring and fall migrations. Bird use information is unavailable for the project site; however, information is available for the greater Willapa Bay area. Buchanan and Evenson (*in* USFWS 1997) found that the Willapa Bay met the Western Shorebird Reserve Network's criteria used to designate internationally important shorebird sites, hosting between 100,000 and 500,000 birds per year with consistent, annual use (USFWS 2002). The Willapa River[1] and the Bear River[2] estuaries support the highest counts of shorebirds in the Willapa Bay as a whole. Willapa Bay is particularly important to wintering dunlins and supports 15.5 percent of the Pacific Flyway population of that species (Buchanan and Evenson 1997).

[1] The Willapa River estuary is located approximately 9 mi east of the project area.
[2] The Bear River estuary is located at the southeast corner of Willapa Bay.

The tide flats around Tokeland (west of the project area) are considered a primary census site for shorebirds (Buchanan and Evenson 1997) and one of coastal Washington's "birding hot spots." The flats are well known for long-legged shorebirds such as willets, godwits, and curlews. Brown pelicans may also be observed using the sandy spits off shore along with other shorebirds and gulls (Morse 2001).

The need for shorebirds to migrate, the tendency for some species or individuals to aggregate, and their dependence on wetlands have placed many shorebird species at risk, including the western snowy plover, listed as threatened under the Endangered Species Act. Populations of many shorebird species are in decline, most likely because of factors such as human disturbance and habitat loss (Fernandez 2004) (e.g., from coastal development and draining of wetlands). Stopover sites such as Willapa Bay are extremely important to these species, and are used for critical resting and foraging during migration. Stop-over sites are typically limited in size and distribution, and the limited resources at these habitats may result in "migratory bottlenecks" that may limit successful migration, reproduction or even survival (Drut and Buchanan 2000). For these reasons, negative impacts to migratory birds and their habitat from the proposed project should be avoided.

Table 2. Water-associated bird species expected or likely to be present in or near Willapa Bay. (Proctor et al. 1980, Parametrix 1997, Morse 2001)

| Common Name | Scientific Name | Common Name | Scientific Name |
|---|---|---|---|
| Tundra swan | *Cygnus columbianus* | Red-throated loon | *Gavia stellata* |
| Trumpeter swan | *Cygnus buccinator* | Western grebe | *Aechmophorus occidentalis* |
| Greater white-fronted goose | *Anser albifrons* | Red-necked grebe | *Podiceps grisegena* |
| Snow goose | *Anser caerulescens* | Double-crested cormorant | *Phalacrocorax auritus* |
| Canada goose | *Branta canadensis* | Brandts cormorant | *Phalacrocorax penicillatus* |
| Black brant | *Branta bernicla* | Pelagic cormorant | *Phalacrocorax pelagicus* |
| Mallard | *Anas platyrhynchos* | Marbled murrelet[1] | *Brachyramphus marmoratus* |
| Gadwall | *Anas strepera* | Bald eagle[1] | *Haliaeetus leucocephalus* |
| American widgeon | *Anas americana* | Brown pelican[1] | *Pelecanus occidentalis* |
| Green-winged teal | *Anas crecca* | Great blue heron | *Ardea herodias* |
| Pintail | *Anas acuta* | American bittern | *Botaurus lentiginosus* |
| Northern shoveler | *Anas clypeata* | Dunlin | *Calidris alpine* |
| Greater scaup | *Aythya marila* | Sanderling | *Calidris alba* |
| Ruddy duck | *Oxyura jamaicensis* | Black turnstone | *Arenaria melanocephala* |
| Common goldeneye | *Bucephala clangula* | Ruddy turnstone | *Arenaria interpres* |
| Bufflehead | *Bucephala albeola* | Red knot | *Calidris canutus* |
| Canvasback | *Aythya valisineria* | Willet | *Catoptrophrus semipalmatus* |
| White-winged scoter | *Melanitta fusca* | Killdeer | *Charadrius vociferous* |
| Surf scoter | *Melanitta perspicillata* | Northern phalarope | *Phalaropus lobatus* |
| Common merganser | *Mergus merganser* | Whimbril | *Numenius phaeopus* |
| Red-breasted merganser | *Mergus serrator* | Greater yellowlegs | *Tringa melanoleuca* |
| Glaucous-winged gull | *Larus glaucescens* | Lesser yellowlegs | *Tringa flavipes* |
| Western gull | *Larus occidentalis* | Spotted sandpiper | *Actitis macularia* |
| Heermans gull | *Larus heermanni* | Least sandpiper | *Calidris minutilla* |
| Herring gull | *Larus argentatus* | Western sandpiper | *Calidris mauri* |
| California gull | *Larus californicus* | Long-billed dowitcher | *Limnodromus scolopaceus* |
| Ring-billed gull | *Larus delawarensis* | Short-billed dowitcher | *Limnodromus griseus* |
| Mew gull | *Larus canus* | American golden plover | *Pluvialis dominica* |
| Bonapartes gull | *Larus philadelphia* | Black-bellied plover | *Pluvialis squatarola* |

| | | | |
|---|---|---|---|
| Thayers gull | *Larus thayeri* | Snowy plover[1] | *Charadrius alexandrinus* |
| Caspian tern | *Sterna caspiai* | Semipalmated plover | *Charadrius semipalmatus* |
| Caseins auklet | *Ptychoramphus aleuticus* | Bar-tailed godwit | *Limosa lapponica* |
| Pigeon guillemot | *Cepphus columba* | Marbled godwit | *Limosa fedoa* |
| Common murre | *Uria aalge* | Long-billed curlew | *Numenius americanus* |
| Common loon | *Gavia immer* | Wandering tattler | *Heteroscelus incanus* |

[1]Federally listed species

**Federally Listed Species**

Several species listed as threatened under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act), are known to or may occur within the vicinity of the proposed project: the western snowy plover (*Charadrius alexandrinus nivosus*), marbled murrelet (*Brachyramphus marmoratus*), bald eagle (*Haliaeetus leucocephalus*), brown pelican (*Pelecanus occidentalis*), bull trout, orca (*Orcinus orca*), and Chinook salmon. Consultation on federally listed species should be initiated with both the Service and the National Marine Fisheries Service (NMFS) in accordance with section 7(a)(2) of the Act. In addition to consideration of the species discussed below, we recommend that the Corps acquire an updated list of federally listed threatened and endangered species found in the project county from the Service's Western Washington Fish and Wildlife Office website (http://www.fws.gov/westwafwo/cta/index.html) to ensure that your obligations under section 7 of the Act are fulfilled. The Corps should also contact the NMFS at (360)753-9530 to request a list of species under their jurisdiction and to determine if evaluation of effects to essential fish habitat (EFH) is necessary. The species listed below are under the jurisdiction of the Service unless noted otherwise.

*Western snowy plover*

Western snowy plover are found in Willapa Bay. Their preferred coastal nesting habitat includes sand spits, dune-backed beaches, unvegetated beach strands, open areas around estuaries, and beaches at river mouths. The encroachment of nonnative European beachgrass, introduced in the late 1800s for dune stabilization, has altered habitat and created cover for predators and has become a significant obstacle for successful western snowy plover reproduction. Human disturbance is also a key factor in the ongoing decline of breeding sites and populations of western snowy plover.

Two western snowy plover nests were found on Empire Spit[3] in summer surveys in 2006 (S. Pearson, WDFW, personal communication, 2006), each containing eggs. While nests have not been previously reported in this area, it is unknown whether 1) nesting has occurred but was not observed or reported, or 2) if the nesting activity in this area is a new occurrence.

There are two important breeding areas in Washington State, down from five locations documented from historic records (USDOI 1995). Leadbetter Point is located approximately 5 mi south-southwest from the project site, and south of the entrance channel to Willapa Bay The outer coast at Midway Beach approximately 5 mi northwest of the project site also provides nesting habitat for western snowy plovers. It is unlikely that dredging or altering sediment and hydraulic processes in the project area may affect existing nesting habitat for this species at

[3] The site was identified as "Graveyard Spit" in the cited personal communication.

Leadbetter Point and Midway Beach as the amount of sand dredged during implementation (600,000 cubic yards) and maintenance (250,000 cubic yards /5-year-period) of the proposed dune is not expected to significantly alter the sediment budget for Willapa Bay (Babcock, personal communication, 2006a; Babcock, personal communication, 2006c). Regarding Empire Spit, the project may enhance western snowy plover habitat by providing and maintaining suitable, unvegetated nesting and foraging areas for this species in the project area waterward of the dune.

*Marbled murrelet*

The marbled murrelet is a small alcid that forages on invertebrates and small schooling fishes, such as sand lance, anchovy, herring, and smelt, along relatively shallow inland marine and coastal areas of Washington (Burkett 1995). Nesting occurs in older forests, with birds traveling between nests and foraging habitat, which may be a significant distance from a nest. Suitable nesting habitat exists within the Willapa Bay watershed (Thompson 1999).

Murrelets have been observed in some coastal areas of the Pacific Northwest aligning themselves on or near the boundaries of rip-current plumes at river mouths and harbor entrances, presumably for foraging (Speich and Wahl 1995) or staging. Marbled murrelets have been observed in Cape Shoalwater and greater Willapa Bay (Thompson 1995; Varoujean and Williams 1995) indicating that summer foraging may occur in the vicinity of the site during the summer. Impacts to marbled murrelet foraging in Willapa Bay, particularly with respect to disturbance during the nesting and fledging period (April 1 through September 15), and negative impacts to their prey species should be avoided or minimized.

*Bald eagle*

Bald eagles nest and winter in the Willapa Bay area. Nests are generally constructed in uneven-aged tree stands with a large-tree component, and are found near water bodies with an adequate food supply. Wintering eagles use tall perch trees near feeding areas. Areas with high waterfowl concentrations and anadromous fish are important for foraging eagles. In some areas bald eagles have become accustomed to high levels of human activity. However, bald eagles are often particularly susceptible to disturbance throughout the nesting season (January 1 to August 15) or while foraging during the wintering period (October 31 to March 15). Disturbance impacts to nesting and wintering bald eagles should be avoided during these critical life history stages, as should adverse impacts to their prey species.

*Brown pelican*

The number of brown pelicans using Willapa Bay has fluctuated over time, likely due to food availability. Large numbers were observed in the 1800s, followed by decades with no reported sightings until the 1970s. Within approximately 15 years, thousands of pelicans began migrating into Washington, and Willapa Bay and southern Washington represented an important area for non-breeding brown pelicans (Jaques 1994). Estuary sandbars, which limit predation and disturbance, are the most important roost habitats for brown pelicans in Washington. Pelicans have been observed in large numbers in recent history on some of the sand bars in Willapa Bay,

including Sand Island. They have also been observed occasionally at Empire Spit[4], near the project site (Morse 2001). Important forage species include northern anchovy, Pacific sardine (*Sardinops sagax*), and Pacific mackerel (*Scomber japonicus*). Impacts to brown pelicans, especially through elimination of or a decrease in the amount of isolated sandbar habitat available for roosting through modification of the bay's hydrology, should be avoided or minimized.

*Bull trout*

The first documented sighting of a bull trout in Willapa Bay occurred in February 2002, when a WDFW fish technician captured a single bull trout in the Willapa River. Bull trout most likely use the Willapa River system for foraging, although their level of use is currently unknown. Bull trout consume a variety of prey species, with small individuals targeting invertebrates, but becoming piscivorous as they mature. This project should be assessed for potential impacts to bull trout, particularly for impacts to their forage species.

*Chinook salmon*

Chinook salmon are believed to use Willapa Bay as both a migratory corridor and as a foraging and rearing area. Both juvenile and adult salmonids such as Chinook salmon require nearshore marine areas that are free of migratory obstructions and high predation rates and provide good water quality and quantity as well as adequate forage and cover (e.g., submerged/overhanging vegetation) (S. Anderson, NMFS, personal communication, 2006). These conditions are necessary for juvenile rearing and to sustain adult physiological transitions between salt water and fresh water for Chinook salmon, as well as other salmonids, such as chum and coho.

Several stocks of Chinook salmon are listed by NMFS under the Act. However, Chinook salmon in Willapa Bay would likely be considered part of the Washington Coast evolutionarily significant unit (ESU). According to their website[5] (accessed March 22, 2006), the Washington Coast ESU listing is not warranted. The Corps should contact NMFS to determine whether this information is still valid and/or if another ESU should be evaluated for this project.

*Orca*

Several stocks (or populations) of orcas (killer whales) are found in the coastal and/or inland waters of the Pacific Northwest. The stocks that are most likely to be found in coastal waters near the project area for at least a portion of their life history (e.g., during seasonal migrations) include the Eastern North Pacific Southern Resident stock, the Eastern North Pacific Transient stock, and the Eastern North Pacific Offshore stock (Carretta et al. 2005). However, orcas are expected to remain outside of Willapa Bay and are not expected to be found in the project area. The Southern Resident orca distinct population segment is currently listed by NMFS under the Act. The Corps should contact NMFS to determine whether effects to orcas should be evaluated in the Biological Assessment.

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[4] The site was identified as "Graveyard Spit" in the cited article.

[5] www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Chinook/

### Future with the Project

If the preferred alternative is implemented, storm waves which overtop and erode the existing dunes would be inhibited, eliminating the resultant sand deposition and transformation of the remaining tidal flats in North Cove into high marsh. The suppression of this transformation allows for future habitat enhancement in the cove, including but not limited to the removal of invasive nonnative species (i.e., smooth cordgrass). Fish and wildlife species that depend on the existing tidal flats in the cove would retain the use of the habitat in the interim.

Although a large portion of the shoreline would be altered through the flood berm enlargement and modification, the armored shoreline would be softened through the placement of sand and stabilizing vegetation. Although this sand and vegetation would likely be replaced or augmented periodically as necessary, it would likely provide better habitat structure than the riprap structure alone.

The combination of the restored dune (Empire Spit) and the augmented flood berm actions would provide a dual benefit for the Corps and the Shoalwater Bay Tribe: 1) Tribal infrastructure and the shoreline would be protected from flooding and the erosive effects of tidal currents and storm waves from typical winter storm events, and 2) the flood berm would allow for longer periods of time between future maintenance and nourishment of the dune. Although the Corps has estimated that dune maintenance would likely be necessary at 10-year intervals, the augmented flood berm would allow for a degree of flexibility due to financial costs or unforeseen circumstances (such as severe damage to the dunes from a storm), minimizing interim erosion to the shoreline and Tribal property.

### Future without the Project

Although there are indications that the northward migration of the main channel into Willapa Bay and the associated erosion evident in the area may be slowing or has halted (Corps 2004), flooding and erosion is still expected to continue to impact the project area during future storm waves and tidal currents. In the absence of the project, North Cove is expected to continue its transformation from historic tidal flats to a high salt marsh through erosion of the existing dune materials into the cove during storm events that overtop the spit. Fish and wildlife species that are dependent upon current habitat conditions would likely continue to be impacted by existing and future eroding conditions. Additionally, although the existing flood berm protects the shoreline structures along 1,720 ft of the Reservation shoreline, shoreline areas within and adjacent to the Reservation that are not sheltered by the flood berm may experience significant flooding during severe storm events (Corps 2004a).

## DISCUSSION

### Development of Alternatives

Several alternatives have been considered during the development phase of the project proposal. The need for shoreline and dune erosion control was evaluated, as was the effectiveness of using

a number of hard and soft structures. Other alternatives considered, but not incorporated in the most recent list of proposed alternatives, included no action, hydraulic modifications (e.g., training dikes/flow diversion structures), and a sea dike.

Analysis of the "no action" alternative indicated that the eroded barrier dune would provide decreasing wave protection for the cove and shoreline infrastructure, resulting in more frequent flooding of the Shoalwater Bay Tribe Reservation and adjoining lands. Hydraulic modification would consist of one of several designs regarding the placement of underwater rock structures to redirect currents and sediment flow in and near the project area. The impacts from these designs would be less predictable than the preferred alternative, and have the potential to result in significant impacts to fish and wildlife and their habitats through unpredictable system-wide alterations. Proposed structures ranged from 2,300 to 4,300 ft long, and involved the placement of over a million tons of rock. A third alternative was the construction of a 12,500-foot rock sea dike along the barrier spit (Empire Spit) and across the mouths of the tidal channels using substantial amounts of armor stone (135,000 tons), quarry spalls (110,000 tons), and under-layer stone (60,000 tons). Placement of the sea dike would also include the excavation of approximately 100,000 cubic yards of substrate, the construction and removal of a temporary off-loading pier, and placement and removal of approximately 10,000 tons of quarry spalls for a temporary access road. The use of a sea dike (or other hard structures) in this area may also have unpredictable impacts, and adaptive management techniques would likely be difficult or cost-prohibitive if the original placement or design was later found to be inadequate (Babcock 2006c).

**Potential Impacts of the Preferred Alternative**

The effects of implementation of the project on fish and wildlife species would be dependent on which alternative is chosen. If the preferred alternative is indeed chosen, the proposed project would likely result in impacts to fish and wildlife resources, but fewer and less significant impacts than those expected from the use of other alternatives that use more substantial hard structures (e.g., groin, dike, etc.) in the bay.

Impacts from the restoration of the existing dune include both direct and indirect effects from procurement (i.e., dredging) and placement of sand. Future dredging and sand placement would also be necessary during maintenance activities, and would result in similar impacts each time additional material is required. Expected effects of dredging include the potential entrainment of crabs, shellfish, forage fish and other aquatic species. The placement of the sand would also result in impacts, particularly the smothering and burial of sessile or slow-moving aquatic organisms in the water column and at or beneath the surface of the substrate. Impacts from dredging and placement of sand are expected to be minor. Colonization of the disturbed areas is expected to be relatively rapid because the sites can be easily accessed by nearby individuals. However, to minimize disturbance or mortality from dredging and sand placement to fish and wildlife, dredging and placement activities should be avoided critical life history stages.

Additionally, if some of the tidal channels within North Cove are obstructed as a result of the dune restoration as proposed, the current amount of access potential for foraging juvenile salmonids may be reduced; however, the cove will still be connected to Willapa Bay through the

tidal channel to the east, and will continue to provide access to juvenile salmonids and other fish species.

Modification of the flood berm would also result in impacts to fish and wildlife species. Because the flood berm modification is expected to increase the length of the existing flood berm, impacts to natural shoreline areas through the installation of riprap and other materials are anticipated. Placement of riprap will be above Mean Higher High Water (MHHW) (R. Director, Corps, personal communication, 2006). The Corps plans to place sand on the riprap to soften the structure, and include plantings of suitable native vegetation on both the flood berm and restored dune. These plantings should help to stabilize both features and encourage more rapid natural colonization of native vegetation.

The impacts from these project components are expected to be significantly less than potential impacts from installation of other hard structures such as groins, dikes, and other placement of rock/rip rap as hydraulic modifications in the bay. The extent of impacts of such structures to the geomorphic and sediment transport processes of the bay would be unpredictable at best, potentially resulting in a number of effects. These effects may include: 1) the erosion of roosting and nesting sites of listed bird species, and pupping and resting sites for harbor seals; 2) erosion of mudflats, eelgrass beds, and marshes important for shellfish, foraging shorebirds, waterfowl, salmonids, and foraging and/or spawning forage fish; and 3) transfer of erosive energy down-drift of the site, compounding shoreline erosion. This additional erosion could generate additional proposed shoreline armoring projects (with associated losses of nearshore and shoreline habitat) in areas that already have high rates of shoreline armoring.

The impacts of the proposed project to upland areas adjacent to the project site were also considered; however, due to the nature of these areas (e.g., Tribal residential/infrastructure, road right-of-way, other residential, etc.), the impacts to these areas from the proposed project are expected to be relatively minor. For example, although the armoring of additional shoreline may result in a decreased ability of the uplands to contribute to the sediment supply of the bay, the existence of the highway corridor along this shoreline currently serves as a barrier to this process.

## CONCLUSIONS

The Corps has determined that the use of soft structures (i.e., the restoration of the dune) in combination with the extension of the existing flood berm would likely be sufficient to achieve the goals of the project. The Corps has attempted to minimize impacts to Willapa Bay through the incorporation of certain measures in the project design, specifically: 1) the use of soft materials (i.e., sand) instead of hard structures in the bay, 2) native vegetation plantings for dune stabilization, and 3) the placement and maintenance of sand and plantings on the existing flood berm and its extension. If the Corps proceeds with project implementation, we recommend that the Corps select their preferred alternative with the proposed measures to minimize impacts to habitat and species.

We support the goals of the proposed restoration project in regard to the protection of Tribal lands and resources, and give our support on the presented components of the preferred alternative, pending the satisfactory inclusion of appropriate conservation measures to minimize impacts to fish and wildlife and their habitats during the construction.

## RECOMMENDATIONS

We are providing the following recommendations to further minimize impacts of the project to the species and habitat present in the Shoalwater Bay/Willapa Bay project area. These recommendations are based on discussions with agency (Federal and State) and Tribal staff, review of literature provided by the Corps and other organizations (see References), and a site visit.

1. We recommend work windows for listed species (including salmonids and bald eagles), spawning forage fish, and other species be incorporated into the project's construction schedule and future maintenance operations to minimize impacts to listed species, their prey, and their habitats during sensitive portions of their life cycle. Please coordinate with the Service, NMFS, and WDFW to finalize the appropriate work window for this project prior to the initiation of section 7 consultation.

2. We recommend the Corps evaluate effects of the project to nesting and foraging marbled murrelets. Although the Corps has noted the proximity of nesting marbled murrelets in the Environmental Assessment (Hoffman and Sievers 2005), we recommend potential impacts to foraging marbled murrelets and their prey also be considered in the final Biological Assessment, particularly during the marbled murrelet nesting and fledging period. We recommend that any construction and maintenance activities that may result in disturbance to foraging marbled murrelets during their nesting and fledging period (April 1 to September 15) not occur until 2 hours after sunrise and cease 2 hours before sunset.

3. We recommend that the Corps continue to coordinate with the Service and with WDFW to retain suitable unvegetated areas on the spit as nesting areas for western snowy plovers. The planting plan should clearly indicate the location of these areas and future actions should maintain these areas in an unvegetated condition. Flexibility in future maintenance of such areas is likely to be necessary, pending results of future western snowy plover surveys. We also recommend that all future dune maintenance activities be preceded by surveys for nesting western snowy plovers by a qualified biologist (in coordination with WDFW and the Service) to avoid disturbance of nesting western snowy plovers. It is hoped that a site management plan can be developed that meets both the objectives of the Shoalwater Bay Tribe and maintain nesting habitat for snowy plovers.

4. We recommend staging, fueling, and wash-out areas be located on an impervious surface, with no runoff allowed to reach surface water, wetlands, or groundwater.

The Corps has not yet identified or defined all potential staging, refueling, and equipment cleaning areas for this project. We recommend that the Corps incorporate measures to ensure that no pollutants, including chemicals, fuels, or other contaminants, are allowed to enter the water at the project site or any other site.

5. We recommend the Corps identify potential local opportunities for compensatory mitigation through restoration or enhancement actions. Although the Corps plans to soften the riprap flood berm structure with the placement of sand and planting of stabilizing vegetation, the length of shoreline that would be impacted by the action is nonetheless considerable and maintenance activities are expected to be necessary to sustain these conditions. These impacts should be mitigated. Potential restoration or enhancement opportunities may include, but are not limited to, the removal of nonnative invasive species from the cove (e.g. smooth cordgrass, beach grasses, etc.) or other similar actions to improve habitat conditions for species that use the area and would potentially be impacted by the proposed project.

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# FIGURES

Figure 1. Location of proposed Shoalwater Reservation Coastal Erosion Project in Willapa Bay, Pacific County, Washington.

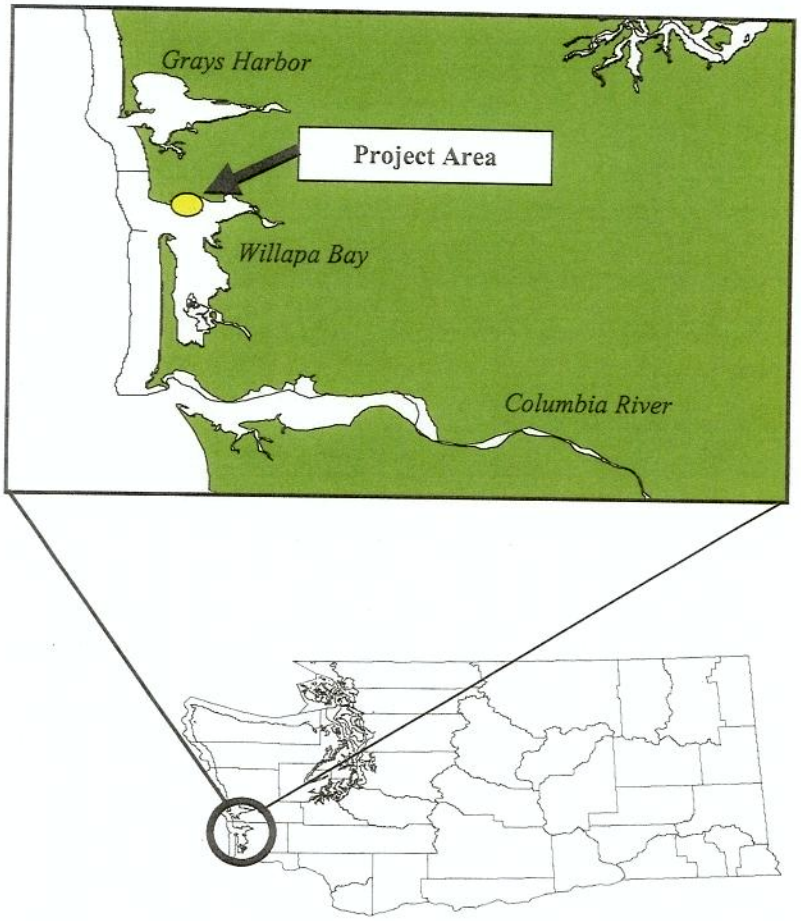


Figure 2. Barrier spits extending southeast from Cape Shoalwater (not shown), in Willapa Bay, Pacific County, Washington. (Photo courtesy U.S. Army Corps of Engineers). Arrows indicate channels into North Cove. The main channel (dotted line) now occupies areas that appear to have once been extensive tidal flats.

Figure 3. View of Willapa Bay and North Cove, showing location of protective sand dunes (Empire Spit). (Aerial photo courtesy of Washington State Department of Ecology). Dotted line indicates main channel. Note main breach in the protective dune.

Figure 4. Location of borrow site for the proposed project. (Drawing courtesy of the U.S. Army Corps of Engineers.)

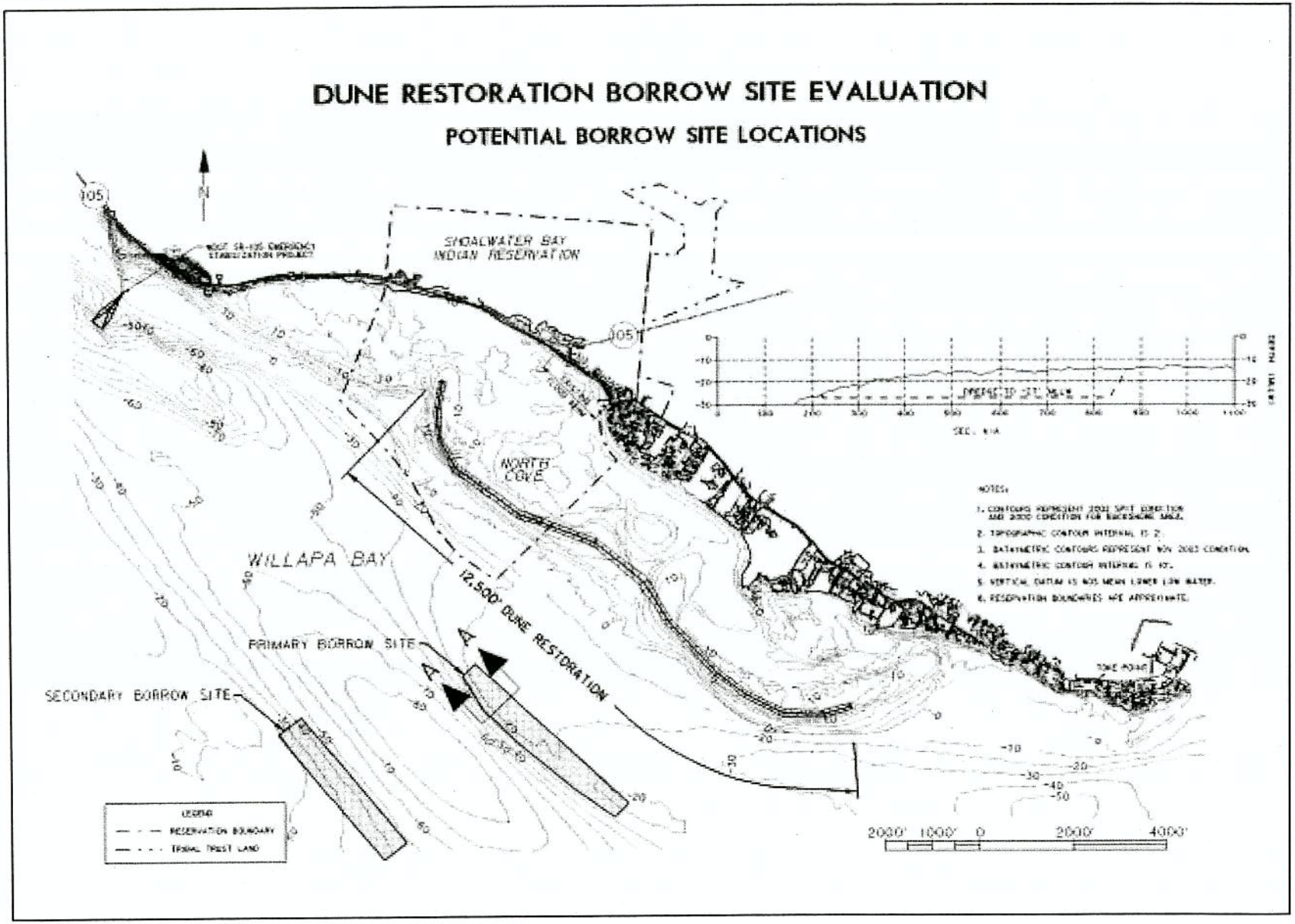
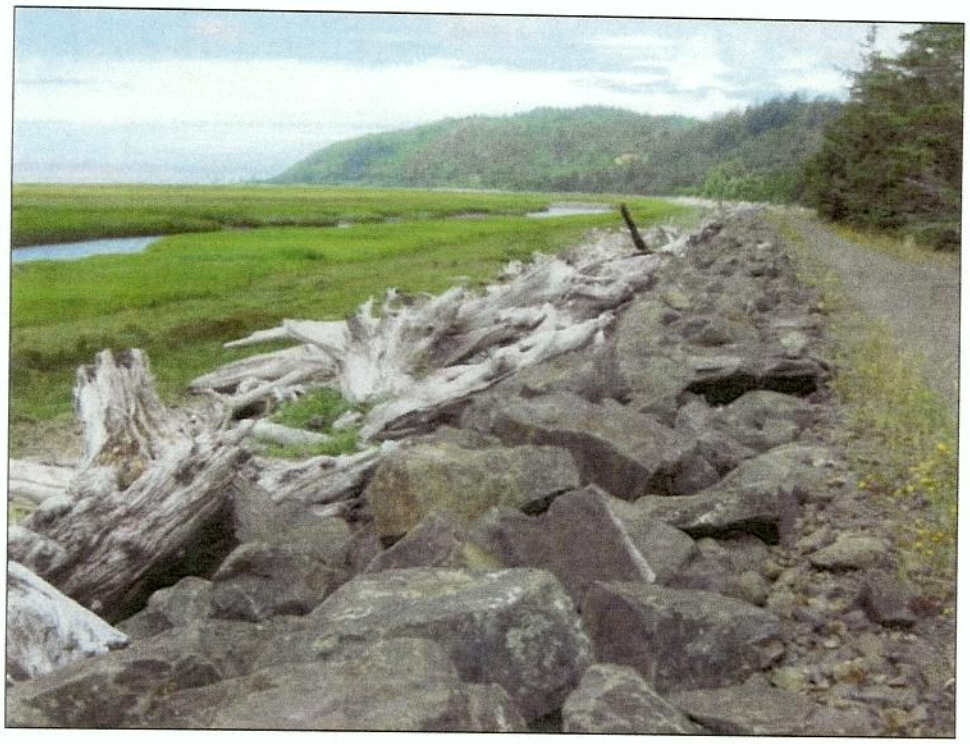
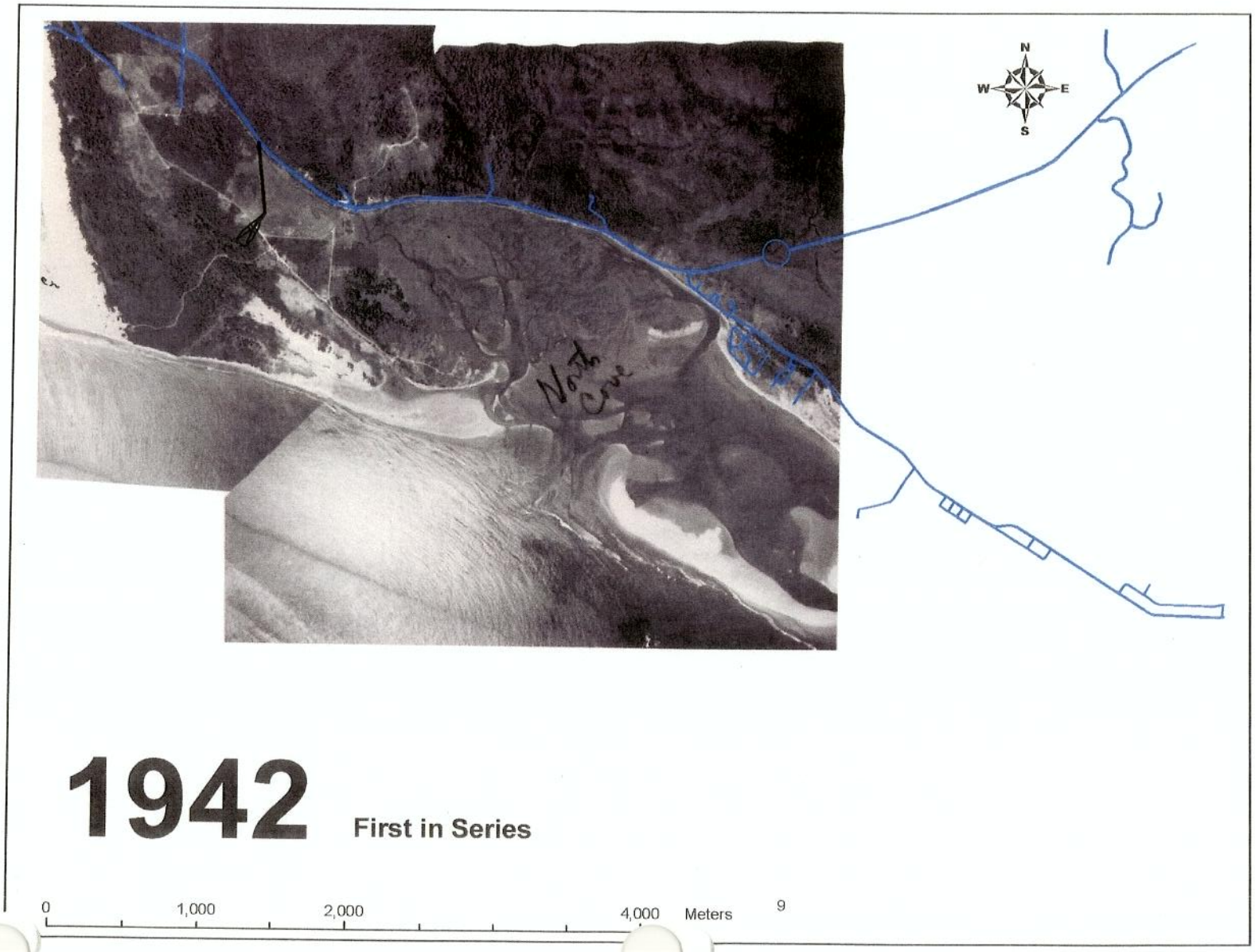


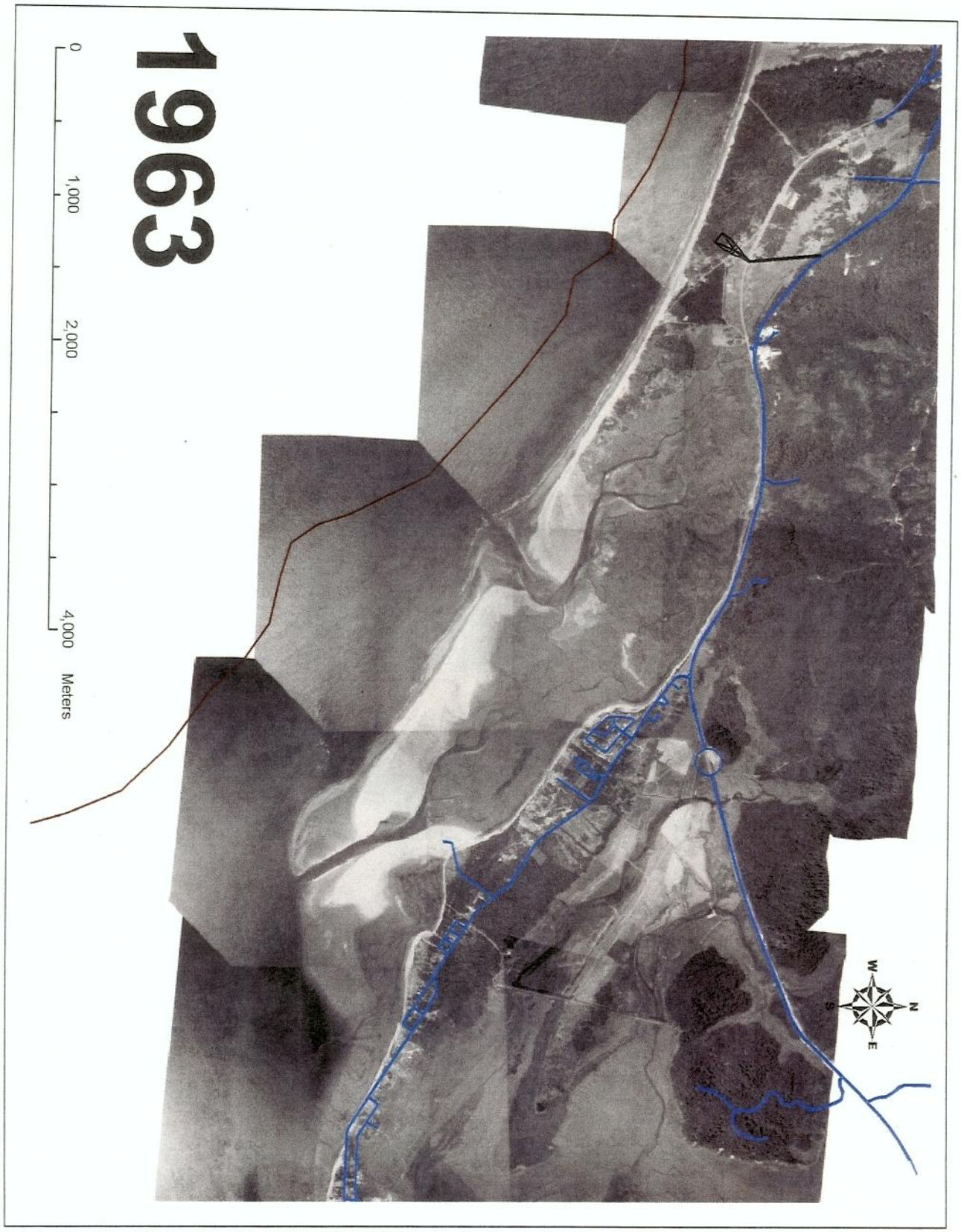
Figure 5. Section of revetment along the Shoalwater Bay Tribal Reservation shoreline, looking west. (Photo by L. Jones).



# APPENDICES

Appendix A. Aerial photographs from previous years indicating the northward retreat and decrease in size of the barrier spit (Empire spit). (Photos courtesy of the U.S. Army Corps of Engineers.)

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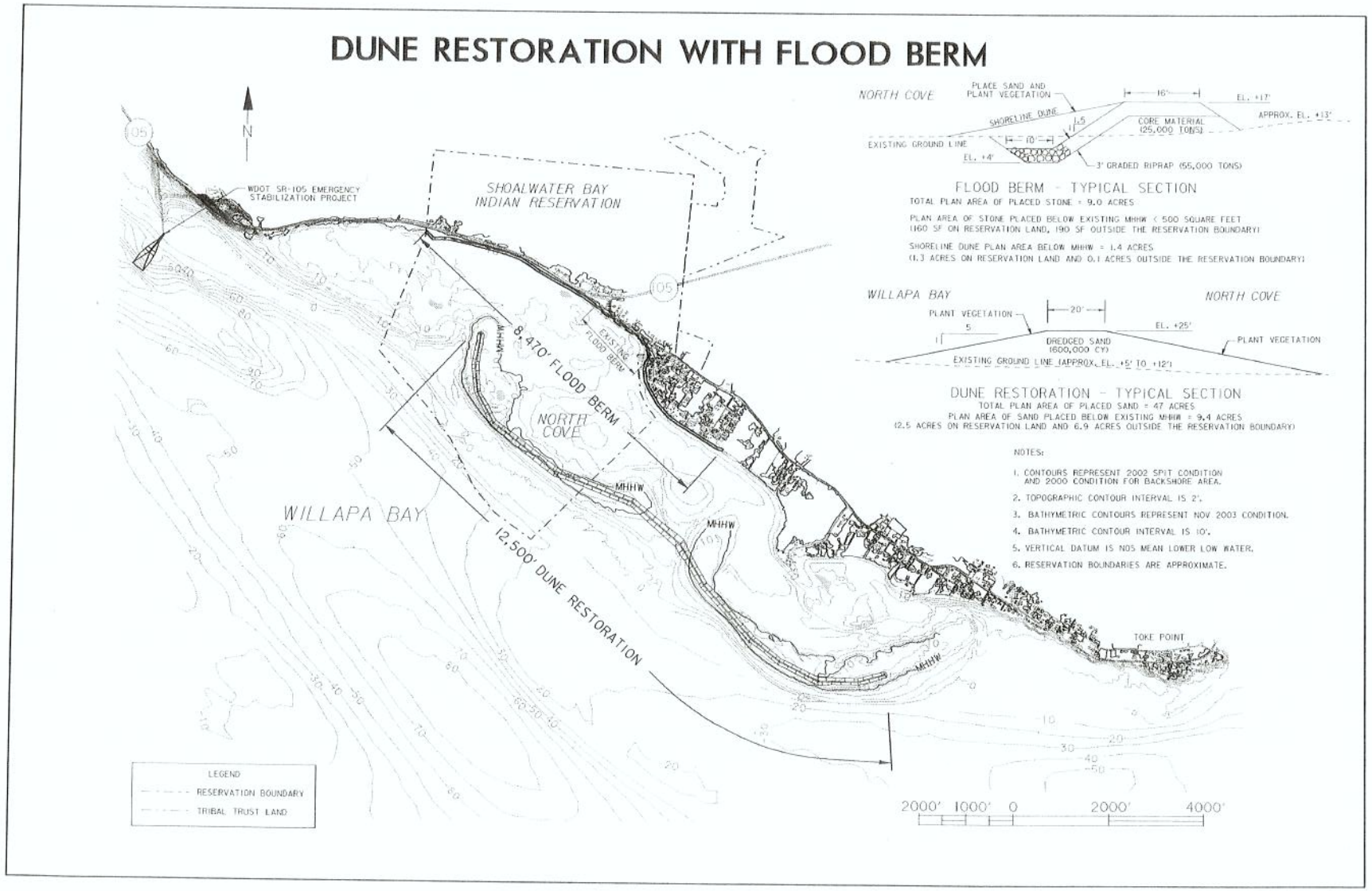
Appendix B. Preferred alternative for the Shoalwater Bay Coastal Erosion Project proposed by the U.S. Army Corps of Engineers (Hoffman and Sievers 2005).



# End of Final Environmental Assessment

## Shoalwater Bay Shoreline Erosion, Washington