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

Refer to NMFS No:
2010/06062

December 17, 2010

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Re: Endangered Species Act Biological Opinion and Letter of Concurrence and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Conservation Recommendations for the Columbia River Crossing Test Pile Project, Mainstem Columbia River, River Mile 106, Lower Columbia-Sandy Watershed (HUC 17080001), Multnomah County, Oregon, and Clark County, Washington

Dear Messrs. Krochaliss and McAvoy:

The enclosed document contains a biological opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the effects of the Federal Highway Administration (FHWA) and Federal Transit Authority (FTA) using their authority under sections 1101, 1701, 1702, and 5309 of the "Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" (SAFETEA-LU) to fund a test pile project at river mile 106 in the mainstem Columbia River to assess the effectiveness of proposed pile installation methods and the extent to which proposed sound attenuation methods will minimize the impact of underwater sound levels.

In this Opinion, NMFS reached the following conclusions:

The proposed test pile project is not likely to adversely affect (NLAA) these species or their designated critical habitats, except for Steller sea lion and southern resident killer whale which do not have critical habitat designated within the action area:

- Upper Columbia River (UCR) spring-run Chinook salmon (*Oncorhynchus tshawytscha*)
- Snake River (SR) spring/summer run Chinook salmon
- SR fall-run Chinook salmon
- SR sockeye salmon (*O. nerka*)

- UCR steelhead (*O. mykiss*)
- Snake River Basin (SRB) steelhead
- eulachon (*Thaleichthys pacificus*)
- southern green sturgeon (*Acipenser medirostris*)
- Steller sea lion (*Eumetopias jubatus*)
- southern resident killer whale (*Orcinus orca*)

The proposed test pile project is not likely to jeopardize the continued existence of these species or result in the destruction or adverse modification of their designated critical habitats, except for LCR coho salmon, which does not have critical habitat designated or proposed:

- Lower Columbia River (LCR) Chinook salmon
- Upper Willamette River (UWR) Chinook salmon
- Columbia River (CR) chum salmon (*O. keta*)
- LCR coho salmon (*O. kisutch*)
- LCR steelhead
- UWR steelhead
- Mid Columbia River (MCR) steelhead

As required by section 7 of the ESA, NMFS is providing an incidental take statement with the Opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the FHWA and FTA must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of listed species.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes two conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These conservation recommendations are a subset of the ESA take statement's terms and conditions. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH conservation recommendations, the FHWA and FTA must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we request that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

If you have questions regarding this consultation, please contact Marc Liverman, QAQC coordinator in the Oregon State Habitat Office, at 503-231-2336.

Sincerely,

William W. Stelle, Jr.
Regional Administrator

cc: Frannie Brindle, ODOT
Jaimee Davis, USCOE

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Endangered Species Act
Biological Opinion and Letter of Concurrence

and

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat
Conservation Recommendations

for the

Columbia River Crossing Test Pile Project
Mainstem Columbia River, River Mile 106
Lower Columbia-Sandy Watershed (HUC 17080001)
Multnomah County, Oregon, and Clark County, Washington

Co-Lead Action Agencies:	Federal Highways Administration Federal Transit Authority
Consultation Conducted By:	National Marine Fisheries Service Northwest Region
Date Issued:	December 17, 2010
Issued by:	William W. Stelle, Jr. Regional Administrator
NMFS No.:	**2010/06062**

INTRODUCTION

This document contains biological opinion (Opinion) that was prepared by National Marine Fisheries Service (NMFS) in accordance with section 7(b) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531, et seq.), and implementing regulations at 50 CFR 402.[1] It also contains essential fish habitat (EFH) conservation recommendations prepared by NMFS in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, et seq.) and implementing regulations at 50 CFR 600. The Opinion and EFH conservation recommendations are both in compliance with section 515 of the Treasury and General Government Appropriations Act of 2001 (Data Quality Act) (44 U.S.C. 3504 (d)(1) and 3516), and underwent pre-dissemination review. The administrative record for this consultation is on file at the Oregon State Habitat Office in Portland Oregon.

Consultation History

The Federal Highway Administration and the Federal Transit Administration (the action agencies) are currently in consultation with NMFS to analyze the effects of partially funding the Columbia River Crossing (CRC) project, an action to replace the Interstate-5 freeway bridges across the Columbia River between the cities of Portland, Oregon and Vancouver, Washington (refer to NMFS No.: 2010/03196). Before that consultation can be completed, FHWA and FTA must complete a test pile study to assess the effectiveness of proposed pile installation methods and the extent to which proposed sound attenuation methods will minimize the impact of underwater sound levels.

On December 8, 2010, NMFS and the action agencies met to discuss the status of the ongoing CRC consultation and the test pile program, and whether consultation on the test pile program should be concluded with a separate biological opinion. NMFS and the action agencies agreed that a separate biological opinion for the test pile program is appropriate because the effects analysis for the rest of the CRC proposal cannot be completed without the test information and the proposed in-water period for the study, January through February 2011, is fast approaching. Moreover, the utility of the test pile program is not limited to the CRC project. Information obtained from this study will be directly applicable to the analysis of effects for other pile driving actions anticipated to occur in the same watershed as the test pile program.

At the December 8, 2010, meeting, the action agencies verbally requested a separate consultation and biological opinion for the test pile study and supported their request with a biological assessment (BA) electronically submitted to NFMS on December 9, 2010.[2] No previous consultations have been completed on this action and the action agencies did not have an opportunity to review a draft of this biological opinion.

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[1] With respect to designated critical habitat, the following analysis relied only on the statutory provisions of the ESA, and not on the regulatory definition of "destruction or adverse modification" at 50 CFR 402.02.

[2] Email from Cindy Callahan, FHWA, to Marc Liverman, NMFS (December 9, 2010) (transmitting biological assessment for the test pile study).

Among other things, the BA presented findings by the action agencies that the proposed test pile study is not likely to adversely affect (NLAA) the following:

- Upper Columbia River (UCR) spring-run Chinook salmon (*Oncorhynchus tshawytscha*)
- Snake River (SR) spring/summer run Chinook salmon
- SR fall-run Chinook salmon
- SR sockeye salmon (*O. nerka*)
- UCR steelhead (*O. mykiss*)
- Snake River Basin (SRB) steelhead
- eulachon (*Thaleichthys pacificus*)
- southern green sturgeon (*Acipenser medirostris*)
- Steller sea lion (*Eumetopias jubatus*)
- southern resident killer whale (*Orcinus orca*)

The action agencies also determined that the proposed test pile study is likely to adversely affect (LAA) the following species and their designated critical habitats:

- Lower Columbia River (LCR) Chinook salmon
- Upper Willamette River (UWR) Chinook salmon
- Columbia River (CR) chum salmon (*O. keta*)
- LCR coho salmon (*O. kisutch*)
- LCR steelhead
- UWR steelhead
- Mid Columbia River (MCR) steelhead

Moreover, the action agencies determined that the proposed test pile study is NLAA for critical habitats designated for any of these species, except for LCR coho salmon and eulachon, which do not have critical habitat designated or proposed, and Steller sea lion and southern resident killer whale, which does not have critical habitat designated within the action area.

NMFS agrees that this species list is accurate and, for reasons explained in the "Not Likely to Adversely Affect" Determinations section at the end of this Opinion, concurs that the proposed action is NLAA UCR spring-run Chinook salmon, SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, UCR steelhead, SRB steelhead, eulachon, southern green sturgeon, Steller sea lion, or southern resident killer whale. However, for reasons explained in the Effects to Critical Habitat section of this Opinion, NMFS disagrees that the proposed test pile program will not adversely affect any designated critical habitat.

Proposed Action

The action agencies propose to fund the test pile program using their authority under sections 1101, 1701, 1702, and 5309 of the "Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" (SAFETEA-LU). A private contractor will be selected to carry out actions necessary to complete the test pile program. The proposed action will be carried out by a contractor action will be completed by a contractor that has yet to be selected. For reasons explained above, the test pile program is related to, but has a separate justification and utility apart from, the CRC project. The purposes of the test pile program are to determine or verify the following information:

- Potential underwater noise levels expected for vibratory installation of temporary piles for two representative substrate types found at the project site.
- Underwater noise levels expected for impact installation of temporary piles for the two substrate types found at typical mid-channel depths at the project site.
- Strike numbers necessary to place pile to reach load bearing capacity with an impact hammer.
- Effectiveness of two noise mitigation strategies during impact pile driving.
- Transmission loss of pile installation noise for both impact and vibratory installation.
- Extent of construction noise impacts in-air for impact pile driving.
- Production rates for pile installation.
- Feasibility of vibratory installation methods.

All in-water work activities for the test pile program are proposed to take place during 10 working days between January 1 and February 28, 2011.

The following sequence of activities will occur at two open-water sites within the Columbia River near river mile (RM) 106:

1. Transport and anchor the work barge.

Equipment and material will be loaded on the work barge at an established construction loading facility, most likely the Port of Vancouver near RM 105 of the Columbia River. These activities will be similar to those that occur on a regular basis at such facilities. The barge will likely be transported to, and positioned at, the pile driving locations using a tugboat or as a self-propelled unit, and anchored in position with spud anchors. In deeper water locations spud anchors may not be long enough, in which case cable or chain deployed anchors will be necessary. Pile driving will occur in areas of sufficient water depth to ensure that the barge will not be grounded at any time during the pile driving operations.

2. Carry out the project spill prevention countermeasures control (SPCC) plan.

Before the start of work, the Contractor will develop and implement a SPCC plan in accordance with ODOT Standard Specification 00290.00 to 00290.90, WSDOT Standard Specification 1-07.15(1), or both. This plan is intended to protect listed species and their critical habitat from effects that might result from the inadvertent discharge of contaminants at the project site.

3. Install sound and water quality monitoring equipment.

Monitoring equipment will include a combination of underwater sound (hydroacoustic) and video for water quality monitoring. Underwater monitoring equipment will be strategically located in both near- and far-field locations, in direct line of sight with each test pile. Details of the hydroacoustic monitoring are being finalized with NMFS and the hydroacoustic contractor.

4. Deploy attenuation, if applicable, and drive the test piles to bearing capacity and project specifications with a vibratory and/or impact hammer.

After positioning and anchoring the work barge and installing an attenuation device, if applicable, the open-ended steel piles will be driven until the target bearing capacity is reached at approximately 80 feet below the surface of the channel substrate. The test piles will be either 24- or 48-inch-diameter, hollow steel piles, with ½-inch or 1-inch-thick walls, respectively. A total of six piles will be driven during the test.

A vibratory hammer will be used to install two piles to the point of resistance before a medium-capacity impact hammer is applied to reach the target bearing capacity. The remaining four piles will be installed using only an impact hammer. For all piles, bearing capacity will be estimated when the pile penetration is less than 1-inch per strike for the last 2 feet of installation. Reaching bearing capacity is anticipated to take less than one hour of drive time, with between 300 and 1,000 blows per pile with an impact hammer. Existing geotechnical data suggests that up to two test piles can be driven to bearing capacity in a single day.

An unconfined and a confined bubble curtain will be evaluated as sound attenuation during the pile driving test. The unconfined bubble curtain consists of seven air manifolds encircling the pile, supplied with pressurized air via hoses mounted to a compressor on the work barge. The confined bubble curtain will include a steel or plastic sleeve encircling the bubble rings to minimize dispersion of air bubbles and to concentrate the bubbles close to the pile. The confined system will also contain any turbidity generated by the pressurized air flow from the manifold.

The evaluation of sound attenuation methods includes monitoring during periods with the air bubbles sequentially turned on and off, to assess the effectiveness of each condition. This on-and-off process is typically conducted more than once for a given pile to assess potential variations on sound levels and attenuation effectiveness with pile penetration depth.

5. Collect sound, geotechnical, and turbidity data during and after pile driving.

Background, underwater and airborne sound levels, turbidity levels, and other environmental data will also be gathered in accordance with the test pile study plan.

6. Remove test piles with a vibratory hammer if possible, or cut off piles 2 feet below the mud line.

After test pile installation and gathering monitoring information, a vibratory hammer will be used to remove the piles. The hollow steel test piles will be installed in sand-dominated substrate material where the sediments within the pile are expected to discharge back into the hole as the pile is extracted such that no additional fill will be required to restore substrate conditions in the area. Piles are expected to be easily extracted from the sandy substrate. However, if any piles cannot be completely removed, they will be cut off about 2 feet below the substrate elevation.

NMFS relied on the foregoing description of the proposed action, including all features identified to reduce adverse effects, to complete this consultation. To ensure that this Opinion remains valid, NMFS requests that the action agencies keep NMFS informed of any changes to the proposed action.

Action Area

Action area means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For this consultation, the action area is defined as the radius within which underwater noise levels generated by the pile test project exceed background, or ambient, noise levels. Background noise levels for the project site are not available.[3] However, due to the curvature of the river and islands present, underwater sound from impact pile driving is expected to reach land well before attenuating to assumed background sound levels of 120 dB root mean square (RMS). The aquatic portion of the action area is not expected to extend beyond Sauvie Island, about 5.5 miles downstream of the project site, and Lady Island, about 12.5 miles upstream. This distance encompasses the Columbia River from approximately RM 101 to 119. As no pile driving activities will occur within North Portland Harbor, there will be no aquatic effects from underwater pile driving noise in this area.

Sixteen ESA-listed species and 12 designated critical habitats occur in the action area and are considered in this opinion (Table 1). Southern resident killer whales do not occur in this action area but are nonetheless considered in this Opinion because Chinook salmon is the preferred prey of southern resident killer whales and a reduction in Chinook salmon could reduce the available quantity of that prey.

[3] One measurement of 60 Pa or 136 dB peak has been reported for the lower Columbia River at RM 45 where the river is tidally influenced (Carlson *et al.et al.* 2001, cited in the BA). A crude approximation of the root mean square (RMS) values is approximately 121 dB RMS (subtracting 15 dB, Jim Laughlin 2009, personal communication).

Table 1. Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation. Listing status: 'T' means listed as threatened under the ESA; 'E' means listed as endangered; "P" means proposed.

Species		Listing Status	Critical Habitat	Protective Regulations
Marine and Anadromous Fish				
Chinook salmon (*Oncorhynchus tshawytscha*)				
	Lower Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
	Upper Willamette River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
	Upper Columbia River spring-run	E 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	ESA section 9 applies
	Snake River spring/summer run	T 6/28/05; 70 FR 37160	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
	Snake River fall-run	T 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Chum salmon *(O. keta*)				
	Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Coho salmon (*O. kisutch*)				
	Lower Columbia River	T 6/28/05; 70 FR 37160	Not applicable	6/28/05; 70 FR 37160
Sockeye salmon (*O. nerka*)				
	Snake River	E 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (*O. mykiss*)				
	Lower Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
	Upper Willamette River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
	Middle Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
	Upper Columbia River	T 8/24/09; 74 FR 42605	9/02/05; 70 FR 52630	2/01/06; 71 FR 5178
	Snake River Basin	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Green sturgeon (*Acipenser medirostris*)				
	Southern	T 4/07/06; 71 FR 17757	10/09/09; 74 FR 52300	6/02/10; 75 FR 30714
Eulachon (*Thaleichthys pacificus*)				
	Eulachon	T 3/18/10; 75 FR 13012	Not applicable	Not applicable
Marine Mammals				
Steller sea lion (*Eumetopias jubatus*)				
	Eastern	T 5/5/1997; 63 FR 24345	Not applicable	11/26/90; 55 FR 49204
Killer whale (*Orcinus orca*)				
	Southern Resident	E 11/18/05; 70 FR 69903	Not applicable	ESA section 9 applies

ENDANGERED SPECIES ACT BIOLOGICAL OPINION

Section 7(a)(2) of the ESA requires Federal agencies to consult with NMFS to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The Opinion that follows records the results of the interagency consultation for this proposed action. The ITS provided after the Opinion specifies (1) the impact of any taking of threatened or endangered species that will be incidental to the proposed action; (2) reasonable and prudent measures that NMFS considers necessary and appropriate to minimize such impact, and (3) nondiscretionary terms and conditions (including, but not limited to, reporting requirements) that must be complied with by the Federal agency, applicant (if any), or both, to carry out the reasonable and prudent measures.

To complete the jeopardy analysis presented in this Opinion, NMFS reviewed the status of each listed species[4] considered in this consultation, the environmental baseline in the action area, the effects of the action, and cumulative effects (50 CFR 402.14(g)). From this analysis, NMFS determined whether effects of the action were likely, in view of existing risks, to appreciably reduce the likelihood of both the survival and recovery of the affected listed species.

This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat. NMFS considered the status of the entire designated area of the critical habitat considered in this consultation, the environmental baseline in the action area, the likely effects of the action on the function and conservation role of the affected critical habitat, and cumulative effects. NMFS used this assessment to determine whether, with implementation of the proposed action, critical habitat would remain functional, or retain the current ability for the primary constituent elements (PCEs) to become functionally established, to serve the intended conservation role for the species.[5]

If the action under consultation is likely to jeopardize the continued existence of an ESA-listed species, or destroy or adversely modify critical habitat, NMFS must identify any reasonable and prudent alternatives for the action that avoid jeopardy or destruction or adverse modification of critical habitat and meet other regulatory requirements (50 CFR 402.02).

Status of the Species and Critical Habitat

The summaries that follow describe the status of ESA-listed salmon and steelhead, their designated critical habitats that are likely to be adversely affected by the proposed test pile program. Information presented in these summaries is based on information presented in a large

[4] An "evolutionarily significant unit" (ESU) of Pacific salmon (Waples 1991) and a "distinct population segment" (DPS) (Policy Regarding the Recognition of District Vertebrate Population; 61 FR 4721, Feb 7, 1996) are both "species" as defined in section 3 of the ESA.

[5] Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (November 7, 2005) (Application of the "Destruction or Adverse Modification" Standard Under Section 7(a)(2) of the Endangered Species Act).

body of scientific publications and reports, and is the basis for the analyses we present in the Effects of the Action section of this Opinion. More detailed information on the status and trends of these listed resources, and their biology and ecology, can be found in the listing regulations and critical habitat designations published in the Federal Register (Table 1) and in many publications available from the NMFS Northwest Region, Protected Resources Division, Portland, Oregon.

The status of species and critical habitat sections below are organized by recovery domains to better integrate recovery planning information that NMFS is developing on the conservation status of the species and critical habitats considered in this consultation. Recovery domains are the geographically-based areas that NMFS is using to prepare multi-species recovery plans. Recovery Domains and species relevant to this consultation are shown in Table 2.

Table 2. Recovery planning domains identified by NMFS and their ESA-listed salmon and steelhead species.

Recovery Domain	Species
Willamette-Lower Columbia	LCR Chinook salmon
	UWR Chinook salmon
	CR chum salmon
	LCR coho salmon
	LCR steelhead
	UWR steelhead
Interior Columbia	MCR steelhead

For each recovery domain, a technical review team (TRT) appointed by NMFS has developed, or is developing, criteria necessary to identify independent salmon populations within each species, recommend viability criteria for that species, and analyze factors that limit species survival. The definition of a population used by each TRT is set forth in the “viable salmonid population” (VSP) document prepared by NMFS for use in conservation assessments of Pacific salmon and steelhead (McElhany *et al.* 2000). The boundaries of each population are defined using a combination of genetic information, geography, life-history traits, morphological traits, and population dynamics that indicate the extent of reproductive isolation among spawning groups.

Understanding population size and spatial extent is critical for the viability analyses, and a necessary step in recovery planning and conservation assessments for any species. If a species consists of multiple populations, the overall viability of that species is a function of the VSP attributes of its constituent populations. Until a viability analysis of a species is completed, the VSP guidelines recommend that all populations should be managed to retain the potential to achieve viable status to ensure a rapid start along the road to recovery, and that no significant parts of the species are lost before the full recovery plan is implemented (McElhany *et al.* 2000).

The status of critical habitat was based primarily on a watershed-level analysis of conservation value that focused on the presence of listed ESA-listed salmon and steelhead and the biological and physical features (*i.e.*, the PCEs) that are essential to their conservation. This analysis for the 2005 designations was completed by Critical Habitat Analytical Review Teams (CHARTs) that focused on large geographical areas corresponding approximately to recovery domains (NOAA Fisheries 2005). Each watershed was ranked using a conservation value attributed to the quantity of stream habitat with PCEs, the present condition of those PCEs, the likelihood of achieving PCE potential (either naturally or through active restoration), support for rare or important genetic or life history characteristics, support for abundant populations, and support for spawning and rearing populations. In some cases, our understanding of these interim conservation values has been further refined by the work of TRTs and other recovery planning efforts that have better explained the habitat attributes, ecological interactions, and population characteristics important to each species.

Recovery planning is underway throughout the WLC and IC recovery domains. In the WLC, NMFS is coordinating development of a recovery plan based on three "management unit" plans developed in southwest Washington, the White Salmon River sub-basin, and northwest Oregon that is expected to be made available for public review and comment in the spring of 2011, along with a Columbia River Estuary Module. A proposed Upper Willamette River Conservation and Recovery Plan is currently available for comment (75 FR 65299; October 22, 2010). In the IC, NMFS is coordinating development of recovery plans in the Snake and Upper Columbia Sub-Domains, and has adopted a final recovery plan for the MCR Sub-Domain (NMFS 2009a).

The Steller sea lion recovery plan is under the jurisdiction of NMFS' Protected Resources Division, Silver Springs, Maryland, and NMFS Northwest Region issued a recovery plan for the southern resident killer whale in 2008 (NMFS 2008a).

Status of the Species. Natural variations in freshwater and marine environments have substantial effects on the abundance of Pacific salmon and steelhead populations. Of the various natural phenomena that affect most populations of salmon and steelhead, changes in ocean productivity are generally considered the most important. Pacific salmon and steelhead are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Ocean predation probably contributes to significant natural mortality, although the levels of predation are largely unknown. In general, Pacific salmon and steelhead are eaten by pelagic fishes, birds, and marine mammals.

Over the past few decades, the size and distribution of the salmon and steelhead populations considered in this Opinion, like the other salmon and steelhead that NMFS has listed, generally have declined because of natural phenomena and human activity, including the operation of hydropower systems, over-harvest, hatcheries, and habitat degradation. Enlarged populations of terns, seals, and sea lions in the Pacific Northwest have reduced the survival of some Pacific salmon and steelhead populations. As noted more fully in the status of the critical habitats section below, climate change is likely to play an increasingly important role in determining the abundance of salmon and steelhead by exacerbating long-term problems related to temperature, stream flow, habitat access, predation, and marine productivity (CIG 2004, Scheuerell and Williams 2005, Zabel *et al.* 2006, ISAB 2007).

Willamette and Lower Columbia (WLC) Recovery Domain. All species that are part of the WLC Recovery Domain are likely to be adversely affected by the proposed test pile program, including LCR Chinook salmon, UWR Chinook salmon, CR chum salmon, LCR coho salmon, LCR steelhead, and UWR steelhead. The WLC-TRT identified 109 demographically-independent populations of those species (Table 3). These populations were further aggregated into strata, groupings above the population level that are connected by some degree of migration, based on ecological subregions. All 109 populations use parts of the mainstem of the Columbia River and the Columbia River estuary that flow through the action area for migration, rearing, and smoltification.

Table 3. Demographically-independent populations in the WLC Recovery Domain.

Species	Number of Demographically Independent Populations
LCR Chinook salmon	32
UWR Chinook salmon	7
CR chum salmon	17
LCR coho salmon	25
LCR steelhead	23
UWR steelhead	5

The WLC-TRT recommended viability criteria that follow the VSP framework and described biological or physical performance conditions that, when met, indicate a population or species has a 5 percent or less risk of extinction over a 100-year period (McElhany *et al.* 2006, see also, NRC 1995). McElhany *et al.* (2007) applied those criteria to populations in Oregon and found that the combined extinction risk is very high for LCR Chinook salmon, UWR Chinook salmon, CR chum salmon, LCR coho salmon, and moderate for LCR steelhead and UWR steelhead, although the status of those species with populations in Washington is still under assessment.

LCR Chinook salmon. This species includes all naturally-spawned populations of Chinook salmon in the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River; the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River; and progeny of seventeen artificial propagation programs. The Willamette/Lower Columbia Technical Recovery Team (WLC-TRT) identified 32 historical populations of LCR Chinook salmon – seven in the coastal subregion, 13 in the Columbia Gorge, and 12 in the western Cascades (Table 4). Only Sandy River late fall Chinook is considered “viable” (McElhany *et al.* 2007).

The major factors limiting recovery of LCR Chinook salmon include altered channel morphology, loss of habitat diversity, excessive sediment, high water temperature, reduced access to spawning/rearing habitat, and harvest impacts (NMFS 2006).

Table 4. LCR Chinook salmon populations.

Stratum		Spawning Population (Watershed)
Ecological Subregion	Run Timing	
Coast Range	Fall	Young Bay
		Grays River
		Big Creek
		Elochman River
		Clatskanie River
		Mill Creek
		Scappoose River
Columbia Gorge	Spring	Upper Cowlitz River
		Cispus River
		Tilton River
		Big White Salmon River
		Hood River
	Early Fall ("tule")	Upper Gorge Tributaries
		Big White Salmon River
	Fall	Upper Cowlitz River
		Lower Cowlitz River
		Coweeman River
		Toutle River
		Lower Gorge Tributaries
		Hood River
Western Cascade Range	Spring	Toutle River
		Kalama River
		Lewis River
		Sandy River
	Early Fall ("tule")	Lewis River
		Salmon Creek
		Sandy River
	Fall	Kalama River
		Clackamas River
		Washougal River
	Late Fall ("bright")	Lewis River
		Sandy River

UWR Chinook salmon. The species includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon, and progeny of seven artificial propagation programs. Of the seven historical populations of UWR Chinook salmon identified by the WLC-TRT (Table 5); only the Clackamas population is characterized as "viable" (McElhany *et al.* 2007).

The major factors limiting recovery of UWR Chinook salmon identified by NMFS include lost/degraded floodplain connectivity and lowland stream habitat, degraded water quality, high water temperature, reduced streamflow, and reduced access to spawning/rearing habitat (NMFS 2006).

Table 5. UWR Chinook salmon populations. Overall viability risk: "extinct or very high" means greater than 60 percent chance of extinction within 100 years; "relatively high" means 60 to 25 percent risk of extinction in 100 years; "moderate" means 25 to 5 percent risk of extinction in 100 years, "low or negligible" means 5 to 1 percent risk of extinction in 100 years; "very low" means less than 1 percent chance of extinction in 100 years, and NA means not available. A low or negligible risk of extinction is considered "viable."

Stratum		Spawning Population (Watershed)	Overall Viability Risk
Ecological Subregion	Run Timing		
Western Cascade Range	Spring	Clackamas	Low
		Mollala	Relatively High
		North Santiam	Very high
		South Santiam	Very high
		Calapooia	Very high
		McKenzie	Moderate
		Middle Fork Willamette	Very high

CR chum salmon. This species includes all naturally-spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon, and progeny of three artificial propagation programs. The WLC-TRT identified 17 historical populations of CR chum salmon and aggregated these into four strata (Myers *et al.* 2006). Unlike other species in the WLC recovery domain, CR chum salmon spawning aggregations were identified in the mainstem Columbia River. These aggregations generally were included in the population associated with the nearest river basin. Three strata and eight historical populations of CR chum salmon occur within the action area (Table 6); of these, none are "viable" (McElhany *et al.* 2007).

The major factors limiting recovery of CR chum salmon include altered channel morphology, loss of habitat diversity, excessive sediment, reduced streamflow, harassment of spawners, and harvest impacts (NMFS 2006).

Table 6. CR chum salmon populations.

Stratum		Spawning Population (Watershed)
Ecological Subregion	Run Timing	
Coast Range	Fall	Young's Bay
		Grays River
		Big Creek
		Elochman River
		Clatskanie River
		Mill Creek
		Scappoose Creek
Columbia Gorge	Summer	Cowlitz River
	Fall	Cowlitz River
		Lower Gorge Tributaries
		Upper Gorge Tributaries
Western Cascade Range	Fall	Kalama River
		Salmon Creek
		Lewis River
		Clackamas River
		Washougal River
		Sandy River

LCR coho salmon. This species includes all naturally-spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood rivers; in the Willamette River to Willamette Falls, Oregon; and progeny of 25 artificial propagation programs. The WLC-TRT identified 24 historical populations of LCR coho salmon and divided these into two strata based on major run timing: early and late (Myers *et al.* 2006). Three strata and nine historical populations of LCR coho salmon occur within the action area (Table 7). Of these nine populations, Clackamas River is the only population characterized as "viable" (McElhany *et al.* 2007).

Table 7. LCR coho salmon spawning populations.

Stratum: Ecological Subregion	Stratum: Run Type	Spawning Population (Watershed)
Coast Range	N	Young's Bay
		Grays River
		Big Creek
		Elochman Creek
		Clatskanie River
		Mill, Germany, Abernathy Creeks
		Scappoose River
Columbia Gorge	N	Lower Gorge Tributaries
	S	Upper Gorge Tributaries
		Big White Salmon River
		Hood River
Western Cascade Range	N	Lower Cowlitz River
		Coweeman River
		Salmon Creek
	N and S	Cispus River
		Upper Cowlitz River
		Tilton River
		North Fork Toutle River
		South Fork Toutle River
		Kalama River
		North Fork Lewis River
		East Fork Lewis River
		Clackamas River
		Washougal River
		Sandy River

In general, late coho salmon spawn in smaller rivers or the lower reaches of larger rivers from mid-November to January, coincident with the onset of rain-induced freshets in the fall or early winter. Spawning typically takes place within a few days to a few weeks of freshwater entry. Late-run fish also tend to undertake oceanic migrations to the north of the Columbia River, extending as far as northern British Columbia and southeast Alaska. As a result, late coho salmon are known as “Type N” coho. Alternatively, early coho salmon spawn in the upper reaches of larger rivers in the Lower Columbia River and in most rivers inland of the Cascade Crest. During their oceanic migration, early coho salmon tend to migrate to the south of the Columbia River and are known as “Type S” coho salmon. They may migrate as far south as the waters off northern California. While the ecological significance of run timing in coho salmon is fairly well understood, it is not clear how important ocean migratory pattern is to overall diversity and the relative historical abundance of Type N and Type S life histories largely is unknown.

The major factors limiting recovery of LCR coho salmon include degraded floodplain connectivity and channel structure and complexity, loss of riparian areas and large wood recruitment, degraded stream substrate, loss of stream flow, reduced water quality, and impaired passage (NMFS 2007).

LCR steelhead. The species includes all naturally-spawned steelhead populations below natural and manmade impassable barriers in streams and tributaries to the Columbia River between and including the Cowlitz and Wind rivers, Washington; in the Willamette and Hood rivers, Oregon; and progeny of ten artificial propagation programs; but excluding all steelhead from the upper Willamette River basin above Willamette Falls, Oregon, and from the Little and Big White Salmon rivers, Washington. The WLC-TRT identified 23 historical populations of LCR steelhead (Myers *et al.* 2006). Within these populations, the winter-run timing is more common in the west Cascade subregion, while farther east summer steelhead are found almost exclusively.

Summer steelhead return to freshwater long before spawning. Winter steelhead, in contrast, return from the ocean much closer to maturity and spawn within a few weeks. Summer steelhead spawning areas in the Lower Columbia River are found above waterfalls and other features that create seasonal barriers to migration. Where no temporal barriers exist, the winter-run life history dominates. Six strata and 23 historical populations of LCR steelhead occur within the action area (Table 8).

The major factors limiting recovery of LCR steelhead include altered channel morphology, lost/degraded floodplain connectivity and lowland stream habitat, excessive sediment, high water temperature, reduced streamflow, and reduced access to spawning/rearing habitat (NMFS 2006).

Table 8. LCR steelhead populations spawning.

Stratum		Population (Watershed)
Ecological Subregion	Run Timing	
Columbia Gorge	Summer	Wind River
		Hood River
	Winter	Lower Gorge Tributaries
		Upper Gorge Tributaries
		Hood River
West Cascade Range	Summer	Kalama River
		North Fork Lewis River
		East Fork Lewis River
		Washougal River
	Winter	Cispus River
		Tilton river
		Upper Cowlitz River
		Lower Cowlitz River
		North Fork Toutle River
		South Fork Toutle River
		Coweeman River
		Kalama River
		North Fork Lewis River
		East Fork Lewis River
		Clackamas River
		Salmon Creek
		Sandy River
		Washougal River

UWR steelhead. This species includes all naturally-spawned steelhead populations below natural and manmade impassable barriers in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River. The WLC-TRT identified five historical populations of UWR steelhead, all with winter run timing (Myers *et al.* 2006). Only winter steelhead historically existed in this area because flow conditions over Willamette Falls allowed only late winter steelhead to ascend the falls, until a fish ladder was constructed in the early 1900s and summer steelhead were introduced. Summer steelhead have become established in the McKenzie River where historically no steelhead existed, although these fish were not considered in the identification of historical populations. UWR steelhead are currently found in many tributaries that drain the west side of the upper Willamette River basin. Analysis of historical observations, hatchery records, and genetic analysis strongly suggested that many of these spawning aggregations are the result of recent introductions and do not represent a historical population. Nevertheless, the WLC-TRT recognized that these tributaries may provide juvenile rearing habitat or may be temporarily (for one or more generations) colonized during periods of high abundance.

One stratum and five historical populations of UWR steelhead occur within the action area (Table 9), although the west-side tributaries population was included only because it is important to the species as a whole, and not because it is independent. Of these five populations, none are "viable" (McElhany *et al.* 2007).

The major factors limiting recovery of UWR steelhead include lost/degraded floodplain connectivity and lowland stream habitat, degraded water quality, high water temperature, reduced streamflow, and reduced access to spawning/rearing habitat (NMFS 2006).

Table 9. UWR steelhead populations. Overall viability risk: "extinct or very high" means greater than 60 percent chance of extinction within 100 years; "relatively high" means 60 to 25 percent risk of extinction in 100 years; "moderate" means 25 to 5 percent risk of extinction in 100 years, "low or negligible" means 5 to 1 percent risk of extinction in 100 years; "very low" means less than 1 percent chance of extinction in 100 years, and NA means not available. A low or negligible risk of extinction is considered "viable."

Stratum		Population Spawning (Watershed)	Overall Viability Risk
Ecological Subregion	Run Type		
West Cascade Range	Winter	Molalla	Moderate
		North Santiam	Moderate
		South Santiam	Moderate
		Calapooia	Moderate
		West-side Tributaries	Moderate

Interior Columbia (IC) Recovery Domain. Only one species that is part of the IC Recovery Domain is likely to be adversely affected by the proposed test pile program, MCR steelhead. The WLC-TRT identified 17 demographically-independent populations of this species. These populations were further aggregated into strata, groupings above the population level that are connected by some degree of migration, based on ecological subregions. All 17 populations use parts of the mainstem of the Columbia River and the Columbia River estuary that flow through the action area for migration, rearing, and smoltification.

MCR steelhead. This species includes all naturally-spawned steelhead populations below natural and artificial impassable barriers in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington, excluding steelhead from the Snake River basin; and progeny of seven artificial propagation programs. The Interior Columbia Technical Recovery Team (IC-TRT) identified 20 historical populations of MCR steelhead in five major groups (Table 10) (IC-TRT 2003, McClure *et al.* 2005).

The major factors limiting recovery of MCR steelhead include altered channel morphology and flood plain, excessive sediment, degraded water quality, reduced streamflow, impaired passage, and hydropower system mortality (NMFS 2006).

Table 10. MCR steelhead populations.

Major Group	Population (Watershed)
Cascade Eastern Slope Tributaries	Klickitat River
	Fifteenmile Creek
	Deschutes River Eastside Tributaries
	Deschutes River Westside Tributaries
	White Salmon– access blocked above Condit Dam
	Deschutes – extirpated above Pelton Dam
	Crooked River - extirpated
John Day River	Lower Mainstem John Day River
	North Fork John Day River
	Middle Fork John Day River
	South Fork John Day River
	Upper Mainstem John Day River
	Willow Creek – extirpated
Rock Creek	Rock Creek
Walla Walla and Umatilla rivers	Umatilla River
	Walla Walla River
	Touchet River
Yakima River	Satus Creek
	Toppenish Creek
	Naches River
	Upper Yakima

Status of the Critical Habitat. NMFS designated critical habitat for all species considered in this Opinion, except LCR coho salmon, for which critical habitat has not been proposed or designated (Table 1). To assist in the designation of critical habitat for ESA-listed species of salmon and steelhead in 2005, NMFS convened Critical Habitat Analytical Review Teams, or "CHARTs," organized by major geographic areas that roughly correspond to salmon recovery planning domain (NOAA Fisheries 2005). Each CHART consisted of Federal biologists and habitat specialists from NMFS, the Fish and Wildlife Service, the Forest Service, and the Bureau of Land Management, with demonstrated expertise regarding salmon and steelhead habitat and related protective efforts within that domain.

Each CHART assessed biological information pertaining to areas under consideration for designation as critical habitat to identify the areas occupied by listed salmon and steelhead, determine whether those areas contained PCEs essential for the conservation of those species, and whether unoccupied areas existed within the historical range of the listed salmon and steelhead that may also be essential for conservation. The CHART then scored each habitat area based on the quantity and quality of the physical and biological features; rated each habitat area as having a ''high,'' ''medium,'' or ''low'' conservation value; and identified management actions that could affect habitat for salmon and steelhead.

The ESA gives the Secretary of Commerce discretion to exclude areas from designation if he determines that the benefits of exclusion outweigh the benefits of designation. Considering economic factors and information from CHARTs, NMFS partially or completely excluded the following types of areas from the 2005 critical habitat designations:

1. Military areas. All military areas were excluded because of the current national priority on military readiness, and in recognition of conservation activities covered by military integrated natural resource management plans.
2. Tribal lands. Native American lands were excluded because of the unique trust relationship between tribes and the federal government, the federal emphasis on respect for tribal sovereignty and self governance, and the importance of tribal participation in numerous activities aimed at conserving salmon.
3. Areas With Habitat Conservation Plans. Some lands covered by habitat conservation plans were excluded because NMFS had evidence that exclusion would benefit our relationship with the landowner, the protections secured through these plans outweigh the protections that are likely through critical habitat designation, and exclusion of these lands may provide an incentive for other landowners to seek similar voluntary conservation plans.
4. Areas With Economic Impacts. Areas where the conservation benefit to the species would be relatively low compared to the economic impacts.

In designating these critical habitats, NMFS organized information at scale of the watershed or 5th field HUC because it corresponds to the spatial distribution and site fidelity scales of salmon and steelhead populations (WDF *et al.* 1992, McElhany *et al.* 2000). For southern green sturgeon, the CHRT identified and designated critical habitat as “specific areas” within freshwater rivers, the bypasses, the Sacramento-San Joaquin Delta, coastal bays and estuaries, and coastal marine areas (within 110 m depth).

NMFS reviews the status of designated critical habitat affected by the proposed action by examining the condition and trends of PCEs throughout the designated area. These PCEs vary slightly for some species, due to biological and administrative reasons, but all consist of site types and site attributes associated with life history events (Tables 11 and 12).

Table 11. PCEs of critical habitats designated for ESA-listed salmon and steelhead species considered in the Opinion, and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site Type	**Site Attribute**	
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Estuarine areas	Forage Free of artificial obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation and "reverse smoltification" Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Nearshore marine areas	Forage Free of artificial obstruction Natural cover Water quantity Water quality	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing
Offshore marine areas	Forage Water quality	Adult growth and sexual maturation Adult spawning migration Subadult rearing

Table 12. PCEs of critical habitat proposed for southern green sturgeon and corresponding species life history events.

Primary Constituent Elements		Life History Event
Site Type	**Site Attribute**	
Freshwater riverine system	Food resources Migratory corridor Sediment quality Substrate type or size Water Depth Water flow Water quality	Adult spawning Embryo incubation, growth and development Larval emergence, growth and development Juvenile metamorphosis, growth and development
Estuarine areas	Food resources Migratory corridor Sediment quality Water flow Water depth Water quality	Juvenile growth, development, seaward migration Subadult growth, development, seasonal holding, and movement between estuarine and marine areas Adult growth, development, seasonal holding, movements between estuarine and marine areas, upstream spawning movement, and seaward post-spawning movement
Coastal marine areas	Food resources Migratory corridor Water quality	Subadult growth and development, movement between estuarine and marine areas, and migration between marine areas Adult sexual maturation, growth and development, movements between estuarine and marine areas, migration between marine areas, and spawning migration

Climate change is likely to have negative implications for the conservation value of designated critical habitats in the Pacific Northwest (CIG 2004, Scheuerell and Williams 2005, Zabel *et al.* 2006, ISAB 2007). Average annual Northwest air temperatures have increased by approximately $1^{o}C$ since 1900, or about 50 percent more than the global average warming over the same period (ISAB 2007). The latest climate models project a warming of 0.1 to $0.6^{o}C$ per decade over the next century. According to the ISAB, these effects may have the following physical impacts within the next 40 or so years:

- Warmer air temperatures will result in a shift to more winter/spring rain and runoff, rather than snow that is stored until the spring/summer melt season.
- With a shift to more rain and less snow, the snowpack will diminish in those areas that typically accumulate and store water until the spring freshet.
- With a smaller snowpack, these watersheds will see their runoff diminished and exhausted earlier in the season, resulting in lower stream flows in the June through September period.
- River flows in general and peak river flows are likely to increase during the winter due to more precipitation falling as rain rather than snow.
- Water temperatures will continue to rise, especially during the summer months when lower stream flows and warmer air temperatures will contribute to the warming regional waters.

These changes will not be spatially homogeneous across the entire Pacific Northwest. Sites with elevations high enough to maintain temperatures well below freezing for most of the winter and early spring would be less affected. Low-lying areas that historically have received scant precipitation are likely to be more affected. The ISAB (2007) also identified the likely effects of projected climate changes on Columbia River salmon and their habitat. These effects may include, but are not limited to, depletion of cold water habitat, variation in quality and quantity of tributary rearing habitat, alterations to migration patterns, accelerated embryo development, premature emergence of fry, and increased competition among species. Similar effects are likely to occur to some extent throughout the Pacific Northwest.

W LC Recovery Domain. Critical habitat was designated in the WLC recovery domain for UWR spring-run Chinook salmon, LCR Chinook salmon, LCR steelhead, UWR steelhead, and CR chum salmon. In addition to the Willamette and Columbia River mainstems, important tributaries on the Oregon side of the WLC include Youngs Bay, Big Creek, Clatskanie River, and Scappose River in the Oregon Coast subbasin; Hood River in the Gorge; and the Sandy, Clackamas, Mollala, North and South Santiam, Calapooia, McKenzie, and Middle Fork Willamette rivers in the West Cascades subbasin.

The Willamette River, once a highly braided river system, has been dramatically simplified through channelization, dredging, and other activities that have reduced rearing habitat by as much as 75 percent. In addition, the construction of 37 dams in the basin blocked access to more than 435 miles of stream and river spawning habitat. The dams alter the temperature regime of the Willamette River and its tributaries, affecting the timing and development of naturally-spawned eggs and fry. Agriculture, urbanization, and gravel mining on the valley floor logging in the Cascade and Coast Ranges contribute to increased erosion and sediment loads throughout the basin.

The mainstem Willamette River has been channelized and stripped of large wood. Development began to encroach on the riparian forest beginning in the 1870s (Sedell and Froggatt 1984). Gregory *et al.* (2002a) calculated that the total mainstem Willamette River channel area decreased from 41,000 to 23,000 acres between 1895 and 1995. They noted that the lower reach, from the mouth of the river to Newberg (RM 50), is confined within a basaltic trench, and that due to this geomorphic constraint, less channel area has been lost than in upstream areas. The middle reach from Newberg to Albany (RM 50 to 120) incurred losses of 12 percent primary channel area, 16 percent side channels, 33 percent alcoves, and 9 percent islands. Even greater changes occurred in the upper reach, from Albany to Eugene (RM 187). There, approximately 40 percent of both channel length and channel area were lost, along with 21 percent of the primary channel, 41 percent of side channels, 74 percent of alcoves, and 80 percent of island areas.

The banks of the Willamette River have more than 96 miles of revetments; approximately half were constructed by the U.S. Army Corps of Engineers. Generally, the revetments were placed in the vicinity of roads or on the outside bank of river bends, so that while only 26 percent of the total length is revetted, 65 percent of the meander bends are revetted (Gregory *et al.* 2002c). The majority of dynamic sections have been armored, reducing adjustments in channel bed and sediment storage by the river, and thereby diminishing both the complexity and productivity of aquatic habitats (Gregory *et al.* 2002b).

Riparian forests have diminished considerably in the lower reaches of the Willamette River (Gregory *et al.* 2002d). Sedell and Frogatt (1984) noted that agriculture and cutting of streamside trees were major agents of change for riparian vegetation, along with snagging of large wood in the channel. The reduced shoreline, fewer and smaller snags, and reduced riparian forest comprise large functional losses to the river, reducing structural features, organic inputs from litter fall, entrained allochthonous materials, and flood flow filtering capacity. Extensive changes began before the major dams were built, with navigational and agricultural demands dominating the early use of the river. The once expansive forests of the Willamette River floodplain provided valuable nutrients and organic matter during flood pulses, food sources for macroinvertebrates, and slow-water refugia for fish during flood events. These forests also cooled river temperatures as the river flowed through its many channels.

Gregory *et al.* (2002d) described the changes in riparian vegetation in river reaches from the mouth to Newberg, from Newberg to Albany, and from Albany to Eugene. They noted that the riparian forests were formerly a mosaic of brush, marsh, and ash tree openings maintained by annual flood inundation. Below the City of Newberg, the most noticeable change was that conifers were almost eliminated. Above Newberg, the formerly hardwood-dominated riparian forests along with mixed forest made up less than half of the riparian vegetation by 1990, while agriculture dominated. This conversion represents a loss of recruitment potential for large wood, which functions as a component of channel complexity, much as the morphology of the streambed does, to reduce velocity and provide habitat for macroinvertebrates that support the prey base for salmon and steelhead. Declining extent and quality of riparian forests have also reduced rearing and refugia habitat provided by large wood, shading by riparian vegetation which can cool water temperatures, and the availability of leaf litter and the macroinvertebrates that feed on it.

Hyporheic flow in the Willamette River has been examined through discharge measurements and was found to be significant in some areas, particularly those with gravel deposits (Fernald *et al.* 2001). The loss of channel complexity and meandering that fosters creations of gravel deposits decreases the potential for hyporheic flows, as does gravel mining. Hyporheic flow processes water and affects its quality on reemerging into the main channel, stabilizing variations in physical and chemical water characteristics. Hyporheic exchange was found to be significant in the National Water-Quality Assessment of the Willamette Basin (Wentz *et al.* 1998). In the transient storage zone, hyporheic flow is important for ecological functions, some aspects of water quality (such as temperature and dissolved oxygen), and some benthic invertebrate life stages. Alcove habitat, limited by channelization, combines low hydraulic stress and high food availability with the potential for hyporheic flows across the steep hydraulic gradients in the gravel separating them from the main channel (Fernald *et al.* 2001).

On the mainstem of the Columbia River, hydropower projects, including the Federal Columbia River Hydropower System (FCRPS), have significantly degraded salmon and steelhead habitats (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2005a, NOAA Fisheries 2006). The series of dams and reservoirs that make up the FCRPS block an estimated 12 million cubic yards of debris and sediment that would otherwise naturally flow down the Columbia and replenish shorelines along the Washington and Oregon coasts.

Industrial harbor and port development are also significant influences on the Lower Willamette and Lower Columbia rivers (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2005a, NOAA Fisheries 2006). Since 1878, 100 miles of river channel within the mainstem Columbia River, its estuary, and Oregon's Willamette River have been dredged as a navigation channel by the Army Corps of Engineers. Originally dredged to a 20-foot minimum depth, the Federal navigation channel of the Lower Columbia River is now maintained at a depth of 43 feet and a width of 600 feet. The Lower Columbia River supports five ports on the Washington State side: Kalama, Longview, Skamania County, Woodland, and Vancouver. In addition to loss of riparian habitat, and disruption of benthic habitat due to dredging, high levels of several sediment chemicals, such as arsenic and polycyclic aromatic hydrocarbons (PAHs), have been identified in Lower Columbia River watersheds in the vicinity of the ports and associated industrial activities.

The most extensive urban development in the Lower Columbia River subbasin occurs in the Portland/Vancouver area. Outside of this major urban area, the majority of residences and businesses rely on septic systems. Common water quality issues with urban development and residential septic systems include higher water temperatures, lowered dissolved oxygen, increased fecal coliform bacteria, and increased chemicals associated with pesticides and urban runoff.

The Columbia River estuary has lost a significant amount of tidal marsh and tidal swamp habitat that are critical to juvenile salmon and steelhead, particularly small or ocean-type species (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2005a, NOAA Fisheries 2006). Edges of marsh areas provide sheltered habitats for juvenile salmon and steelhead where food, in the form of amphipods or other small invertebrates which feed on marsh detritus, is plentiful, and larger predatory fish can be avoided. Historically, floodwaters of the Columbia River inundated the margins and floodplains along the estuary, allowing juvenile salmon and steelhead access to a wide expanse of low-velocity marshland and tidal channel habitats. In general, the riverbanks were gently sloping, with riparian and wetland vegetation at the higher elevations of the river floodplain becoming habitat for salmon and steelhead during flooding river discharges or flood tides. Sherwood *et al.* (1990) estimated that the Columbia River estuary lost 20,000 acres of tidal swamps, 10,000 acres of tidal marshes, and 3,000 acres of tidal flats between 1870 and 1970. This study further estimated an 80 percent reduction in emergent vegetation production and a 15 percent decline in benthic algal production.

Habitat and food-web changes within the estuary, and other factors affecting salmon population structure and life histories, have altered the estuary's capacity to support juvenile salmon (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2005a, NOAA Fisheries 2006). Diking and filling activities that decrease the tidal prism and eliminate emergent and forested wetlands and floodplain habitats have likely reduced the estuary's salmon-rearing capacity. Moreover, water and sediment in the Lower Columbia River and its tributaries have levels of toxic contaminants that are harmful to fish and wildlife (LCREP 2007). Contaminants of concern include dioxins and furans, heavy metals, polychlorinated biphenyls (PCBs) and organochlorine pesticides such as dichlorodiphenyltrichloroethane (DDT). Simplification of the population structure and life-history diversity of salmon possibly is yet another important factor affecting juvenile salmon viability. Restoration of estuarine habitats, particularly diked emergent and forested wetlands, reduction of avian predation by terns, and flow manipulations to restore historical flow patterns might significantly enhance the estuary's productive capacity for salmon, although historical changes in population structure and salmon life histories may prevent salmon from making full use of the productive capacity of estuarine habitats, even in their presently altered state.

The NMFS recently proposed critical habitat for southern green sturgeon, including coastal U.S. marine waters within 110 m depth from Monterey Bay, California, including Monterey Bay, north to Cape Flattery, Washington, including the Straits of Juan de Fuca, Washington, to its U.S. boundary; the Sacramento River, lower Feather river, and lower Yuba River in California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California; the Lower Columbia River estuary; and certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, and Yaquina Bay), and Washington (Willapa Bay and Grays Harbor). In addition to the general exclusions listed above, the CHART determined that the following areas within the Southern Oregon and Northern California Coasts Recovery Domain will be excluded from critical habitat designations: Elkhorn Slough, Tomales Bay, Noyo Harbor, Eel River estuary, Klamath/Trinity River estuary, and the Rogue River estuary. Excluded estuary areas extend to the head of tide. The CHART based their determination on these areas having a "low" or "ultra-low" conservation value and a lack of documentation that southern green sturgeon use these areas extensively.

IC Recovery Domain. Critical habitat has been designated in the IC recovery domain, which includes the Snake River Basin, for SR spring/summer Chinook salmon, SR fall-run Chinook salmon, UCR spring-run Chinook salmon, SR sockeye salmon, MCR steelhead, UCR steelhead, and SRB steelhead. Major tributaries in the Oregon portion of the IC recovery domain include the Deschutes, John Day, Umatilla, Walla Walla, Grande Ronde, and Imnaha rivers.

Habitat quality in tributary streams in the IC recovery domain varies from excellent in wilderness and roadless areas to poor in areas subject to heavy agricultural and urban development (Wissmar *et al.* 1994, Carmichael 2006). Critical habitat throughout the IC recovery domain has been degraded by intense agriculture, alteration of stream morphology (*i.e.*, channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer stream flows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in developed areas.

Migratory habitat quality in this area has been severely affected by the development and operation of the FCRPS dams and reservoirs in the mainstem Columbia River, Bureau of Reclamation tributary projects, and privately owned dams in the Snake and Upper Columbia river basins. For example, construction of Hells Canyon Dam eliminated access to several likely production areas in Oregon and Idaho, including the Burnt, Powder, Weiser, Payette, Malheur, Owyhee, and Boise river basins (Good *et al.* 2005), and Grande Coulee and Chief Joseph dams completely block anadromous fish passage on the upper mainstem Columbia River.

Hydroelectric development modified natural flow regimes, resulting in higher water temperatures, changes in fish community structure leading to increased rates of piscivorous and avian predation on juvenile salmon and steelhead, and delayed migration for both adult and juveniles. Physical features of dams such as turbines also kill migrating fish. In-river survival is inversely related to the number of hydropower projects encountered by emigrating juveniles. Similarly, development and operation of extensive irrigation systems and dams for water withdrawal and storage in tributaries have drastically altered hydrological cycles. A series of large regulating dams on the middle and upper Deschutes River affect flow and block access to upstream habitat, and have extirpated one or more populations from the Cascades Eastern Slope major population (IC-TRT 2003). Similarly, operation and maintenance of large water reclamation systems such as the Umatilla Basin and Yakima Projects have significantly reduced flows and degraded water quality and physical habitat in this domain.

Many stream reaches designated as critical habitat in the IC recovery domain are over-allocated under state water law, with more allocated water rights than existing streamflow conditions can support. Irrigated agriculture is common throughout this region and withdrawal of water increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence *et al.* 1996). Reduced tributary stream flow has been identified as a major limiting factor for all listed salmon and steelhead species in this area except SR fall-run Chinook salmon (NMFS 2005).

Many stream reaches designated as critical habitat are listed on the state of Oregon's Clean Water Act section 303(d) list for water temperature. Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Contaminants such as insecticides and herbicides from agricultural runoff and heavy metals from mine waste are common in some areas of critical habitat.

Environmental Baseline

The environmental baseline includes 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).

The action area extends from RM 101 to 119 in the mainstem Lower Columbia River. This is within the Columbia River estuary, which extends from the mouth of the river to the upstream limit of tidal influence, *i.e.*, to Bonneville Dam at RM 146.1. The construction footprint for the proposed test pile project is at RM 106.

Within the Lower Columbia River subbasin, including the action area, flooding was historically a frequent occurrence, contributing to habitat diversity via flow to side channels and deposition of woody debris. The Lower Columbia River estuary is estimated to have had 75 percent more tidal swamps than the current estuary because tidal waters could reach floodplain areas that are now isolated from the river channel by dikes. These areas provided feeding and resting habitat for juvenile salmonids in the form of low-velocity marshland and tidal channel habitats (Bottom *et al.* 2005).

Over the past century, human activities have extensively altered the upland and riverine habitat conditions in the action area. As a result, these activities contribute to the risk of extinction for salmon stocks in the Columbia River basin due to loss or fragmentation of important freshwater and estuarine habitats needed to maintain diverse wild populations and life histories. These habitat components have been lost or directly altered through damming, diking, filling, and dredging activities, and also degraded through changes to flow regulation that affect sediment transport and salinity within the estuary.

The Columbia River estuary historically received annual spring freshet flows that averaged 75 to 100 percent higher than current freshet flows. Conversely, historical winter flows (October through March) were approximately 35 to 50 percent lower than current flows. The greater historical peak and variable flows encouraged greater sediment transport and more flooding of wetlands, contributing to a more complex ecosystem than exists today (ISAB 2000).

Historical changes to Columbia River mainstem habitat have increased nontidal water/wetland and upland habitat, and substantially decreased tidal mud flats and tidal marsh habitat types (Fresh *et al.* 2005). The Lower Columbia River estuary lost approximately 43 percent of its tidal marsh (from 16,180 acres historically to 9,200 acres in 1970), and 77 percent of its historical tidal swamp habitats (from 32,020 acres historically to 6,950 acres in 1970) between 1870 and 1970 (Thomas 1983). In particular, the diking and filling of floodplains has eliminated large expanses of low-energy, off-channel habitat for Pacific salmonid rearing and migrating during high flows. As a result, the connectivity among the habitats needed to support tidal and seasonal movements of juvenile salmonids has been altered or lost.

The twelve major dams located in the Columbia Basin, built on the Columbia and Snake Rivers between the 1930s and 1970s, significantly altered the timing and velocity of hydrologic flow and reduced peak season discharges (NMFS 2010). The second major factor regulating stream flow in the action area is tidal influence from the Pacific Ocean. Although the salt water wedge does not extend into the action area, tidal shifts affect flow and stage in the Columbia River up to Bonneville Dam. NMFS defines the Columbia River estuary as extending from the mouth to the upstream extent of tidal influence, which therefore includes the area up to Bonneville Dam, and the action area.

Historically, terrestrial habitat in the action area was characterized by closed upland forest/woodland with patches of grassland savannah and prairie in lowland areas near water (Hulse *et al.* 2002). Forest types of the region included old-growth conifers such as Douglas-fir (*Pseudotsuga menziesii*), spruce (*Picea* sp.), and hemlock (*Tsuga* sp.); remnant hardwoods (*e.g.*., Oregon oak [*Quercus garryana*] woodlands); and riparian, wetland, and aquatic systems (Omernik 1987). Most upland habitat in the action area has been converted to commercial and residential developed uses.

The lower river habitats contribute to the viability and persistence of salmonid populations in a number of ways. The amount of accessible habitat affects the abundance and productivity of a population, and the distribution, connectivity, number, sizes, and shapes of the habitat affects both the life history diversity and the spatial structure of a population (Fresh *et al.* 2005). In addition, life-stage specific survival rates vary with habitat characteristics (*e.g.*., temperature and salinity regimes, food web relationships).

The Columbia River within the action area is substantially altered by human disturbance, including the existing I-5 bridge, located just east of the proposed project area. The majority of the immediate upland areas are highly developed with urbanization extending to the shoreline, which has resulted in extensive removal of historical streamside forests and wetlands. Riparian areas have been further degraded by the construction of dikes and levees and the placement of stream bank armoring. For several decades, industrial, residential, and upstream agricultural sources have contributed to profound water quality degradation in the river. Additionally, existing levels of disturbance are high due to heavy barge traffic.

Availability of aquatic habitat for native fish, particularly those that rely heavily on low-velocity side channel habitat for holding, feeding, and rearing, has declined as a result of these changes to habitat-forming processes. Aquatic habitat components that have been affected by these changes include the amount and distribution of woody debris, rates of sand and sediment transport, variations in temperature patterns, the complexity and species composition of the food web, the distribution and abundance of salmonid predators, the complexity and extent of tidal marsh vegetation, and seasonal patterns of salinity.

The shallow nearshore habitat in the action area occurs near both the Oregon and Washington shores and is influenced by flow and sediment input from tributaries and the mainstem river. This sediment input eventually settles to form shoals and shallow flats, which are used extensively by juvenile salmonids, and may potentially be used by adult fish for migrating, feeding, and holding. Phytoplankton, microdetritus, and macroinvertebrates are also present in shallow areas and serve as the prey base for salmonids (USACE 2001).

Hydrology has been profoundly altered from historical conditions by constructed dikes and levees, and bridge footings which constrict the floodplain. Numerous upstream dams, shoreline levees, and channel dredging have restricted habitat forming processes such as sediment transport and deposition, erosion, and natural flooding. Additionally, the shorelines receive high levels of disturbance in the form wakes from heavy barge traffic. Therefore, habitat complexity and shallow habitat areas are generally lacking in the action area. Shoreline erosion rates are likely slower than they were historically due to flow regulation from upstream dams. The river channel is deeper and narrower than historical conditions.

The substrate in the test pile project area consists of coarse sand with relatively small percentages of fine sediments and/or organic material (DEA 2006; NMFS 2002). The project location is in deep water of approximately 30 feet to 50 feet.

Sand and gravel mining routinely occurs in several locations in and near the action area. Multnomah County issued seven permits for sand and gravel mining between September 2006 and June 2009, with expiration dates extending to as late as May 2019.

Some high-quality backwater and side channel habitats have persisted along the Lower Columbia River near undeveloped islands outside of the action area (USACE 2001). These habitats contain high-quality wetlands and riparian vegetation, such as emergent plants and low herbaceous shrubs. However, the riparian area within the action area is relatively degraded, and shallow water habitat has only sparse vegetative cover. Because riparian areas are limited in size and are unlikely to grow in this urban setting, there is little potential for future large wood recruitment. Fish cover elements are generally sparse in the action area, although some boulders and artificial structures are present.

Species within the Action Area

All populations spawning within the Columbia River basin use the Columbia River mainstem and estuary to complete part of their life history, including migration, rearing and smoltification. With few exceptions for populations that spawn below RM 106, every individual from each of those populations must pass through the action area at least twice, during downstream migration as a juvenile and upstream migration as an adult. However, only a small proportion of the fish in the affected populations will be present within the Lower Columbia River, an area that extends from the mouth to Bonneville Dam at RM 146.1 (Table 13).

Table 13. Proportion of selected runs in the Lower Columbia River during the test pile program (based on information from the BA, Table 4-2).

Species Population	Juvenile	Adult
Chinook	0.1 – 1.3	0.01 – 0.09
Chum	0.01 – 1.20	<0.1
Coho	0.4	<0.1
Steelhead	<0.1	0.5 – 5.3

Because the action area itself extends only extends for approximately 15.9 miles, or 10.9 percent of the length of the Lower Columbia River (not including the Willamette River), it is likely that the proportion of runs that would occur in the action area during the proposed test pile project will be at least an order of magnitude smaller than those shown in Table 13.

The condition of these individuals when they arrive in the action area, and their experience within the action area, varies widely based on life history type (*e.g..*, ocean or stream type), run timing, body size, age, behavior, disease, habitat quality, and their biological interactions with other individuals and species through biological processes such as competition and predation.

Critical Habitat within the Action Area

Critical habitat units are described by their PCEs. PCEs are the physical and biological features of critical habitat essential to the conservation of listed species, including, but not limited to: (1) Space for individual and population growth and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and (5) habitats that are protected from disturbance or are representative of the historic geographic and ecological distributions of a species (USFWS and NMFS 1998).

Only three of the six PCEs that are used to describe these critical habitats also occur within the action area. Those are freshwater spawning sites, freshwater rearing sites, and freshwater migration corridors. Three PCEs related to estuarine, nearshore, and marine areas are important elsewhere within the range of these critical habitats but do not occur within the action area.

Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development. Spawning habitat is extremely limited in the action area, and is present for only three species. CR chum spawn in shallow habitat on the Washington shore of the Columbia River near Government Island, at approximately RM 115. Otherwise, the rest of the action area appears to lack suitable spawning habitat (*e.g.*., gravel substrate influenced by groundwater seeps). Although other suitable chum spawning habitat exists within the action area, redds may be at risk if river levels drop and exposes the eggs. Due to residential development in upland areas adjacent to spawning habitat, groundwater seeps that support hyporheic flow may be at risk.

Freshwater rearing sites with: (i) water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; (ii) water quality and forage supporting juvenile development; and (iii) natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. This PCE is functioning in the action area but is highly degraded. Based on site visits and the interpretation of aerial photographs, floodplain connectivity with associated off-channel refugia is limited or absent. Dikes, levees, and streambank armoring are abundant alongside critical habitat within the action area. Urban development extends up to the streambank in numerous locations. Water quality in the action area is 303(d)-listed for temperature, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), dichlorodiphenyltrichloroethane (DDT) metabolites, particularly dichlorodiphenyldichloroethylene (DDE), and arsenic; the U.S. Environmental Protection Agency has approved total maximum daily loads for dioxin and total dissolved gas (DEQ 2007a). Dissolved copper and dissolved zinc are commonly detected in highway stormwater runoff, and are likely to be present in the action area. Natural cover elements are limited or absent due to the highly altered and managed nature of the river channel. Given the volumes of water conveyed in the mainstem Columbia River, water quantity is not necessarily limited. However, flow control at Bonneville Dam affects river levels, and juvenile stranding and entrapments are possible. Forage for juvenile salmonids is not documented as limited in the action area. However, lack of complex habitat structure and cover likely reduces the abundance and diversity of forage species.

Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival. The action area functions as a migration corridor for salmonids, but this PCE is highly degraded. There are no known physical barriers to fish passage between the action area and the Pacific Ocean. However, water quality is impaired, and natural cover is limited or absent within the action area. Water quantity is not a limiting factor, with the exception of the risk of stranding and entrapments as discussed above.

Effects of the Action

Effects of the action refers to the direct and indirect effects of an action on the species or critical 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). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. No interrelated or interdependent actions are associated with the test pile program.

The effects of the test pile program will include underwater noise, reduced water quality, and increases in undesirable over-water cover. For reasons explained below, the first two effects are expected to occur as very short-term pulses (*i.e.,* minutes to hours), separated by virtually instantaneous and complete recovery periods, and repeated over a period of up to four days, although the intensity, or magnitude, of the underwater noise effects will be such that individual fish within the geographic area affected are likely to be injured or killed. The increase in over-water cover will last the duration of the test pile program but will have a very weak effect, if any, on a small area.

According to the BA, completion of the test pile project will require installation and removal of three 24-inch and three 48-inch steel piles. Both impact pile driving and vibratory pile driving methods will be tested, with one to two days of testing anticipated at each of the two locations. Impact driving is expected to be limited to approximately six hours total during the project, of which approximately two hours of driving will occur without attenuation methods operating. Two test piles at each location will be installed using an impact hammer to test the effectiveness of an unconfined and confined bubble curtain. In-water noise attenuation measures will be tested during impact driving activities during the pile driving project and produce a wide range of impact. These activities will produce a variety of underwater noise levels within radii that will be referred to collectively as “the impact zone” (Table 14). In the absence of site-specific data, these radii were calculated using the Practical Spreading Loss model for determining the extent of sound from a source (Davidson 2004, Thomsen *et al.* 2006, Stadler 2010).

Table 14. Proposed pile test project: Impact pile driving and effect characteristics.

Impact Pile Driving and Effect Characteristics ("impact zone")	24-inch Pile		48-inch Pile	
	Without Attenuation	With Attenuation	Without Attenuation	With Attenuation
Total strikes per day	500	500	500	500
Total days of driving	3	3	3	3
Strike interval (seconds)	1.5	1.5	1.5	1.5
Root mean square sound pressure level radius exceeds 150 dB re: 1 μPa^2 (distance in feet)	13,058	2814	66,144[1]	17,751
Cumulative sound exposure level radius that exceeds 183 dB re: 1 μPa^2•sec (distance in feet)	1466	177	3250	774
Cumulative sound exposure level radius that exceeds 187 dB re: 1 μPa^2•sec (distance in feet)	823	164	1771	449
Peak sound pressure level that exceeds 206 dB re: 1 μPa (distance in feet)	82	112	16	23

[1] Upstream distance; downstream radius is 29,031 feet due to topographic interception.

No data are available to estimate underwater noise levels likely to be produced by the vibratory pile driving, although it is anticipated that the root mean square sound pressure level will exceed 150 dB re: 1 μPa^2.

Pile installation and removal will disturb the sediments in the action area. Further, installation and operation of the bubble curtain will result in some local resuspension of coarse-grained material into the water column. Because these actions will take place in a sandy substrate and will be limited to a small area and a brief portion of the work period, the increase in turbidity is expected to be small.

Six temporary piles, several barge spuds in the water column, and at least one work barge and several work boats will be used. These elements will occupy space in the water column and create undesirable over-water cover that may lead to a temporary impediment to fish passage and an increase in cover for predators on juvenile salmon and steelhead, such as northern pike minnow (*Ptychocheilus oregonensis*). This duration of this effect will be limited to a maximum of 10 days, no project activities will occur in shallow water, the total space occupied by the piles and spuds will be limited to 50 square feet, and the channel substrate and flow of channel substrate is such that recovery from any adverse effects will occur within hours.

Species Within the Action Area

Fish are sensitive to underwater impulsive sounds, like pile driving, that produce a sharp sound pressure peak occurring in a short interval of time. As the pressure wave passes through a salmon, steelhead, or other fish with a swim bladder, the swim bladder is rapidly squeezed due to the high pressure, and then rapidly expanded as the under pressure component of the wave passes through the fish. The pneumatic pounding may rupture capillaries in the internal organs as indicated by observed blood in the abdominal cavity, and maceration of the kidney tissues. The injuries caused by such pressure waves are known as barotraumas, and include hemorrhage and rupture of internal organs, as described above, external hemorrhage, and damage to the auditory system. These injuries can cause instantaneous death, death within minutes after exposure, or death which occurs several days later. Sublethal injuries may make fish more susceptible to predation or disease, or otherwise less fit to complete essential biological functions such as feeding, breeding or sheltering.

A multi-agency work group determined that to protect listed species, sound pressure waves should be within a single strike threshold of 206 dB re: 1 μPa, and for cumulative strikes sound pressure waves should be less than 187 dB re: 1 μPa^2•sec sound exposure level for fish that are larger than 2 grams and less than 183 dB re: 1 μPa^2•sec sound exposure level for fish that are smaller than 2 grams (IWG 2008). Any salmon or steelhead that occurs within the radius where the root mean square sound pressure level will exceed 150 dB re: 1 μPa^2 may experience a temporary threshold shift in hearing due to a temporary fatiguing of the auditory system that can reduce the survival, growth, and reproduction of the affected fish by increasing the risk of predation and reducing foraging or spawning success (Stadler and Woodbury 2009).

Thus, noise levels that are predicted to be produced by the pile study program are likely to injure or kill OC chum salmon embryos and alevins, and any juvenile salmon or steelhead weighing less than 2 grams, that occur within the radius where the noise produced by a strike pile strike will exceed 206 dB re: 1 μPa, or where the cumulative sound exposure level will exceed 183 dB re: 1 μPa^2•sec. Similarly, any juvenile salmon and steelhead that weigh more than 2 grams, and any adult salmon or steelhead, that occur within the radius where the noise produced by a pile strike will exceed 206 dB re: 1 μPa, or where the cumulative sound exposure level will exceed 183 dB re: 1 μPa^2•sec are likely to be injured or killed. Finally, any salmon or steelhead that occurs within the the radius where the root mean square sound pressure level will exceed 150 dB re: 1 μPa^2 may experience an temporary threshold shift in hearing that will increase the risk that those individuals will be subject to predation and reduce their likelihood of foraging or spawning success.

Reduced water quality associated with pile installation and removal and an increase in undesirable associated with the piles and barge may cause juvenile salmon and steelhead to avoidance of the immediate area surrounding the piles and barge, or to a small increase in predation in that area.

Critical Habitat Within the Action Area

1. Freshwater spawning
   a. Substrate – No effect
   a. Water quality – Noise during pile driving and, to a very small extent, pulses of suspended sediment during pile driving and testing will diminish conservation value of this PCE to support CR chum salmon embryos during incubation and for alevins during emergence and outmigration
   c. Water quantity – No effect
2. Freshwater rearing
   a. Floodplain connectivity – No effect
   b. Forage – No effect
   c. Natural cover – Minor effects from undesirable over-water structure during pile

driving and testing will reduce the conservation value of this PCE to support juvenile salmon and steelhead while feeding, resting, and during smoltification

   d. Water quality – Noise from pile driving and minor pulses of suspended sediment will diminish conservation value for juvenile salmon and steelhead while feeding, resting, and during smoltification
   e. Water quantity – No effect
3. Freshwater migration
   a. Free of artificial obstruction - Noise from pile driving and minor pulses of suspended sediment will diminish conservation value of this PCE to support safe passage of salmon and steelhead, adults and juveniles
   b. Natural cover – Minor effects from undesirable over-water structure during pile driving and testing will reduce the conservation value of this PCE to support safe passage of juvenile salmon and steelhead
   c. Water quality – Noise from pile driving and minor pulses of suspended sediment will diminish conservation value of this PCE to support safe passage for juvenile salmon and steelhead
   d. Water quantity – No effect
4. Estuarine areas – No effect
5. Nearshore marine areas – No effect
6. Offshore marine areas – No effect

Cumulative Effects

Cumulative effects are 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).

No future state or private activities, not involving Federal activities, were identified in the BA as reasonably certain to occur in the action area.

Synthesis and Integration of Effects

Species at the Population Scale

Of 109 independent populations and seven species of ESA-listed salmon and steelhead that are likely to be adversely affected by this proposed action, and that have had a viability analysis completed, few are rated as “viable” and the overall risk of extinction varies from low (1 to 5 percent chance of extinction in 100 years) to very high (greater than 60 percent chance of extinction in 100 years). Many factors have been identified as limiting the recovery of these species, most notably degraded habitat (especially floodplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, stream substrate and streamflow), hatchery and harvest-related effects, and adverse effects related to mainstem hydropower development.

Four recovery plans and an estuary module are under development for species in the WLC Recovery Domain, and a recovery plan has been completed for MCR steelhead in the IC

Recovery Domain. While the nature of the proposed test pile project makes it difficult to compare with actions identified as necessary for recovery in those plans, it is clear that information gained from the test pile project will be useful to reduce the adverse effects of future major construction projects in the lower Columbia River on these species.

The NMFS designated critical habitat for all species considered in this opinion, except LCR coho salmon, for which critical habitat has not been designated or proposed. PCEs designated for salmon and steelhead include physical and biological features that support adult migration and juvenile rearing and migration. The lower Columbia River has been largely significantly altered by the effects of dam and reservoir development upstream, channelized, revetted, and stripped of large wood, thereby significantly diminishing both the complexity and productivity of aquatic habitats.

The environmental baseline within the action area includes a channelized mainstem with highly regulated streamflow, simplified channel habitats, and a river that is disconnected from its floodplain. Extensive development for residential, commercial and recreational use converted much of the shoreline to riprap with little relief, few trees, and many over and in-water structures. The proposed test pile program is in a relatively narrow and deep stretch of the Columbia River that does not provide slow water, shallow areas preferred by juvenile salmonids.

The effects of the proposed action that will adversely affect listed species over a period of weeks during the pile test program are underwater noise, reduced water quality, and an increase in undesirable over-water cover. The first two effects are expected to occur as very short-term pulses (*i.e.,* minutes to hours), separated by virtually instantaneous and complete recovery periods, and to be repeated over a period of up to four days. The intensity, or magnitude, of the underwater noise effects will be such that individual fish within the geographic area affected are likely to be injured or killed.

The proportion of juvenile and adult fish from each affected population that is likely to occur within the radius where the root mean square sound pressure level will exceed 150 dB re: 1 μPa^2 and thus could sustain an injury in the form of a temporary threshold shift in hearing that would impair essential biological functions, is likely to be far less than 0.01 percent, except for adult MCR steelhead. The proportion of adult MCR steelhead that could be affected may be as high as 0.5 percent. The proportion of fish that are likely to be within the immediate vicinity of pile driving where they could encounter harmful noise at levels that exceed a single strike threshold of 206 dB re: 1 μPa, or sound pressure waves for cumulative strikes that exceed 187 dB re: 1 μPa^2•sec sound, and thus be subject to hemorrhage and rupture of internal organs, is orders of magnitude smaller than the zone where they could experience temporary auditory fatigue, such that the proportion of adult MCR steelhead populations likely to encounter significant barotraumas is less than .03 percent.

The habitat-related effects of this action cannot be accurately quantified because the precise distribution and abundance of adult and juvenile fish within the action area are not a simple function of the quantity, quality, or availability of predictable habitat resources within that area. Nonetheless, the primary adverse effects of the action related to underwater noise will occur during times when the relative density of juvenile salmon and steelhead is very low and will be completed within a few days. Moreover, the effects anticipated will not contribute to a factor that is limiting the recovery of any these species, or create a new factor that could limit their recovery. It is likely that the net effect of the proposed action will be a very small and temporary reduction in the number of juvenile and adult fish from ESA-listed species in the action area, far too few to significantly reduce adult returns, and thus too few to affect the abundance or productivity of any affected population. Therefore, it is unlikely that the proposed action will appreciably reduce the likelihood of survival and recovery of any listed species.

Critical Habitat at the Watershed Scale

The same effects of the proposed action that will have an adverse affect on listed salmon and steelhead will also have an adverse affect on critical habitat PCEs for salmon and steelhead, *i.e.*, underwater noise, water quality reduction, and increase in undesirable over-water structure. Together, these effects are likely to cause a minor reduction in the conservation value of critical habitat PCEs for the rearing and migration corridor within the action area, but are too small and brief to affect the conservation value of the lower Columbia River, or any designated critical habitat as a whole. Therefore, it is likely that critical habitat will remain functional and retain the current ability for PCEs to become functionally established, to serve the intended conservation role for the species.

Conclusion

For reasons explained at the end of this Opinion, the proposed action is NLAA UCR spring-run Chinook salmon, SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, UCR steelhead, SRB steelhead, eulachon, southern green sturgeon, or southern resident killer whale, or their designated critical habitats, except for eulachon, which does not have critical habitat designated or proposed, and Steller sea lion and southern resident killer whale, which do not have critical habitat designated within the action area.

After reviewing the status of LCR Chinook salmon, UWR Chinook salmon, CR chum salmon, LCR coho salmon, LCR steelhead, UWR steelhead, MCR steelhead, or Steller sea lion and their designated critical habitats, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, NMFS concludes that the proposed test pile project in not likely to jeopardize the continued existence of these species, or result in the destruction or adverse modification of their designated critical habitats, except for LCR coho salmon, which do not have critical habitat designated or proposed.

Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. 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. Harm is further defined by NMFS as significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by Fish and Wildlife Service as an intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not prohibited under the ESA, provided that such taking is in compliance with the terms and conditions of an incidental take statement.

The NMFS is not including an incidental take authorization for Steller sea lions at this time because the incidental take of marine mammals has not been authorized under section 101(a)(5) of the Marine Mammal Protection Act and/or its 1994 Amendments. Following issuance of such regulations or authorizations, the NMFS may amend this biological opinion to include an incidental take statement for Steller sea lions.

Amount or Extent of Take

Work that would be permitted under the proposed pile test program will cause harm to LCR Chinook salmon, UWR Chinook salmon, CR chum salmon, LCR coho salmon, LCR steelhead, UWR steelhead, and MCR steelhead in the lower Columbia River between approximately RM 101 and 119. This area is used by CR chum salmon as a spawning area, and by adults and juveniles of all of these species for rearing and migration during the time when the pile test program would produce harmful underwater noise, reduced water quality and undesirable over-water structure. Habitat Analytical Review Team (CHART) in 2007 as having "High" conservation value for each species considered in this consultation, although present conditions in the action area are degraded. The habitat that will be affected is not limited at the site or watershed scale.

The distribution and abundance of ESA-listed salmon and steelhead that occur within an action area is affected by habitat quality, competition, predation and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by the proposed action. Thus, the distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action. As explained in the synthesis and integration of effects, NMFS estimates that the proposed action is likely to injure or kill an insignificant percentage of the affected populations.

For this Opinion, the extent of take is defined as the area where underwater noise created by the proposed test pile program will harm juvenile and adult salmon and steelhead by causing auditory and other tissue damage. The extent of take is described by an area affected by the radius of underwater noise created by pile driving an unattenuated 48-inch pile, *i.e.*, approximately 66,000 feet upstream and 29,000 feet downstream for the radius where the root mean square sound pressure level will exceed 150 dB re: 1 μPa^2, approximately 3250 feet up and downstream for a cumulative sound exposure level radius that exceeds 183 dB re: 1 μPa^2•sec, approximately 1,771 feet up and downstream for a cumulative sound exposure level radius that exceeds 187 dB re: 1 μPa^2•sec, and approximately 16 feet for a peak sound pressure level that exceeds 206 dB re: 1 μPa.

The best available indicators for this extent of take are: (1) The number of 48-inch piles that will be driven, *i.e.*, three; and (2) exceeding the radius of underwater noise created by pile driving an unattenuated 48-inch pile by a significant margin, *i.e.*, 10 percent. Exceeding either of these limits will trigger the reinitiation provisions of this opinion.

In the accompanying Opinion, NMFS determined that this level of incidental take is not likely to result in jeopardy to the species affected.

Reasonable and Prudent Measures

The following measures are necessary and appropriate to minimize the impact of incidental take of listed species due to the proposed action:

The FHWA and FTA shall:

1. Ensure that all a qualified fishery qualified biologist is present during all impact pile driving and vibrating operations to observe and report any indications of dead, injured, or distressed fishes, including direct observations of these fishes or increases in bird foraging activity.

2. Ensure completion of a monitoring and reporting program to confirm that the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are effective in minimizing incidental take.

Terms and Conditions

The measures described below are non-discretionary, and must be undertaken by the FHWA and FTA for the exemption in section 7(o)(2) to apply. The FHWA and FTA have a continuing duty to regulate the activity covered by this incidental take statement. If the FHWA and FTA (1) fail to assume and implement the terms and conditions or (2) fails to require their agents to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the funding document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the FHWA and FTA must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement.

1. To implement reasonable and prudent measure #1 (qualified fishery biologist observer), the FHWA and FTA shall ensure that at least one fishery biologist with the experience, knowledge, supplies, and equipment necessary to observe any fish, mammal or bird behavior in the vicinity of the pile driving and removal, and to collect and verify any injured or dead fish that may be observed, is present at all times and during each stage of the pile installation and removal.

2. To implement reasonable and prudent measure #2 (monitoring and reporting), the FHWA and FTA shall:

   a. Carry out all steps of the final test pile project monitoring plan.
   b. Provide NMFS with a copy of a draft test pile project monitoring reports within 60-days of completing the hydroacoustic monitoring.
   c. Provide NMFS with a copy of a final test pile project monitoring reports within 30-days of receiving comments on the draft report from NMFS.
   d. To submit the project monitoring reports, or to reinitiate consultation, contact:

      Oregon State Habitat Office
      National Marine Fisheries Service
      Attn: 2010/06062
      1201 NE Lloyd Blvd., Ste. 1100
      Portland, Oregon 97232-1274

Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. The following recommendations are discretionary measures that are consistent with this obligation and therefore should be carried out by the FHWA and FTA:

> The FHWA and FTA should develop and carry out a plan to better equip their staff and partners with the skills, tools and resources necessary to support more collaborative problem-solving during the ESA consultation process; align their accountability systems with higher expectations for collaboration; and achieve and recognize the superior environmental outcomes that accrue through collaborative problem-solving efforts.

Please notify NMFS if the FHWA and FTA carry out this recommendation so that we will be kept informed of actions that are intended to improve the conservation of listed species or their designated critical habitats.

Reinitiation of Consultation

Reinitiation of formal consultation is required and shall be requested by the Federal agency or by NMFS where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If the amount or extent of taking specified in the incidental take statement is exceeded; (b) if new information reveals effects of the action that may affect listed species or designated critical habitat in a manner or to an extent not previously considered; (c) if the identified action is subsequently modified in a manner that has an effect to the listed species or designated critical habitat that was not considered in the biological opinion; or (d) if a new species is listed or critical habitat is designated that may be affected by the identified action (50 CFR 402.16).

To reinitiate consultation, contact the Oregon State Habitat Office of NMFS, and refer to the NMFS Number assigned to this consultation (2010/06062).

"NOT LIKELY TO ADVERSELY AFFECT" DETERMINATIONS

NMFS concurrence with a determination that an action "is not likely to adversely affect" listed species or critical habitat is based on a finding that the effects are expected to be discountable, insignificant, or completely beneficial (USFWS and NMFS 1998). Insignificant effects relate to the size of the impact and should never reach the scale where take occurs; discountable effects are those that are extremely unlikely to occur; and beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat.

Based on an analysis of run timing for the following fish species that was included in the BA, NMFS concludes that it is extremely unlikely that any individual from the following species will be in the action area when the project is being completed:

- Upper Columbia River (UCR) spring-run Chinook salmon
- Snake River (SR) spring/summer run Chinook salmon
- SR fall-run Chinook salmon
- SR sockeye salmon (*O. nerka*)
- UCR steelhead
- Snake River Basin (SRB) steelhead
- eulachon (*Thaleichthys pacificus*)
- southern green sturgeon (*Acipenser medirostris*)

Steller Sea Lion Determination. The eastern Steller sea lion ranges from southeast Alaska to southern California with a minimum abundance of 44,404 animals (NMFS 2009b), and has increased at 3 percent per year for the past 30 years (NMFS 2008b). The greatest increases have occurred in southeast Alaska and British Columbia (together accounting for 82 percent of pup production), but performance has remained poor in California at the southern extent of their range. In Southeast Alaska, British Columbia and Oregon, the number of Steller sea lions has more than doubled since the 1970s. There are no substantial threats to the species, and the population continues to increase at approximately 3 percent per year. The final Steller sea lion recovery plan identifies the need to initiate a status review for the eastern DPS and consider removing it from the federal List of Endangered Wildlife and Plants (NMFS 2008b). The eastern Steller sea lions breeds on rookeries located in southeast Alaska, British Columbia, Oregon, and California; there are no rookeries located in Washington. Haulouts are located throughout the eastern Steller sea lion range (NMFS 2008b).

Steller sea lions are generalist predators, able to respond to changes in prey abundance. Their primary prey includes a variety of fishes and cephalopods. Some prey species are eaten seasonally when locally available or abundant, and other species are available and eaten year-round (review in NMFS 2008b). Pacific hake appears to be the primary prey item across the eastern Steller sea lion range (NMFS 2008b). Other prey items include Pacific cod, walleye Pollock, salmon, and herring, among other species.

Steller sea lions occur in Oregon waters throughout the year, and use breeding rookeries at Rogue Reef and Orford Reef and haulout locations along the Oregon coast. There are four haulout sites used by Steller sea lions in the Columbia River and these include the tip of the South Jetty, where greater than 500 Steller sea lions commonly occur, and three locations proximate to and at the Bonneville Dam tailrace area where Steller sea lions occasionally occur. Over the last nine years, the number of Steller sea lions seasonally present at the Bonneville dam has increased from zero individuals in 2002 to a minimum estimate of 53 subadult and adult male Steller sea lions in 2010, which although an increase is still a relatively small number of individuals (NMFS 2008b, Stansell *et al.* 2008, 2009, 2010). The few Steller sea lions that travel up the Columbia River to the tailrace area of Bonneville Dam travel there to forage on anadromous fishes. Some individual Steller sea lions occur at the tailrace area as early as fall; their numbers peak in winter to early spring and they depart by late spring (Stansell *et al.* 2008, 2009, 2010). Individuals are likely to transit through the river up to the tailrace area within 1-2 days with transit speeds of 4.6 km/hr in the upstream direction and 8.8 km/hr in the downstream direction (based on the transit times of California sea lions, Brown *et al.* 2010). Therefore, individuals likely spend little time in any one location prior to their arrival in the tailrace area. In-season return trips between the river mouth and the tailrace area may occur, but limited data suggest that Steller sea lions make few if any return trips until their departure from the tailrace area by late spring. Only one of less than 10 individual Steller sea lion tagged with acoustic/satellite-tags was observed to make an in-season return trip; all others made a single trip, departing by late spring (data collected in 2010, B. Wright unpublished data). However, tags were deployed in the middle of the season, and therefore, return trips could occur more commonly or regularly in the early part of the season.

Steller sea lions may be present during the proposed in-water work window. As described above, the installation of piles will elevate underwater sound in the action area. Sound pressure generated by this activity could injure or disturb Steller sea lions. NOAA is currently developing comprehensive guidance on sound levels likely to cause injury and behavioral disruption for marine mammals in the context of the Marine Mammal Protection Act and Endangered Species Act, among other statutes. Until formal guidance is available, NMFS uses conservative thresholds of sound pressure levels from broadband sounds that cause behavioral disturbance (160 dB rms re: 1µPa for impulse sound and 120 dB rms re: 1µ Pa for continuous sound) and injury (190 dB rms re: 1µPa for pinnipeds) (70 FR 1871).

Based on these conservative thresholds, the FHWA and FTA anticipate that their proposed pile driving would produce sound pressure levels that could disturb or injure Steller sea lions. To insure injury does not occur, the FHWA and FTA will implement a safety zone during all impact pile driving and during vibratory installation of 120-inch steel casings out to the 190 dB isopleths. FHWA and FTA established the initial size of safety zones based on worst-case underwater sound modeling (9 and 54 meters for 18-24 inch and 36-48 inch steel piles, respectively and 5 meters for 120-inch steel casing). FHWA and FTA will monitor the safety zone throughout impact pile installation and vibratory installation of 120-inch steel casings, and pile-driving operations will not initiate or will suspend if a Steller sea lion is detected approaching or entering the safety zone. The safety zone monitoring makes any potential injury of Steller sea lions extremely unlikely, and therefore discountable. Hydroacoustic monitoring of both impact and vibratory installation will confirm the anticipated sound levels. FHWA and FTA will use the actual SPL measurements from this monitoring to enlarge or reduce the size of safety zones, based on the most conservative SPL measurements.

Although the safety zone monitoring and shutdown procedures will avoid injury of Steller sea lions, beyond this zone behavioral disruption may occur out to the 160 dB and 120dB isopleths for impact and vibratory driving, respectively. Based on conservative sound modeling, FHWA and FTA anticipate that noise from vibratory installation will not attenuate to the 120 dB disturbance threshold before encountering land on the opposite shore and up and down river in either direction. Noise from impact installation is likewise anticipated to extend across the river to the opposite shore, but will attenuate to the 160 dB disturbance threshold both up and down river in closer proximity (within a river reach of 541 meters with an attenuation device and within 5,412 meters without an attenuation device).

It is unlikely that Steller sea lions exposed to sound levels above the disturbance thresholds will temporarily avoid traveling through the affected area. Steller sea lions en route to the Bonneville tailrace area are highly motivated to travel through the action area in pursuit of foraging opportunities upriver (NMFS 2008b). Steller sea lions have shown increasing habituation in recent years to various hazing techniques used to deter the animals from foraging on sturgeon and salmon in the Bonneville tailrace area, including acoustic deterrent devices, boat chasing, and above-water pyrotechnics (Stansell *et al.* 2009). Many of the individuals that travel to the tailrace area return in subsequent years (NMFS 2008b). Therefore, it is likely that Steller sea lions will continue to pass through the action area even when sound levels are above disturbance thresholds.

Although Steller sea lions are unlikely to be deterred from passing through the area, even temporarily, they may respond to the underwater noise by passing through the area more quickly, or they may experience stress as they pass through the area. Steller sea lions already move quickly through the lower river on their way to foraging grounds below Bonneville. Any increase in transit speed is therefore likely to be slight. Another possible effect is that the underwater noise will evoke a stress response in the exposed individuals, regardless of transit speed. However, the period of time during which an individual would be exposed to sound levels that might cause stress is short given their likely speed of travel through the affected areas. In addition, there would be few repeat exposures for the individual animals' involved (estimated six exposures per animal). Thus it is unlikely that the potential increased stress will have an effect on individuals or the population as a whole.

Therefore, NMFS finds it unlikely that the amount of anticipated disturbance would significantly change Steller sea lions' use of the Columbia River or significantly change the amount of time they would otherwise spend in the foraging areas below Bonneville Dam. Even in the event that either change was significant and animals were displaced from foraging areas in the Columbia River, there are alternative foraging areas available to the affected individuals. NMFS does not anticipate any effects on haulout behavior because there are no proximate haulouts within the areas affected by elevated sound levels. All other effects of the proposed action are at most expected to have a discountable or insignificant effect on Steller sea lions, including an insignificant reduction in the quantity and quality of prey otherwise available to Steller sea lions where they would intercept the affected species (*i.e.*, salmonids and green sturgeon as described in the respective sections above).

<u>Southern Resident Killer Whale Determination</u>. Southern Resident killer whales spend considerable time in the Georgia Basin from late spring to early autumn, with concentrated activity in the inland waters of Washington State around the San Juan Islands, and typically move south into Puget Sound in early autumn (NMFS 2008a). Pods make frequent trips to the outer coast during this season. In the winter and early spring, Southern Resident killer whales move into the coastal waters along the outer coast from the Queen Charlotte Islands south to central California, including coastal Oregon and off the Columbia River (NMFS 2008a). There are no documented sightings of Southern Resident killer whales in Oregon coastal bays. There is no documented pattern of predictable Southern Resident occurrence along the Oregon outer coast and any potential occurrence would be infrequent and transitory. Southern Residents primarily eat salmon and prefer Chinook salmon (NMFS 2008a, Hanson *et al.* 2010).

NMFS finds that all effects of the proposed action will either cause no effect or are expected to be discountable, insignificant or beneficial (NLAA) for Southern Resident killer whales. The proposed action would take place in the Columbia River, where Southern Resident killer whales do not occur. Therefore, NMFS does not anticipate any direct effects on Southern Resident killer whales.

As stated above for Steller sea lions, the proposed action may affect the quantity of their preferred prey, Chinook salmon. Any salmonid take including Chinook salmon up to the aforementioned amount and extent of take would result in an insignificant reduction in adult equivalent prey resources for Southern Resident killer whales that may intercept these species within their range.

Therefore, NMFS finds that the proposed action may affect, but is not likely to adversely affect Southern Resident killer whales.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions, or proposed actions that may adversely affect EFH. Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitats, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that may be taken by the action agency to conserve EFH.

The Pacific Fishery Management Council (PFMC) described and identified EFH for groundfish (PFMC 2005), coastal pelagic species (PFMC 1998), and Chinook salmon, coho salmon, and

Puget Sound pink salmon (PFMC 1999). The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of Chinook and coho salmon for which EFH has been designated in the action area (PFMC 1999).

Based on information provided by the action agency and the analysis of effects presented in the ESA portion of this document, NMFS concludes that proposed action will have the following adverse effects on EFH designated for Pacific Coast salmon:

1. Underwater noise
2. Reduced water quality
3. Increases in undesirable over-water cover.

The first two effects are expected to occur as very short-term pulses (*i.e.*, minutes to hours), separated by virtually instantaneous and complete recovery periods, and repeated over a period of up to four days, although the intensity, or magnitude, of the underwater noise effects will be such that individual fish within the geographic area affected are likely to be injured or killed. The increase in over-water cover will last the duration of the test pile program but will have a very weak effect, if any, on a small area. The effects of the test pile program will include underwater noise, reduced water quality, and increases in undesirable over-water cover.

Essential Fish Habitat Conservation Recommendations

The following two conservation measures are necessary to avoid, mitigate, or offset the impact of the proposed action on EFH. These conservation recommendations are a subset of the ESA terms and conditions.

1. The FHWA and FTA should ensure that at least one fishery biologist with the experience, knowledge, supplies, and equipment necessary to observe any fish, mammal or bird behavior in the vicinity of the pile driving and removal, and to collect and verify any injured or dead fish that may be observed, is present at all times and during each stage of the pile installation and removal.

2. The FHWA and FTA should carry out all steps of the final test pile project monitoring plan; provide NMFS with a copy of a draft test pile project monitoring reports within 60-days of completing the hydroacoustic monitoring; and provide NMFS with a copy of a final test pile project monitoring reports within 30 days of receiving comments on the draft report from NMFS.

Statutory Response Requirement

Federal agencies are required to provide a detailed written response to NMFS' EFH conservation recommendations within 30 days of receipt of these recommendations [50 CFR 600.920(k)]. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse affects of the activity on EFH. If the response is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations.

The reasons must include 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.

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

Supplemental Consultation

The FHWA and FTA must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations [50 CFR 600.920(l)].

DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section addresses these Data Quality Act (DQA) components, documents compliance with the DQA, and certifies that this Opinion has undergone pre-dissemination review.

Utility: Utility principally refers to ensuring that the information contained in this document is helpful, serviceable, and beneficial to the intended users.

The Opinion in this document concludes that the proposed test pile project will not jeopardize the affected listed species. Therefore, the FHWA and FTA may fund this action in accordance with its authority under sections 1101, 1701, 1702, and 5309 of the "Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" (SAFETEA-LU). The intended users are the FHWA and FTA.

Individual copies were provided to the above-listed entities. This consultation will be posted on the NMFS Northwest Region website <http://www.nwr.noaa.gov>. The format and naming adheres to conventional standards for style.

Integrity: This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

Objectivity:

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the ESA Consultation Handbook, ESA regulations (50 CFR 402.01, *et seq*.) and the MSA implementing regulations regarding EFH [50 CFR 600.920(j)].

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the Literature Cited section. The analyses in this Opinion/EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

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