UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
BIN C15700
Seattle, WA 98115-0070

NMFS Tracking
Nos. 2003/00381 and 2003/00833

July 26, 2004

Thomas F. Mueller
Corps of Engineers
Regulatory Branch-CENWS-OD-RG
Post Office Box 3755
Seattle, Washington 98124-3755

Re: Endangered Species Act Section 7 Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Bethune New Pier (COE No. 200201287) and Wanta Enlarged Pier (COE No. 200201338).

Dear Mr. Mueller:

The attached document transmits NOAA's National Marine Fisheries Service's (NOAA Fisheries) Biological Opinion (Opinion) and Magnuson-Stevens Fishery Conservation and Management Act (MSA) Essential Fish Habitat (EFH) consultation on the US Army Corps of Engineers' (COE) proposed issuance of 404 permits to Bethune and Wanta for a new pier and enlarged pier (respectively) in Lake Sammamish. The consultations are in accordance with section 7 of the endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1536), and section 305(b)(2) of the MSA (16 U.S.C. 1855). The COE determined that the proposed actions are likely to adversely affect Puget Sound chinook (*Oncorhynchus tshawytscha*) that occur under NMFS' jurisdiction, and adversely affect EFH.

This Opinion is the result of an analysis of effects of the proposal on Puget Sound chinook in Lake Sammamish. The Opinion and EFH consultations are based on information provided in the Biological Evaluations (BE) and other information sent to NOAA Fisheries by the COE on August 28, 2003 and June 2, 2003, as well as additional information transmitted via telephone conversations, e-mail, and fax. A complete administrative record of this consultation is on file at the Washington Habitat Branch Office.

NOAA Fisheries concludes that implementation of the proposed projects is not likely to jeopardize the continued existence of Puget Sound chinook. In your review, please note that the incidental take statement, which includes reasonable and prudent measures and terms and conditions, was designed to minimize take. NOAA Fisheries also concludes that the project will adversely affect EFH; conservation recommendations can be found at section 3.0 of the attached document.

If you have any questions regarding this correspondence or the attached document, please contact Kitty Nelson of the Washington Habitat State Office at (206) 526-4643.

Sincerely,

Russell M Strach for

D. Robert Lohn
Regional Administrator

Enclosure

cc: Karen Myers, USFWS

Endangered Species Act - Section 7
Biological Opinion
and
Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

Bethune New Pier on Lake Sammamish, Washington
Wanta Enlarged Pier on Lake Sammamish, Washington

Agency: U.S. Army Corps of Engineers

Consultation Conducted By: National Marine Fisheries Service
Northwest Region

Date Issued: July 26, 2004

Russell M Strach for

Issued By:
D. Robert Lohn
Regional Administrator

NMFS Tracking Nos.: 2003/00381 and 2003/00833

TABLE OF CONTENTS

1.0 INTRODUCTION

The Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531-1544), as amended, establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with the NOAA's National Marine Fisheries Service (NOAA Fisheries) and United States Fish and Wildlife Service (together "the Services"), as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or to destroy or adversely modify critical habitat, if designated. This document contains the biological opinion (Opinion), which is the product of an interagency consultation pursuant to section 7(a)(2) of the ESA and implementing regulations at 50 CFR 402.

The analysis also fulfills the Essential Fish Habitat (EFH) consultation requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) as amended (16 U.S.C. 1801 *et seq.*). The MSA established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (section 305(b)(2)). This document also transmits the results of that consultation.

The U.S. Army Corps of Engineers (COE) proposes to issue permits under section 10 of the Rivers and Harbors Act and section 404 of the Federal Clean Water Act, that would allow construction of a new pier (Bethune) and an enlarged pier (Wanta) on the west shore of Lake Sammamish.

1.1 Consultation Histories

Bethune New Pier

On June 26, 2003, NOAA Fisheries received a Biological Evaluation (BE) and EFH Assessment from the COE, with a request for ESA section 7 formal consultation and EFH consultation for the Bethune new pier and boatlift project. The COE determined that the proposed project "may affect, [is] likely to adversely affect Puget Sound chinook (*Oncorhynchus tshawytscha*)." The Opinion and EFH consultations are based on information in the BE dated October 2002 and responses to NOAA Fisheries questions dated August 27, 2003 and August 29, 2003. On August 29, 2003, NOAA Fisheries initiated formal consultation with the COE.

Wanta Enlarged Pier

On April 8, 2003, NOAA Fisheries received a BE and EFH Assessment from the COE, with a request for ESA section 7 informal consultation and EFH consultation for the Wanta enlarged pier and boatlift project. The COE stated that the letter initiating informal consultation would also serve to initiate formal consultation if NOAA Fisheries found the proposed action was likely to adversely affect Puget Sound chinook. The Opinion and EFH consultations are based on information in the final BE dated December 2002 and responses to NOAA Fisheries questions dated April 21, 2003 and June 2, 2003. On June 2, 2003 formal consultation was initiated with the COE.

1.2 Description of the Proposed Actions

Bethune New Pier

The COE proposes to authorize construction of a new pier and boatlift and shoreline enhancements for the Bethune project along the west shoreline of Lake Sammamish. The proposed new pier will be 60 feet long, covering 508 square feet. A 30-foot long by 4-foot wide bridge (without piling support) will connect the pier to the shoreline at the ordinary high water (OHW) of 27.0 feet (COE Datum). The walkway extending waterward from the bridge is 20 feet long by 6 feet wide and connects to a terminal ell that is 26 feet long by 10 feet wide. The end of the pier will be located in approximately 10 feet of water at OHW (COE Datum). The applicant proposes 11 prisms for the entire pier and 1/8 inch spacing between the boards to provide light transmittal beneath the structure. A boatlift for a 20-foot ski boat will be located shoreward of the ell.

The applicant will drive a maximum of eight 4-inch diameter steel pilings into the substrate to support the pier, using a drop hammer. The top surface of the pier will be 28 inches above OHW level (COE Datum) and the proposal includes the installation of optional fascia that hangs below the pier deck. The pier deck and support structure will be built with a mixture of chromated copper arsenate (CCA) and ammoniacal copper zinc arsenate (ACZA) treated wood.

Wanta Enlarged Pier

The COE proposes to authorize construction of an enlarged pier, installation of the two boatlifts and one lift for a personal watercraft (PWC), and shoreline enhancements for the Wanta project along the southwest shoreline of Lake Sammamish immediately north of Vasa Creek. The proposal includes replacing an existing 318 square foot pier with an enlarged structure that is approximately 575 square feet.

The proposed pier is 109 feet long. The structure will have a 20-foot long by 4-foot wide shore bridge, a 30-foot long by 4-foot wide aluminum overwater bridge, a 40-foot long by 4-foot wide walkway, a 20-foot long by 4-foot wide finger pier, and a 24-foot long by 10-foot wide terminal ell. The end of the pier will be located in approximately 12 feet of water at OHW (COE Datum). The applicant proposes to install 19 prisms for the entire pier to provide light transmittal beneath the structure. The PWC will be located at the north end of the ell and two boatlifts will be located shoreward of the ell. The nearshore boatlift will be covered by a canopy that is 6-8 feet higher than the pier deck.

The applicant will drive a maximum of thirteen 4-inch diameter steel pilings into the substrate to support the pier using a drop hammer or a vibratory hammer. The top surface of the pier will be 28 inches above OHW level (COE Datum) and the proposal includes the installation of optional fascia. The pier deck and support structure will be built with ACZA treated wood.

1.2.1 Conservation Measures

Bethune New Pier

The applicant will remove existing concrete remnants of an old boat rail from the water in front of the property. The applicant also proposes to remove non-native vegetation from the property and install a beach log, accent rocks and wavebreak rocks on both sides of the pier. Wavebreak rocks will be installed from the shoreline down to two feet below OHW (COE Datum). The applicant proposes to plant two red alder (*Alnus rubra*), three Pacific willow (*Salix lasiandra*), seven Sitka willow (*Salix sitchensis*), hardstem bulrush (*Scirpus acutus*), small fruit bulrush (*Scirpus microcarpus*) and other native species in the nearshore and across the front of the property.

Wanta Enlarged Pier

The applicant proposes to replace the grass and riprap along 90 feet of the north side of Vasa Creek with native plants. Accent/scour/wavebreak rocks are proposed to be placed at a depth of 2 feet below OHW (COE Datum). Emergent plants will be planted shoreward of the rocks. Native vegetation will include five Pacific willows (*Salix lasiandra*), six Sitka willows (*Salix sitchensis*), one shore pine (*Pinus contorta*), hardstem bulrush (*Scirpus acutus*) and small fruit bulrush (*Scirpus microcarpus*).

Bethune and Wanta Proposed Projects

A monitoring plan is proposed for five years following project construction. Annual photo records of the vegetation will be taken from the same locations in July and January each year, and submitted to the COE by February 28 each year.

During construction, the applicant will use silt curtain and silt fences to control the amount of suspended sediments that may be produced by construction activities. The applicant will complete the project (construction and conservation measures) between July 15 and December 31, in order to avoid effects to migrating and rearing chinook salmon.

1.2.2 Construction Methods

Bethune and Wanta Proposed Projects

Construction period for each project will be about ten days. Pier construction and log/rock installation will be conducted from a barge and with hand labor. The barge will not be allowed to ground out. A silt containment barrier will be installed around the sites and will be maintained in good working order for the duration of the shoreline work. The applicant will use a drop hammer or a vibratory hammer to drive the pilings; installation of pilings will take two days.

1.3 Description of the Action Area

An action area is defined by the Services regulations (50 CFR Part 402) as "all areas to be affected directly or indirectly by the Federal action, and not merely the immediate area involved in the action." The action area affected by the proposed actions includes the riparian zone, the open water, and the shoreline of Lake Sammamish because this area can be indirectly affected by boating activity from boats that will moor at the new pier. Activities related to the proposed action would occur within a small portion of the range of Puget Sound chinook, including rearing and migratory habitat along the perimeter of Lake Sammamish.

2.0 ENDANGERED SPECIES ACT - BIOLOGICAL OPINION

The objective of ESA consultation is to ensure that activities funded, authorized, or undertaken by a Federal agency, are not likely to jeopardize the continued existence of listed species, or destroy or adversely modify their critical habitat. Critical habitat is not currently designated for Puget Sound chinook, therefore, that analysis will not be presented in this document. The standards for determining jeopardy as described in section 7(a)(2) of the ESA are further defined in 50 CFR 402.14.

2.1 Evaluating the Proposed Action

In making its jeopardy analysis, NOAA Fisheries determines if the effects of the proposed action, together with the effects of the baseline and cumulative effects, will impair the listed species' potential to survive and recover. This analysis involves the initial steps of (1) defining the biological requirements of the species, and (2) evaluating the relevance of the environmental baseline to the species' current status. NOAA Fisheries must then consider the estimated level of injury and mortality attributable to: (1) collective effects of the proposed or continuing action; (2) the environmental baseline; and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery that occur beyond the action area. Significant impairment of recovery efforts or other adverse effects which rise to the level of "jeopardizing" the "continued existence" of a listed species can be the basis for issuing a "jeopardy" opinion (50 CFR 402.02). If a jeopardy conclusion is reached, NOAA Fisheries must identify reasonable and prudent alternatives to the project that do not jeopardize, if any.

2.1.1 Biological Requirements

The biological requirements of the Puget Sound Evolutionarily Significant Unit (ESU) of chinook salmon are those conditions necessary for the ESU to survive and recover to such naturally reproducing population levels that protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow them to become or continue to be self-sustaining in the natural environment. An ESU is a distinct population segment considered important to maintain the genetic diversity of a species, and is within the meaning of the term species, as defined by the ESA (16 U.S.C. 1532(16)).

The biological requirements for salmonids can be defined as habitats that have properly functioning conditions (PFC) relevant to any chinook life stage. Generally, Puget Sound chinook require a complex of habitat conditions consisting of adequate water (volume), good water quality, sufficient food, available shelter, appropriate water temperatures, appropriate substrate, passage (for both immigration and emigration) and appropriate biotic interactions. During their residence in and migration through Lake Sammamish, juvenile chinook require refugia for resting, feeding, growth, and predator avoidance. Recent studies by United States Fish and Wildlife Service (USFWS) indicate that juvenile chinook need a diverse habitat including open water areas and areas with woody debris to meet these requirements (Tabor and Piaskowski 2001). The smallest juvenile chinook are found only along shallow shorelines with small substrates such as sand and gravel, during both the day and night. They also use woody debris and overhanging vegetation as resting sites and for refuge from predators. As they grow, chinook avoid over-water structure, riprap and bulkheads, and move into deeper water.

NOAA Fisheries has determined that the specific habitat conditions affected by the proposed action are structural complexity (submergent and emergent vegetation), riparian vegetation structure, chemical contamination of water (from treated wood and outboard motor fuel) and interactions with non-native species.

2.1.2 Status of the Species

NOAA Fisheries' status review of chinook salmon from Washington, Idaho, Oregon, and California in 1998, identified fifteen distinct species (ESUs) of chinook salmon in the region (Myers *et al.* 1998). After assessing information concerning chinook salmon abundance, distribution, population trends, risks, and protection efforts, NOAA Fisheries determined that chinook salmon in the Puget Sound ESU are at risk of becoming endangered in the foreseeable future. Subsequently, NOAA Fisheries listed Puget Sound chinook salmon as threatened (March 1999, 64 FR 14308). This listing extends to all naturally spawning chinook salmon populations residing below natural barriers (e.g., long-standing, natural waterfalls) in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula, inclusive. In 2003, the estimates of trends in natural spawning escapements for Puget Sound chinook populations are similar to the previous status review of Puget Sound chinook conducted with data through 1997 (BRT 2003). The long-term trends in abundance and median population growth rates for naturally spawning populations of chinook in the Puget Sound ESU both indicate that about half of the populations of chinook in Puget Sound are declining and half are increasing in abundance (BRT 2003). The long-term population growth rates indicate that most populations are just replacing themselves.

Historically, 31 quasi-independent populations of chinook comprised the Puget Sound ESU. Recently, the Puget Sound Technical Recovery Team (PSTRT), an independent scientific body convened by NOAA Fisheries to develop technical criteria and guidance for salmon delisting in Puget Sound, identified 22 geographically distinct populations of chinook salmon remaining in the Puget Sound ESU, including the Cedar River population (PSTRT 2001, 2002; BRT 2003). The spawning aggregations presumed to be extirpated were mostly the early-returning chinook (spring-type chinook), and most of these fish returned to the mid to southern parts of Puget Sound, Hood Canal and the Strait of Juan de Fuca. The remaining 22 population designations are preliminary and may be revised based on additional information or findings of the PSTRT. Through the recovery planning process NOAA Fisheries will define how many and which naturally spawning populations of chinook salmon are necessary for the recovery of the ESU as a whole (McElhany *et al.* 2000).

The PSTRT has determined that chinook in the north Lake Washington tributaries and the Cedar River as distinct from chinook in other Puget Sound streams and from each other (NMFS 2001). Analysis of genetic data has shown that the Cedar River chinook population is genetically divergent from the North Lake Washington population, and that chinook salmon sampled from Bear Creek and Issaquah Creek are genetically similar to each other (Marshall 2000).

2.1.2.1 Status of the Species in the Action Area

The 2003 Comprehensive Resource Chinook Management Plan categorizes Lake Washington chinook (North Lake Washington Tributary population) as a Category 2 population (NMFS 2003). Category 2 designations include areas where indigenous populations may no longer exist, but where sustainable populations existed historically (NMFS 2003). Category 2 populations typically occur in watersheds where the habitat has been significantly degraded. In many of these systems, such as Issaquah Creek, hatchery and natural fish are currently inseparable on the spawning grounds. The level of natural spawning in these streams may largely reflect production and escapement of hatchery origin fish. The objective for Category 2 populations is to use the most locally-adapted population to reestablish naturally-sustainable populations. The co-managers' goal of harvest management is to provide sufficient escapement to the spawning grounds to increase natural productivity (NMFS 2003).

The North Lake Washington population includes tributaries to the Sammamish River, including Bear Creek and Issaquah Creek (Seiler *et al.* 2003). Chinook spawn naturally in Issaquah Creek and the East Fork Issaquah Creek. These juveniles migrate with hatchery produced juveniles and other juveniles produced from North Lake Washington tributaries (e.g. Bear Creek) to Puget Sound. The naturally spawned chinook that travel through Lake Sammamish include progeny of hatchery salmon that strayed to the spawning grounds. Naturally reproduced juveniles migrating from Issaquah Creek and the East Fork Issaquah Creek (hereafter referred to as Lake Washington chinook) and returning spawners are the population of special concern in this consultation.

In contrast to chinook production from the Cedar River and Bear Creek, nearly all of the naturally produced chinook originating from Issaquah Creek are thought to be from progeny of hatchery adults (Seiler *et al.* 2003). Issaquah Hatchery has been releasing chinook salmon since 1937 and currently releases nearly two million age zero plus chinook each year during the end of May and early June (John Kugen, fish hatchery specialist, Issaquah Hatchery, pers. comm., July 10, 2003). Consequently, more chinook spawners return to Issaquah Creek than to either the Cedar River or Bear Creek. In 2002 the Issaquah Hatchery allowed more than 3,180 chinook spawners upstream of the hatchery to spawn naturally in the stream (Larry Klub, manager, Issaquah Hatchery, pers. comm., October 28, 2002). From March 15, 2000 to July 3, 2000, wild chinook production in Issaquah Creek was estimated at 30,000 juveniles (Seiler *et al.* 2003) with actual juvenile production higher. Chinook fry are thought to leave Issaquah Creek and enter Lake Sammamish in January similar in timing to fry migration from the Cedar River into Lake Washington (Dave Seiler, fisheries biologist, WDFW, pers. comm., July 10, 2003).

Chinook smolts migrate and rear in Lake Sammamish from five days to a month or more and may residualize in Lake Sammamish (Hans Berge, fisheries biologist, pers. comm., July 9, 2003). Berge observed hatchery and wild chinook enter Lake Sammamish and distribute themselves along the shoreline (the littoral zone) and in the top 10 feet of the water column (in the pelagic zone) at the mouth of Issaquah Creek on May 29, 2003 through May 31, 2003. The Issaquah Hatchery released chinook at this time but Berge observed 10-15% of the juvenile chinook had adipose fins in tact and were smaller in size, both signs that they were not hatchery chinook.

Predators, including yellow perch (Brian Footen, fisheries biologist, MIT, pers.comm., July 14, 2003), cutthroat trout and various species of mergansers, cormorants and seagulls apparently move to the south end of the lake when the hatchery fish are released, to feed on the abundant food source, (Dan Estelle, WDFW, pers. comm., July 10, 2003). Naturally produced chinook may derive some benefit against predation by being obscured in large numbers of hatchery released salmon, when migrating during late May and June.

In summary, naturally produced chinook migrate from Issaquah Creek to Lake Sammamish from January through July, where they use the shoreline for rearing before migrating to Lake Washington and Puget Sound.

2.1.3 Environmental Baseline

The environmental baseline is the current set of conditions to which the effects of the proposed action will be added. The term "environmental baseline" means "the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process" (50 CFR 402.02).

Since settlers arrived in the Sammamish River Valley, the system's hydrology, floodplain, and aquatic and terrestrial habitats have changed significantly (Tetra Tech 2002). Bowers noted that "development of the shoreline of Lake Sammamish has reduced the once abundant overhanging vegetation and woody debris." Trees along the shore of Lake Sammamish were so dense that when water levels were high "it [was] difficult to walk any distance along the shore without swinging from one bough of a tree to another" (Bowers 1898). The heaviest logging activity occurred from the 1880s through about 1900.

The Sammamish River begins at the north end of Lake Sammamish and connects Lake Sammamish to Lake Washington. In 1916, construction of the Hiram M. Chittenden Locks changed the hydrology of Lake Sammamish lowering the elevation of the lake surface by six feet and drying up the wetland complex that formed the Sammamish River corridor. Sometime before 1950 the Sammamish River was dredged for navigation purposes (Ajwani 1956). In 1964 major alteration to the river channel was completed to reduce flooding; it included additional straightening, channelization, and dredging (Tetra Tech 2002). The Sammamish River has lost approximately 16 river miles of length, most off-channel rearing habitat, its floodplain, and most of its riparian vegetation (Tetra Tech 2002). As water temperatures rise during the summer the river is a substantial thermal migration-barrier to adult spawners (Kahler 2000).

Lake Sammamish is like a fjord with a long uniform trough and steeply sloping sides but is not as deep as most fjord lakes. Lake Sammamish is approximately 8 miles long and 1.2 miles wide with a surface area of 4,897 acres, a maximum depth of 105 feet and a mean depth of 58 feet (KC 2003). Bottom substrates are composed primarily of gravel and cobble (Pflug 1981). The southern and northern ends of the lake have shallow slopes, silt and sand substrates with dense growths of aquatic vegetation (Pflug 1981). Lake Sammamish thermally stratifies from late May to mid-November when conditions for salmonids in some parts of the lake can be lethal. During 1998, in early August, the surface temperature rose to 24.3 degrees Centigrade. During the fall, dissolved oxygen levels dropped precipitously so that by early November dissolved oxygen was less than 1 milligram per liter at depths greater than 45 feet (Beauchamp *et al.* 2002).

Although non-point source phosphorus entering the lake from run-off had increased from about 13 micrograms per liter in 1978 to 22 micrograms per liter in 1996 (KC 2002) recent monitoring data has shown a decline in total phosphorus concentrations in the lake. (Kerwin 2001). Alkalinity and pH levels have increased over this period, too. Contamination of the lake from pesticides, and metals from non-point run-off and stormwater is also a concern. In select areas, Lake Sammamish contains elevated concentrations of sediment-associated contaminants, although sediment quality is generally good (Kerwin 2001).

Issaquah Creek is the major tributary to the lake, entering at the south end and contributing approximately 70% of the surface flow. Tibbetts Creek on the southeast end of the lake and Pine Lake Creek entering on the central east side of the lake contribute about six percent and three percent respectively. Surface water discharge from Lake Sammamish is through the Sammamish River at the north end of the lake. A low flow control weir at Marymoor Park controls the discharge to the Sammamish River, to prevent the lake from draining too low in the summer (Tetra Tech 2002). Thus, the water elevation of Lake Sammamish is artificially maintained, although to a lesser extent than Lake Washington's hydrology. The high and low water levels follow a natural regime in Lake Sammamish (high water lake levels during the winter and low water levels during the summer and early fall), however, the weir may be a passage barrier for adult salmonids into Lake Sammamish during the fall migration time when flows are typically low (Kerwin 2001).

The COE determined the OHW elevation of Lake Sammamish to be 27.0 feet, although water levels commonly reach much higher elevations. According to USGS data collected over the past 35 years, the elevation of higher water events appears to be closer to 28 to 29 feet. This discrepancy affects how piers in the lake have been constructed, in turn affecting fish habitat. Many piers are submerged during the rainy season because setbacks for construction are measured from the designated OHW of 27.0 feet. Reliance on the lower OHW elevation allows development to occur much closer to the water and results in construction of bulkheads to protect homes from wave action, and a reduction in the riparian area next to the shoreline. The shoreline riparian area that supports ecological structure and processes important for sustaining fish habitat is reduced.

The lake is surrounded primarily by suburban homes and large landscaped yards (Kerwin 2001). While the full amount of bulkhead and pier construction on the entire lake is unknown, many Lake Sammamish residences have piers and bulkheads or retaining walls. A general survey of the shoreline from the proposed project to the south end of Weber Point revealed a total of

13 piers along a half mile of shoreline, or one pier every 200 feet.

Non-native species are changing the density and diversity of plants in and around Lake Sammamish. Eurasian water milfoil (*Myriophyllum spicatum*), an invasive aquatic plant, has replaced native vegetation in many areas of the lake (Kerwin 2001) and annual periods of plant die-off and decay can reduce dissolved oxygen levels below the minimum requirement for salmonids (Frodge *et al.*1995). At the north end of the lake the non-native fragrant water lily (*Nymphaea odorata*) is found in large expanses. Excessive non-native macrophyte growth may decrease available littoral habitat for some aquatic species like juvenile chinook that are shoreline dependent. Macrophytes may also provide a refuge for predators such as largemouth bass (*Micropterus salmoides*). Non-native fish in Lake Sammamish include eastern brook trout (*Salvelinus fontinalis*), largemouth and smallmouth bass (*Micropterus dolomieui*), yellow perch (*Perca flavescens*), lake trout (*Salvelinus namaycush*), brown bullhead (*Ictalurus nebulosus*), black crappie (*Pomoxis nigromaculatus*), and pumpkinseed sunfish (*Lepomis gibbosus*) (Ajwani 1956, Beauchamp *et al.* 2002). The loss and alteration of littoral habitat and introduction of non-native species has produced an overall change in species composition, and shifts the dynamics of fish predation (Kerwin 2001).

2.1.3.1 Factors Affecting Species in the Action Area

Probable causes of decline for chinook abundance in Lake Sammamish include changes in fish species composition, predation, degraded riparian habitats and water quality (Overman 2002). Changes in sediment quality, sediment transport, macrophyte conditions, and introduction of exotic plants may also contribute to the decline. Additional habitat impacts in the action area are loss of large woody debris (LWD) and blockage or passage problems associated with dams or other structures (March 9, 1998, 64 FR. 11494). Land use activities associated with urban development have substantially altered quantity and quality of fish habitat (Myers *et al.* 1998). Impacts associated with urban development include elimination of rearing habitat, removal of vegetation, and elimination of LWD recruitment (Myers *et al.* 1998).

2.1.4 Relevance of Baseline to Status of the Species

When the listed species are present in the action area, their biological requirements are not being met by the baseline conditions. The factors for decline that contributed to the need for listing the ESU continue to be present in the action area as baseline conditions. The long-term declines in distribution and abundance of chinook are attributed in part to significant structural and hydrologic changes from historical conditions: water withdrawals and impoundments, urbanization, habitat degradation, and habitat accessibility, both in the action area and throughout the watershed.

To improve the status of Puget Sound chinook and increase the likelihood of survival and recovery, improvements over current conditions in both the quality and quantity of the species' habitat are needed to support chinook migration and rearing activities (increasing survival) throughout the species' range, including in the action area.

Restoring functional conditions along the shoreline would allow the natural processes that enable habitat formation and water quality maintenance, both of which are necessary to sustain fish. Specifically, riparian vegetation, in-water vegetation, and woody debris need to be re-established in and around the shoreline. Additionally, because armoring of the shoreline changes shoreline gradients and sediment supplies to the lake (decreasing the amount of shallow water habitat and appropriately sized substrate), a reduction in structural armoring is necessary to re-establish the shoreline conditions that juvenile salmon prefer. Moreover, care must be taken to avoid improving habitat for non-native species that inhabit the lake, which can compete with juvenile salmon for food, or prey upon juvenile chinook as they rear in and migrate through the lake.

2.2 Effects of the Proposed Action

The ESA implementing regulations define the "effects of the action" as "the direct and indirect effects of an action on threatened or endangered species or habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 CFR 402.02). These effects, when added to the effects on listed species from the baseline condition, and cumulative effects, are analyzed to determine whether or not a project will jeopardize the continued existence of a listed species.

2.2.1 Direct Effects

Direct effects are the immediate effects of the project on the species or its habitat. Direct effects result from the agency action and include the effects of interrelated actions and interdependent actions. Future Federal actions that are not a direct effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated as they would be the subject of future consultation under ESA section 7.

Direct effects of new piers and enlarged piers include increased shade (from the pier and the moored boats) and structure in the nearshore area, shoreline modification where the pier is connected to land, water quality impacts, and pile-driving noise.

2.2.1.1 Shade and Structure

The effects on juvenile chinook of shade and structure produced by piers and floats in Lake Sammamish are not well understood, but some recent observations have been made of chinook behavior around piers. Tabor and Piaskowski (2001) reported chinook fry utilize overwater structure during the day, but that larger juvenile chinook avoided over-water structure at night and during the day. In Lake Washington during June 2003, schools of migrating chinook moved offshore from shallow to deeper water before swimming under a solid dock (Roger Tabor, USFWS, personal communication, October 8, 2003). The change in orientation is probably stimulated by the change in light level below the dock.

Although Bethune's new pier and Wanta's enlarged pier will both add new structure and shade to the littoral area, the applicants have minimized in-water structure by bridging the nearshore and designing the pier with small steel pilings that are spaced far apart. Both proposals have sections where the pier width has not been minimized, and the top surface of both piers is low to the water (proposed for 28 inches above the OHW (COE Datum)) and thus both piers block light transmission under the pier. The stringers and optional fascia can reduce the actual height off the water to 12 inches, further limiting under-pier light transmission. Bethune and Wanta will also moor boats at their piers, producing additional, unbroken shade. Wanta also proposes to install a canopy over one of the boatlifts.

The canopy, piers, and subsequent boat moorage will create shade and structure that may be favorable for predators, and that migrating salmon may avoid. Because structure and shade may cause migrating juvenile chinook to move offshore, it functionally reduces the shallow nearshore area available for rearing. Because juvenile salmonids prefer shallow nearshore areas, the installation of the piers may be detrimental for chinook.

Bethune and Wanta propose to install prisms (each prism is 18 square inches) in the surface of their piers to allow light transmission through the pier (EcoPacific 2002a; EcoPacific 2002b). A common misconception from a study conducted on prisms (Schefsky 1998) is that prisms create light under the pier. In fact, prisms actually absorb light and pass only 58%, or about half, of the incident light that reaches their surface (Richard J. Schefsky, engineer, Northwest Laboratories of Seattle, Inc., pers. comm., October 9, 2002). Pier surfaces would pass almost twice as much light if the space were left open rather than filled by a prism. The proposal for Bethune and Wanta piers are to include 11 and 19 prisms, respectively. This number of prisms does not significantly improve light transmittance under their piers, as compared to solid decking. Preliminary studies by NOAA Fisheries indicate that piers with at least 50% open space transmit significantly more (an order of magnitude) photosynthetically active radiation (PAR) than prisms (Perry Gayaldo, biologist, NOAA Fisheries, pers. comm., June 20, 2003).

Besides only transmitting about half the light that would come through an equivalent open space, prisms direct the light to discrete spots rather than allow the light to pass directly through the space to the water below. If care is not taken during installation, support beams immediately under the pier will block the transmitted light from even reaching the water because of this directional focus. Portions of the prisms hanging below the pier surface will be splashed with water and covered with spider webs that further block light transmittance. On the surface of the pier, prisms can also be easily covered over by kayaks, storage chests, towels and other equipment. In a study of different lighting designs under ferry piers in Puget Sound, prisms were found to pass the least amount of light when compared with glass blocks, grating and the other light transmitting designs (Blanton *et al.* 2002).

NOAA Fisheries knows of no research that focuses on determining what level of light is a barrier or causes changes to juvenile migration behavior in Lake Sammamish, but it is known that the physical design (e.g., pier height and width, pier orientation, construction design materials, piling type and number) will influence whether the shadow cast on the near-shore covers a sufficient area and scope of darkness to constitute a barrier (Blanton, *et al*. 2002). Pier avoidance might expose juveniles to greater risk from predation as chinook travel in deeper water around piers. Based upon the foregoing information, NOAA Fisheries reasons that the proposed piers with prisms will substantially shade the water and substrate below, to the detriment of juvenile chinook salmon.

2.2.1.2 Shoreline Modification

Conditions will change slightly where the piers contact the upland. The proposed piers will alter the shoreline for a 4-foot width on each property and preclude the vegetation in this location. Each project will provide shrubs and small trees as enhancements along the shorelines of Bethune's and Wanta's properties, and along Vasa Creek. Improved riparian conditions will provide leaf litter and insect matter along the lake shore, and eventually woody debris, restoring natural ecological functions (Christensen *et al*. 1996).

2.2.1.3 Water Quality

The pier and float construction and presence each may slightly degrade water quality. Installing the pier will mobilize sediments in the water column, temporarily increasing turbidity levels in the immediate vicinity (several feet) of the construction activities. The level of turbidity is likely exceed the natural background levels, however this condition will be short-lived with low potential to harm chinook. As the spatial scale of the pier installation will be small, and restrictions on piling spacing limits the overall number of pilings, the area in which salmon might be exposed to turbid conditions from construction is minimized. Moreover, installation will occur when listed species are least likely to be present near the project site, reducing the likelihood of their exposure to turbid conditions.

While 4-inch diameter steel is proposed for pilings, ACZA (ammoniacal copper zinc arsenate) wood will be used for the structure of the piers. No other treated wood components have been proposed for use in either pier. The use of treated wood in the piers and ramps may release minor levels of contaminants into the water column via rainwater that falls on the structure and drains directly into Lake Sammamish. This contributes an undetermined level of contamination. Leaching rates of contaminants from treated wood is highly variable and depends on many factors (Posten 2001). As salmon rear near or migrate past treated wood structures they are exposed directly, though arguably at low levels, to the contaminants. (Posten 2001). The effects on fish in Lake Sammamish specifically, from water and sediment contamination originating from treated wood use, are unknown, but some degradation of the existing baseline may occur through the addition of these treated wood structures.

2.2.1.4 Pile-Driving Noise

Pile driving, especially with a drop-hammer, typically causes temporary, intense under-water noise. Drop-hammers produce sharp spikes of sound that can easily reach levels that harm fish. The extent to which the noise will disturb fishes is related to the distance from the sound source, size of hammer and pilings, and affected species, as well as the duration and intensity of the pile-driving operation. The noise caused by drop-hammer pile-driving is likely to elicit a startle response from chinook near the sound source. After the initial strikes, the startle response wanes and the fish may remain within the field of a potentially-harmful sound (Dolat 1997; NMFS 2002). Salmonids may be physically harmed by peak sound pressure levels that exceed 180 dB (re: 1 micropascal); behavior may be disrupted when sound pressure levels exceed 150 dB (re: 1 micropascal) (NMFS 2002).

For constructing Bethune and Wanta piers, the applicants have proposed drop-hammer pile driving, but the pile driving will occur over a short time period (two days) during the COE/NOAA Fisheries/USFWS designated work window, when listed species are least likely to be present near the project site. This reduces the number of fish that are likely to be exposed to pile-driving noise. Because pile driving 4-inch piles diameter will not produce high intensity sound, the noise produced during is unlikely to injure the fish that may be present .

2.2.2 Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by

the
action. Indirect effects might include other Federal actions that have not undergone section 7 consultation but will result from the action under consideration. These actions must be reasonably certain to occur, or be a logical extension of the proposed action (50 CFR 402.02).

Indirect effects from the proposals include increased predation opportunity and altered aquatic vegetation conditions from increased shade in the nearshore, and indirect exposure to contaminants (when salmonids ingest other organisms that have been exposed to the contaminants), and water quality impacts from increased boat use in the action area.

2.2.2.1 Predation

Predation occurs throughout the life cycle of salmonids and is an important mortality agent. Many interdependent factors affect the magnitude of predation mortality, including the characteristics of prey and predators, and the characteristics of habitat. Piscivorous fish are generally considered to be the most important predators of juvenile salmon (Healey 1991). Lake Sammamish has a diverse and abundant piscivorous community including cutthroat trout (*Oncorhynchus clarki clarki*), and the non-native yellow perch and smallmouth bass. During the spring, juvenile chinook composed 25% of the wet weight diet of yellow perch. In late May, over 50% of perch, cutthroat, and smallmouth bass diets are chinook and unidentified smolts (Footen and Tabor 2003).

The spatial and temporal overlap between bass and chinook in the nearshore creates a risk of predation on juvenile chinook. Numerous predators are assumed to be present in the project locations; the piers are proposed in an area where listed salmonids migrate and rear, and where largemouth bass and smallmouth bass are also found. Pflug (1981) categorizes the west side of Lake Sammamish, where Wanta's and Bethune's proposed piers will be located, as suitable for both species of bass. Bethune's proposed pier will be located where moderate numbers of smallmouth bass nest sites have been identified (Pflug 1981). Wanta's proposed pier is located on the north side of the delta of Vasa Creek. Tabor *et al*. (2002) found twice as many chinook salmon at tributary delta sites in Lake Washington as compared to the lake reference site. Because juvenile chinook feeding occurs at the mouths of streams where large numbers of chironomid pupae are found (Koehler *et al.* 2000), significant numbers of juvenile chinook may use the area where Wanta's pier will be located.

Peak spawning for both largemouth and smallmouth bass occurs in May and June. At this time of year juvenile salmonids are also rearing and migrating in the littoral areas. Of the anadromous salmonids that use the littoral zone, juvenile chinook are most at risk to bass predation (Fresh *et al.* 2001). Chinook are vulnerable to predation because the timing of bass migration into the littoral area of the lake coincides with the peak occurrence of juvenile chinook salmon in this habitat (Fresh *et al.* 2001). Also, the preferred pattern of outmigrating salmonids in Lake Sammamish appears to be isolated to the littoral areas of the entire lake (Pflug 1981). Pflug found that during May, both bass species showed a strong preference for salmonid smolts during his study (Pflug 1981). Overman (2002) found juvenile salmon to be especially important food sources for both bass species in Lake Sammamish during periods of salmon outmigration (Overman 2002). Although both smallmouth and largemouth consumed similar food items, including insects, crayfish and prey fish, salmonids comprised a higher percentage of largemouth bass diets (Overman 2002).

The new in-water structure and shade provide cover for predator fish such as smallmouth bass, potentially increasing this risk of predation on juvenile salmon. This is in part because light plays an important role in predation. Largemouth and smallmouth bass are both ambush predators, which lie in-wait, then dart out at the prey in an explosive rush (Gerking 1994). Prey species are better able to see predators under high light intensity, thus more light provides prey species a relative advantage (Hobson 1979). Petersen and Gadomski (1994) found conversely, that predator success was higher at lower light intensities. Howick and O'Brien (1983) found that in high light intensities, prey species (bluegill) can locate largemouth bass before they are seen by the largemouth bass; in low light intensities, the largemouth bass can locate the prey before they are detected by the prey. Walters *et al.* (1991) found that high light intensities may result in predators' increased use of shade producing structures, and predation studies have suggested that predation is a likely impact from these structures (Helfman 1979).

Largemouth bass inhabit vegetated areas, open water, and areas with cover such as piers and submerged trees (Mesing and Wicker 1986). Colle *et al.* (1989) found in lakes lacking vegetation, that largemouth bass preferred habitat associated with piers. Wanjala *et al.* (1986) found that adult largemouth bass in a lake were generally found near submerged structures suitable for ambush feeding. As described above, over-water structures such as piers create a light/dark interface that allows ambush predators to remain in the darkened area (barely visible to prey) and watch for prey to swim by against a bright background (high visibility). Prey species moving around structure are unable to see predators in the dark area under the structure and are more susceptible to predation. In his study of largemouth bass in Lake Washington, Stein (1970) frequently found largemouth bass under piers. NOAA Fisheries is not aware of any studies which have been done to specifically determine impacts of freshwater pier structures on salmon, but salmon stocks with already low abundance are susceptible to further depression by predation (Larkin 1979).

Depth and substrate at the project sites appear conducive to use by both rearing and migrating salmonids, and nesting and feeding bass. Substrate at both sites is composed of sand and gravel. Cobbles were present in the substrate at the Bethune site (EcoPacific 2002a) whereas the Wanta site substrate included silt, deposited from Vasa Creek (EcoPacific 2002b). The end of the Bethune pier is located in water 9 feet deep and the end of the Wanta pier is located over a steep slope ranging between 7-14 feet deep. A band of Eurasian water milfoil (*Myriophyllum spicatum*) is present between 5-10 feet deep at both sites. The addition of pilings (although minimized in diameter) in the lake and the terminal pier platforms of both piers which are not minimized in size, will likely provide some additional cover/hiding refuge for predators and some additional level of shading which modifies habitat to favor non-native predators.

Both the Wanta and Bethune project proposals include the addition of accent/scour or wavebreak rocks and emergent vegetation below the 27.0 foot OHW (COE Datum) elevation. Pflug (1981) states that smallmouth bass spawning areas typically consist of gravel and cobble and are associated with benthic structure such as the base of an isolated boulder or dock-piling. Nest depths ranged from between 2 and 12 feet although most nests were in 5-7 feet of water. Largemouth bass require the presence of aquatic vegetation to spawn and their nests were located in depths ranging between 2 and 5 feet. Because the actual water elevation is a couple of feet higher than the 27.0 OHW (COE Datum) the addition of rock could facilitate largemouth bass spawning at the sites. The Bethune proposal includes the removal of old rails from the near shore which will remove existing structure for potential bass spawning from this site.

While the relative roles and extent that additional in- and over-water structure and reduced light play in benefitting predaceous fish is unknown, NOAA Fisheries finds that the scientific literature and recent studies regarding predator/prey behavior indicate the addition of in/over-water structures such as piers increases predator success under certain conditions. We believe those conditions exist at the site of the proposed piers. First, bass and yellow perch are ambush predators that might have a predatory advantage from the presence of in/overwater structures. Second, Puget Sound chinook are found all around the lake, and are the appropriate size for these predators. Third, juvenile chinook and bass presence in the nearshore area overlap temporally and spatially. Much of the bass and yellow perch predation on salmonids in the Lake Washington system corresponds with the out-migration of smolts in the spring and summer (Kahler *et al.* 2000).

The proposed Bethune and Wanta piers will add approximately 1,100 square-feet of over-water coverage and 21 new pilings. The additional structure and shade from the proposals will change habitat to favor non-native predators. Though the bridged nearshore design and the use of small diameter pilings spaced 18-feet apart is expected to minimize benefits to structure-dependent predaceous fish, the piers will shade the nearshore area and modify existing open water habitat. Although the proposed design minimizes the potential impact on wild chinook to some extent, NOAA Fisheries does expect habitat to be degraded for chinook by the proposed structures, particularly the Wanta pier, due to its proximity to preferred habitat for juvenile chinook.

2.2.2.2 Littoral Productivity

The pier and float will also have general effects to littoral productivity. Shading can cause loss of submerged aquatic vegetation, alteration of habitat used by juvenile salmon, potential loss of salmon prey resources, and potential interruption of fish migratory patterns (Pentilla and Doty 1990; Simenstad *et al.* 1999). While the shade from the structures may reduce the growth of non-native aquatic macrophytes, such as Eurasian water milfoil and white pond lily, it will also reduce growth of native macrophytes, algae, and phytoplankton. At a minimum, shade from the pier and float might affect the overall productivity of littoral environments (White 1975; Kahler *et al.* 2000) and to an uncertain degree, affect listed chinook through changes in productivity and trophic interactions.

2.2.2.3 Boating Activity

The proposed piers will enable increased boating activity in the lake. Bethune and Wanta will be mooring boats at their piers that may increase boating activity in the lake. Boating activity can have several impacts on listed salmonids and aquatic habitat. Engine noise, propellor wash (previously discussed), and the physical structure of boat hulls may disturb or displace nearby fishes (Mueller 1980; Warrington 1999a). Boat traffic can cause: (1) increased turbidity in shallow waters; (2) uprooting of native aquatic macrophytes in shallow waters; (3) shoreline erosion (Warrington 1999b); and (4) aquatic pollution (through exhaust, fuel spills, or release of petroleum lubricants). These boating impacts indirectly affect listed fish in a number of ways, though the degree of these effects is highly variable through time, and unquantifiable.

Turbidity may injure or stress affected fishes by clogging their gills with fine particles. Uprooting of aquatic macrophytes can reduce available refuge for juveniles in shallow water, as well as reduce the prey base that depends on the macrophytic vegetation. Increased wave action could displace juveniles from feeding along the shoreline, and increase shoreline erosion, steepening the shore and deepening the water, allowing predators easier access to juvenile salmonids.

Pollution may also affect fish by impacting potential prey species or aquatic vegetation. Two-cycle outboard motors will discharge oil and gasoline, degrading water quality in the action area. Polycyclic aromatic hydrocarbons (PAHs) are commonly released from petroleum based contaminants used in outboard motors such as fuel, oil, and some petroleum-based hydraulic fluids. While PAHs at high levels of exposure, can cause lethal as well as acute and chronic sublethal effects to aquatic organisms (Neff 1985), and may cause a variety of harmful effects (cancer, reproductive anomalies, immune dysfunction, and growth and development impairment) to exposed fish (Johnson 2000; Johnson *et al.* 1999; Stehr *et al.* 2000), boating activities at this structure are not expected to consistently create PAH exposure at levels that could produce these results.

2.3 Cumulative Effects

Cumulative effects are defined as "those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation" (50 CFR 402.02). Future Federal actions that are unrelated to the proposed actions are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

While continuing shoreline development within the range of the ESU will contribute additional effects to Puget Sound chinook habitat, such as changes to: (1) shoreline vegetation and riparian structure; (2) substrate composition; (3) structural complexity; (4) habitat access; and (5) non-native species abundance and composition, within the action area for this project, NOAA Fisheries does not expect extensive riparian buffer degradation. Within the action area all of the land is either currently developed for residential or commercial purposes, or is publicly owned and used as park land.

2.4 Conclusion

NOAA Fisheries concludes that the effects of the proposed actions, considered together with effects from the baseline and cumulative effects, are not likely to jeopardize the continued existence of Puget Sound chinook. NOAA Fisheries bases its conclusion on the fact that, while the construction and installation of the proposed piers will degrade some baseline habitat functions locally, it will not appreciably further reduce the function of the already impaired habitat, or retard the long-term progress of impaired habitat towards PFC at the ESU scale. The non-jeopardy determination is based on the applicant's use of design criteria incorporating the following features: (1) first 30 feet of nearshore is bridged without pilings; (2) the number of small diameter steel pilings is limited to minimize added structure.

Project components that improve habitat conditions for listed chinook are: (1) vegetative riparian improvements; and (2) the removal of existing boat rails and debris that might function as habitat for predators in the proposed action area.

Because the elements of the project that will harm fish are minimized, other components of the proposed project will incrementally improve riparian vegetation, it is uncertain if and the ultimate effect of adding shade and structure will foster increased predator use in this location, or improve conditions by shading out the extensive amount of invasive aquatics. NOAA Fisheries concludes that the proposed project, in total, will minimize damage to the habitat conditions required for the survival of the Lake Sammamish wild chinook population.

2.5 Reinitiation of Consultation

As provided in 50 CFR 402.16, where discretionary Federal agency involvement or control over the action has been retained by the action agency (or is authorized by law), consultation must be reinitiated if: the amount or extent of incidental take is exceeded; new information reveals effects of the agency action that may affect listed species in a manner or to an extent not considered in this Opinion; the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The applicants, by carrying out the action as described, will add approximately 1,100 square feet of over-water structure and 12.4 cubic feet of in-water piling structure (not including the boat lifts), and will enhance approximately 1,700 square feet of riparian habitat along the lakeshore and Vasa Creek. If the extent of construction should exceed these limits, or the enhancement of the shoreline is not fully implemented, effects not previously considered would result, work must stop, and the COE must reinitiate consultation.

2.6 Incidental Take Statement

Section 9 of the ESA prohibits the take of endangered species. Section 4 extends the prohibition to threatened species through regulation (see 50 CFR 223.203). “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 U.S.C.1532 (19)). “Harm” is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). “Harass” is defined as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3).

“Incidental take” is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. An incidental take statement provided under ESA section 7(b)(4), specifies the impact of any incidental taking of endangered or threatened species, provides reasonable and prudent measures (RPMs) that are necessary to minimize such impact, and sets forth terms and conditions with which the action agency or the applicant must comply in order to implement the reasonable and prudent measures. Section 7(o)(2) of the ESA states that take that is in compliance with the terms and conditions specified in an incidental take statement is not considered prohibited take.

2.6.1 Amount or Extent of the Take

Listed chinook use the action area for migration and rearing activities, and scientists recognize that some juveniles residualize in Lake Sammamish. Because listed chinook are present at all times of the year, these listed fish are reasonably likely to encounter either effects from the construction, the effects of permanent alteration in their habitat, or both. Therefore, despite measures included in the proposed action to reduce take, take is nevertheless reasonably likely to occur.

Because fish presence depends on a variety of fluctuating factors, such as age, size, prey availability, etc., NOAA Fisheries cannot estimate the number of fish that would be present in the action area or the project site either during construction or in subsequent years, despite the use of the best scientific and commercial data available. Therefore NOAA Fisheries cannot estimate the number of chinook that may be taken as a consequence of this project. NOAA Fisheries expects take of listed chinook will be in the form of harm caused by detrimental habitat modifications resulting from the installation and presence of the piers. The extent of take is that number of fish that would be harmed by following extent of habitat modification anticipated in this biological opinion: approximately 1100 square feet of over-water structure and 12.4 cubic feet of in-water piling structure.

2.6.2 Reasonable and Prudent Measures

The RPMs to minimize the impact of take from the proposed projects are described below. The RPMs are non-discretionary; for the exemption in Section 7(o)(2) to apply, the COE, the applicant, or both, must implement them by carrying out the terms and conditions described in the following subsection. The COE has a continuing duty to regulate the activity covered in this incidental take statement. If the COE fails to retain the oversight to ensure compliance with the terms and conditions, the protective coverage of section 7(o)(2) may lapse.

NOAA Fisheries believes the following RPMs are necessary and appropriate to minimize take of chinook.

1. The COE shall avoid and minimize incidental take from the effects of shade and structure;

2. The COE shall avoid and minimize incidental take from degraded water quality; and

3. The COE shall ensure access to the piers by NOAA Fisheries for monitoring purposes.

2.6.3 Terms and Conditions

To comply with ESA section 7 and be exempt from the prohibitions of ESA section 9, the COE, its applicant, or both, must comply with the Terms and Conditions that implement the Reasonable and Prudent Measures. These terms and conditions are nondiscretionary. They shall be integrated into the project design and construction activities to ensure that they are implemented:

1. To implement RPM No. 1, the COE shall reduce extent and quality of aquatic predator (shade) habitat by further reducing the size of the overwater structures, substantively improving the amount of light that is transmitted under the pier and avoiding the placement of rocks in shallow water by the following:

   a. walkway widths to the terminal ell shall be no wider that 4 feet;

   b. terminal ells shall be no wider than 6 feet and no longer than 24 feet (including the walkway width);

   c. piers shall provide 60% light transmission under the pier for all walkways and finger piers with the exception of the terminal ell;

   d. canopies for boat covers shall allow a minimum of 70% light transmission;

   e. optional fascia shall not be installed below the top of the piling caps;

   f. and accent/scour/wave protection rocks shall not be placed lower that 27.0 feet OHW (COE Datum) elevation.

2. To implement RPM No. 2, the COE shall minimize lake contamination by allowing only the use of ACZA treated wood (or less toxic materials).

3. To implement RPM No. 3, the COE shall ensure that the applicant provide NOAA Fisheries with access to the pier for the purposes of gathering data on fish use and light transmission through the pier.

2.7 Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out programs for the conservation of endangered and threatened species. The conservation recommendations provided here are discretionary agency activities to designed to minimize or avoid adverse effects of agency actions on listed species, or critical habitat where applicable, to help implement recovery plans, or to develop additional information.

NOAA Fisheries encourages the COE to evaluate the effectiveness for juvenile chinook of the removal of non-native vegetation associated with COE permitted projects. Further, NOAA Fisheries encourages the COE to explore the use of its permit authorities in a manner that improves salmonid habitat and ecosystem function in the action area to compensate for habitat impacts associated with piers and boating activity. Lastly, NOAA Fisheries encourages the use of four-stroke engines in boating to reduce pollution risk.

NOAA Fisheries requests notification should any of these conservation recommendations be implemented, so that additional actions minimizing or avoiding adverse effects of the project or benefitting listed species or their habitats can be recorded.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The MSA established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (section 305(b)(2));

- NOAA Fisheries must provide conservation recommendations for any Federal or State action that would adversely affect EFH (section 305(b)(4)(A));

- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (section 305(b)(4)(B)).

Essential Fish Habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA section 3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Essential Fish Habitat consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

3.2 Identification of Essential Fish Habitat

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*), and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (*i.e.* natural waterfalls in existence for several hundred years) (PFMC 1999). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999; see: http://www.pcouncil.org/salmon/salother/a14.html). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

3.3 Proposed Actions

The proposed action and action area are detailed above in section 1.2 and 1.3 of this document. The action area includes habitats that have been designated as EFH for various life-history stages of chinook and coho salmon.

3.4 Effects of Proposed Action

As described in detail in section 2.2 of the Opinion, the proposed action may result in short- and long-term adverse effects to a variety of habitat parameters. These adverse effects are:

1. Habitat modification detrimental for salmonids.

2. Decrease in water quality from pier construction and boat operations.

3. Increased non-native predation on juvenile chinook.

3.5 Conclusion

NOAA Fisheries concludes that the proposed action may adversely affect designated EFH for chinook and coho salmon.

3.6 Essential Fish Habitat Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions that would adversely affect EFH. While NOAA Fisheries understands that the conservation measures described in the BA will be implemented by the COE, it does not believe that these measures are sufficient to address the adverse impacts to EFH described above. To minimize the remaining adverse and aggregate effects to designated EFH for Pacific salmon (shade, structure, water quality), NOAA Fisheries urges that the COE implement the following recommendations:

1. To minimize the adverse effect of modifying habitat the COE should ensure that walkways be no wider than 4 feet, that ells be no wider than 6 feet and no longer than 24 feet (including the walkway width), that the pier surface allow a minimum of 60% open space, no optional fascia be installed, accent/scour rocks be installed at the 27.0 foot OHW (COE Datum) elevation or higher.

2. To minimize the effect of use of treated wood, the COE should ensure that ACZA or equivalent or better treated wood be used for construction and that all Best

Management Practices (BMPs) of the Western Wood Preservers and construction related BMPs be used during pier installation.

3.7 Statutory Response Requirement

Pursuant to the MSA (section 305(b)(4)(B)) and 50 C.F.R. 600.920(j), Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

3.8 Supplemental Consultation

The COE must reinitiate EFH consultation with NOAA Fisheries if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920(k)).

4.0 REFERENCES

Ajwani, S. 1956. A review of Lake Washington watershed, historical, biological, and limnological. Master's thesis, University of Washington, Seattle, Washington.

Beauchamp, D.A., M.M. Mazur, J.K. McIntyre, J.H. Moss, and N.C. Overman. 2002. Trophic dynamics of fishes and zooplankton in Lakes Washington and Sammamish. Annual Report to King County. Report No. WASFWRU 02-001. Seattle. 161 p.

Biological Review Team (BRT), West Coast. 2003. Preliminary conclusion regarding the updated status of listed ESUs of West Coast salmon and steelhead. Co-manager Review draft. Northwest Fisheries Science Center and Southwest Fisheries Science Center. NOAA Fisheries.

Blanton, S., R. Thom, A. Borde, H. Diefenderfer, and J. Southard. 2002. Evaluation of methods to increase light under ferry terminals. Prepared for Washington State Department of Transportation, April 2002.

Bowers, George. 1898. Bulletin of the United States Fish Commission for 1897. Washington: Government Printing Office.

Christensen, D.L., B.R. Herwig, D.E. Schindler, and S.R. Carpenter. 1996. Impacts of lakeshore residential development on coarse woody debris in north temperate lakes. Ecological Applications 6(4), 1996, pp.1143-1149.

Colle, D.E., R.L. Cailteux, and J. V. Shireman. 1989. Distribution of Florida largemouth bass in a lake after elimination of all submersed aquatic vegetation. N. Am. J. Fish. Mgmt. 9:213-218.

Dolat, S.W. 1997. Acoustic measurements during the Baldwin Bridge demolition (final, dated March 14, 1997). Prepared for White Oak Construction by Sonalysts, Inc, Waterford, CT., 34 p. plus appendices.

EcoPacific. 2002a. Biological evaluation pier construction Bethune property. Prepared for United States Army COE, Seattle District.

EcoPacific. 2002b. Biological evaluation pier construction Wanta property. Prepared for United States Army COE, Seattle District.

Footen, B. and R. Tabor. 2003. Piscivorous impacts on juvenile chinook. Proceedings of the 2003 Greater Lake Washington Chinook Workshop at Shoreline, WA., January 24, 2003, Seattle Public Utilities, Seattle, WA.

Fresh, K.L. 2001. Historic and current salmonid population conditions in the Lake Washington Basin pp.38-67 *in* Salmon and steelhead habitat limiting factors report for the Cedar Sammamish Basin (Water Resource Inventory Area 8). Prepared by John Kerwin, Washington Conservation Commission, Olympia Washington, September 2001, 587 pp.

Fresh, K.L., D. Rothaus, K.W. Mueller, and C. Mueller. 2001. Habitat utilization by predators, with emphasis on smallmouth bass, in the littoral zone of Lake Washington (draft). WDFW.

Frodge, J.D., D.A. Marino, G.B. Pauley, and G.L. Thomas. 1995. Mortality of largemouth bass (*Micropterus salmoides*) and steelhead trout (*Oncorhynchus mykiss*) in densely vegetated littoral areas tested using in situ bioassay. Lake and Reservoir Management 11:343-358.

Gerking, S.D. 1994. Feeding Ecology of Fish. Academic Press Inc., San Diego, California. 416 p.

Healey, M.C. 1991. Life history of chinook salmon (*Oncorhynchus tschawystcha*). Pages 313–393 in C. Groot and L. Margolis, editors. Pacific salmon life histories. UBC Press, Univ. Brit. Col. Vancouver, Canada.

Helfman, G.S. 1979. Fish attraction to floating objects in lakes. Pages 49-57 in D.L. Johnson and R.A.Stein, eds. Response of fish to habitat structure in standing water. Special Publication 6, North Central Division, American Fisheries Society, Bethesda, MA, USA. 77p.

Hobson, E. S. 1979. Interactions between piscivorous fishes and their prey. Pages 231-242 in R.H. Stroud and H. Clepper, editors. Predator-prey systems in fisheries management. Sport Fishing Institute, Washington D.C.

Howick, G. . and W. J. O'Brien. 1983. Piscivorous feeding behavior of largemouth bass: an experimental analysis. Trans. Am. Fish. Soc. 112:508-516.

Johnson, L., S.Y. Sol, G.M. Ylitalo, T. Hom, B. French, O.P. Olson, and T.K. Collier. 1999. Reproductive injury in English sole (Pleuronectes vetulus) from the Hylebos Waterway, commencement Bay, Washington. Journal of Aquatic Ecosystem Stress and Recovery. 6:289-310.

Johnson, L. 2000. An analysis in support of sediment quality thresholds for polycyclic aromatic hydrocarbons (PAHs) to protect estuarine fish. National Marine Fisheries Service, Seattle, Washington (draft white paper). 29p.

Kahler, T.M., Grassley and D. Beauchamp. 2000. A summary of the effects of bulkheads, piers, and other artificial structures and shorezone development on ESA-listed salmonids in lakes. City of Bellevue.

Kerwin, J. 2001. Salmon and steelhead habitat limiting factors report for the Cedar-Sammamish Basin (Water Resource Inventory Area 8). Washington Conservation Commission. Olympia, WA.

King County. 2002. Lake Washington/Cedar/Sammamish watershed (WRIA 8) near term agenda for salmon habitat conservation, draft, February 2002.

King County. 2003. Lake Sammamish Water Quality web site.

http://dnr.metrokc.gov/wlr/waterres/lakes/wash.htm.

Larkin, P.A. 1979. Predator-prey relations in fishes: an overview of the theory. Pages 13-22 in R.H. Stroud and H. Clepper, editors, Predator-prey systems in fisheries management. Sport Fishing Institute, Washington D.C.

Marshall, A.R. 2000. Genetic analysis of Cottage Lake Creek/Bear Creek and Issaquah Creek naturally spawning fall-run chinook. Washington Department of Fish and Wildlife, Olympia, WA. 10p.

McElhany, P., M.H. Ruckleshaus, M.J. Ford, T.C. Wainwright, E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-42. 174 p.

Mesing, C.L. and A.M. Wicker. 1986. Home range, spawning migrations, and homing of radio-tagged Florida largemouth bass in two central Florida lakes. Trans. Am.Fish. Soc. 115:286-295.

Mueller, G. 1980. Effects of recreational river traffic on nest defense by longear sunfish. Trans. Am. Fish. Soc. 109:248-251.

Myers, J.M.., R.G. Kope, G.J. Bryant, D. Teel, L..J. Lierheimer, T.C. Wainwright, W.S. Grant, F. W. Waknitz, K. Neely, S. T. Lindley, and R. S. Waples. 1998. Status review of chinook salmon from Washington, Idaho, Oregon, and California. U.S. Dept. Commerce., NOAA Tech. Memo. NMFS-NWFSC-35, 443 p.

Neff, J.M. 1985. Polycyclic aromatic hydrocarbons. In: Fundamentals of aquatic toxicology, G.M. Rand and S.R. Petrocelli, pp. 416-454. Hemisphere Publishing, Washington, D.C.

National Marine Fisheries Service (NMFS). 2001. Independent populations of chinook salmon in Puget Sound, Puget Sound TRT public review draft. 52p.

National Marine Fisheries Service (NMFS). 2002. Biological Opinion for the San Francisco-Oakland Bay Bridge East Span Seismic Safety Project.

National Marine Fisheries Service (NMFS). 2003. Proposed Evaluation and Pending Determination of a Resource Management Plan (RMP).

Overman, N.C., 2002. A synthesis of existing data and bioenergetics modeling of the Lake Sammamish food web. Pages 103-130 *in* D.A. Beauchamp *et al.* Trophic dynamics of fishes and zooplankton in Lakes Washington and Sammamish. Washington Cooperative Fish and Wildlife Research Unit. Annual Report, submitted to King County Department of Water and Land Resources, SWAMP Program. Report No. WACFWRU 02-001. Seattle.

Pentilla, D. and D. Doty. 1990 (Draft). Results of 1989 eelgrass shading studies in Puget Sound. Washington Department of Fisheries, Marine Fish Habitat Investigations Division.

Petersen, J. and D.M. Gadomski. 1 994. Light-mediated predation by Northern Squawfish on juvenile chinook salmon. Journal of Fish Biology 45 (supplement A), 227-242.

PFMC (Pacific Fishery Management Council). 1999. Amendment 14 to the Pacific Coast salmon plan. Appendix A: Description and identification of essential fish habitat, adverse impacts and recommended conservation measures for salmon. Portland, Oregon.

Pflug, D.E. 1981. Smallmouth bass (*Micropterus dolomieui*) of Lake Sammamish: a study of their age and growth, food and feeding habits, population size, movement and homing tendencies, and comparative interactions with largemouth bass. Master's thesis, University of Washington, Seattle, Washington.

Posten, Ted. 2001. Treated wood issues associated with overwater structures in marine and freshwater environments. Prepared for Washington Department of Fish and Wildlife, Washington Department of Ecology and Washington Department of Transportation.

Puget Sound Technical Recovery Team (PSTRT). 2001. Independent populations of chinook salmon in Puget Sound. Public Review Draft. 61 p. plus appendix. (Available at http://nwfsc.noaa.gov/cbd/trt/)

Puget Sound Technical Recovery Team (PSTRT). 2002. Planning ranges and preliminary guidelines for the delisting and recovery of the Puget Sound chinook evolutionarily significant unit. 17p. (Available at: http://nwfsc.noaa.gov/cbd/trt/trt_puget.htm)

Schefsky, Richard. 1998. Northwest Laboratories of Seattle, Incorporated. Relative light distribution of a 2 and one quarter inch by 9 inch plastic prism at a distance of 28 inches below the top surface of the prism. Report prepared for Sierra Marine Construction Company.

Seiler, D., G. Volkhardt, and L. Kishimoto. 2003. Evaluation of downstream migrant salmon production in 1999 and 2000 from three Lake Washington tributaries: Cedar River, Bear Creek, and Issaquah Creek. Washington Department of Fish and Wildlife. Olympia, WA.

Simenstad, C.A., B.J. Nightingale, R.M. Thom, and D.K. Shreffler. 1999. Impacts of ferry terminals on juvenile salmon migrating along Puget Sound shorelines. Phase I: Synthesis of state of knowledge. Report No. WA-RD 472.1. Washington State Transportation Center (TRAC), Seattle, WA.

Stehr, C.M., D.W. Brown, T. Hom, B.F. Anulacion, W.L. Reichert, and T.K. Collier. 2000. Exposure of juvenile chinook and chum salmon to chemical contaminants in the Hylebos Waterway of Commencement Bay, Tacoma, Washington. Journal of Aquatic Ecosystem Stress and Recovery. 7:215-227.

Stein, Jeffery N., 1970. A study of the largemouth bass population in Lake Washington. Master's Thesis, University of Washington, Seattle, Washington.

Tabor, R.A. and R.M. Piaskowski. 2001. Nearshore habitat use by juvenile chinook salmon in lentic systems of the Lake Washington basin, annual report, 2001. Prepared for City of Seattle, November 2001.

Tabor, R.A., Scheurer, J., Gearns, G., and E. Bixler. 2002. Nearshore habitat use by juvenile chinook salmon in lentic systems of the Lake Washington basin, annual report, 2002. Prepared for City of Seattle, December, 2002. Draft.

Tetra Tech, Inc. 2002. Sammamish River corridor action plan final report, 2002. Prepared for US Army Corps of Engineers and King County, September 2002.

Walters, D.A., W.E. Lynch Jr., and D.L. Johnson. 1991. How depth and interstice size of artificial structures influence fish attraction. N. Am. J. Fish. Mgmt. 11:319-329.

Wanjala, B.S., J.C. Tash, W.J. Matter and C.D. Ziebell. 1986. Food and habitat use by different sizes of largemouth bass (*Micropterus salmoides*) in Alamo Lake, Arizona. Journal of Freshwater Ecology, Vol. 3 (3):359-368.

Warrington, P.D. 1999a. Impacts of recreational boating on the aquatic environment. http://www.nalms.org/bclss/impactsrecreationboat.htm

Warrington, P.D. 1999b. Impacts of outboard motors on the aquatic environment. http://www.nalms.org/bclss/impactsoutboard.htm

White, S.T., 1975. The influence of piers and bulkheads on the aquatic organisms in Lake Washington. Master's thesis. University of Washington, Seattle, Washington.