UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232

Refer to NMFS No:
WCR-2017-6525

May 25, 2017

Shawn H. Zinszer
Chief, Regulatory Branch
U.S. Army Corps of Engineers
P.O. Box 2946
Portland, Oregon 97208-2946

Re: Endangered Species Act Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Linnton Mill Restoration Project on the Willamette River (HUC 170900120202), Multnomah County, Oregon

Dear Mr. Zinszer:

Thank you for your letter of February 15, 2017, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) on the effects of authorizing the Linnton Mill Restoration project based on the Corps' authority under section 10 of the Rivers and Harbors Act and section 404 of the Clean Water Act. In this opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*), Upper Willamette River (UWR) Chinook salmon, LCR coho salmon (*O. kisutch*), LCR steelhead (*O. mykiss*), or UWR steelhead, or result in the destruction or adverse modification of their designated critical habitats.

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 Federal action agency 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 three conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. Two of 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 Federal action agency 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.

Please contact Mischa Connine in the Willamette Branch of the Oregon Washington Coastal Office, at 503-230-5401 or mischa.connine@noaa.gov if you have any questions concerning this section 7 consultation, or if you require additional information.

Sincerely,

Kim W. Kratz
for Barry A. Thom
Regional Administrator

cc: Melody White (Corps)
Tom Taylor (Corps)
Glenn Grette (Grette Associates, LLC)
Jay Dirkse (Grette Associates, LLC)

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation

Linnton Mill Restoration Project on the Willamette River
(HUC 170900120202), Multnomah County, Oregon
(Corps No.: NWP-2014-477)

NMFS Consultation Number: WCR-2017-6525

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Lower Columbia River Chinook Salmon (*Oncorhynchus tshawytscha*)	Threatened	Yes	No	No
Upper Willamette River Chinook Salmon (*O. tshawytscha*)	Threatened	Yes	No	No
Lower Columbia River Coho Salmon (*O. kisutch*)	Threatened	Yes	No	No
Lower Columbia River Steelhead (*O. mykiss*)	Threatened	Yes	No	No
Upper Willamette River Steelhead (*O. mykiss*)	Threatened	Yes	No	No

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service
West Coast Region

Issued By:

Barry A. Thom
Regional Administrator

Date: May 25, 2017

TABLE OF CONTENTS

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, 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.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). A complete record of this consultation is on file at the Oregon Washington Coastal Office.

1.2 Consultation History

Grette Associates (the applicant) met with NMFS and representatives of other agencies several times between November, 2014 and December, 2015, to present their project and get feedback on it. The NMFS received a letter from the U.S Army Corps of Engineers (Corps) on February 15, 2017, requesting initiation of formal ESA consultation on the effects of authorizing Grette Associates to conduct a habitat restoration project, based on their authority under section 10 of the Rivers and Harbors Act and section 404 of the Clean Water Act. Formal consultation was initiated on February 15, 2017.

The Corps determined that the proposed action is likely to adversely affect Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*), Upper Willamette River (UWR) Chinook salmon, LCR coho salmon (*O. kisutch*), LCR steelhead (*O. mykiss*), UWR steelhead, and designated critical habitats. The Corps also determined that EFH for Chinook and coho salmon may be adversely affected by the proposed action.

This opinion is based on information provided in the biological assessment (BA), the joint permit application, project maps, photographs, drawings, and the meetings between November, 2015 and December, 2015.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). "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 (50 CFR 402.02). There are no interdependent or interrelated activities associated with the proposed action.

The action is the Corps' issuance of a permit under section 10 of the Rivers and Harbors Act and section 404 of the Clean Water Act to Grette Associates for the Linnton Mill restoration project. A summary of the proposed action is described below.

The site is currently occupied by Linnton Plywood, a non-operating commercial sawmill on 24 acres along the west bank of the Willamette River, between River Mile 4.7 and 5.0 (Figure 1). Grette Associates proposes to develop a habitat restoration project on this site (Figure 2). The project will include the following elements:

- Remove the existing sawmill and infrastructure, i.e., building, road, pads, utilities, and equipment;
- Excavate 5.47 acres to create aquatic habitat, of which 4.34 acres would be new, off-channel habitat;
- Install large woody debris (LWD) within the created channels to provide in-water habitat structure and complexity;
- Restore 4.81 acres of shallow water habitat, including the removal of 0.36 acres of overwater structures;
- Restore 1.81 acres of active channel margin (ACM) habitat, including the removal of 1,050 feet of shoreline armoring;
- Restore 9.29 acres of riparian habitat, and 4.86 acres of upland habitat, including removal of invasive vegetation, and planting native vegetation;
- Removal of approximately 800 piles (many creosote-treated); and
- Disconnect the stormwater discharge pipes from the unnamed tributary to the Willamette River, and replace the failing culvert;
- Juvenile salmonid monitoring via snorkel surveys and beach seining; and
- Provide permanent protection of the site, excluding areas already encumbered by easements, through placement of a conservation easement or deed restriction.

Figure 1. Current conditions at the Linnton Mill site.

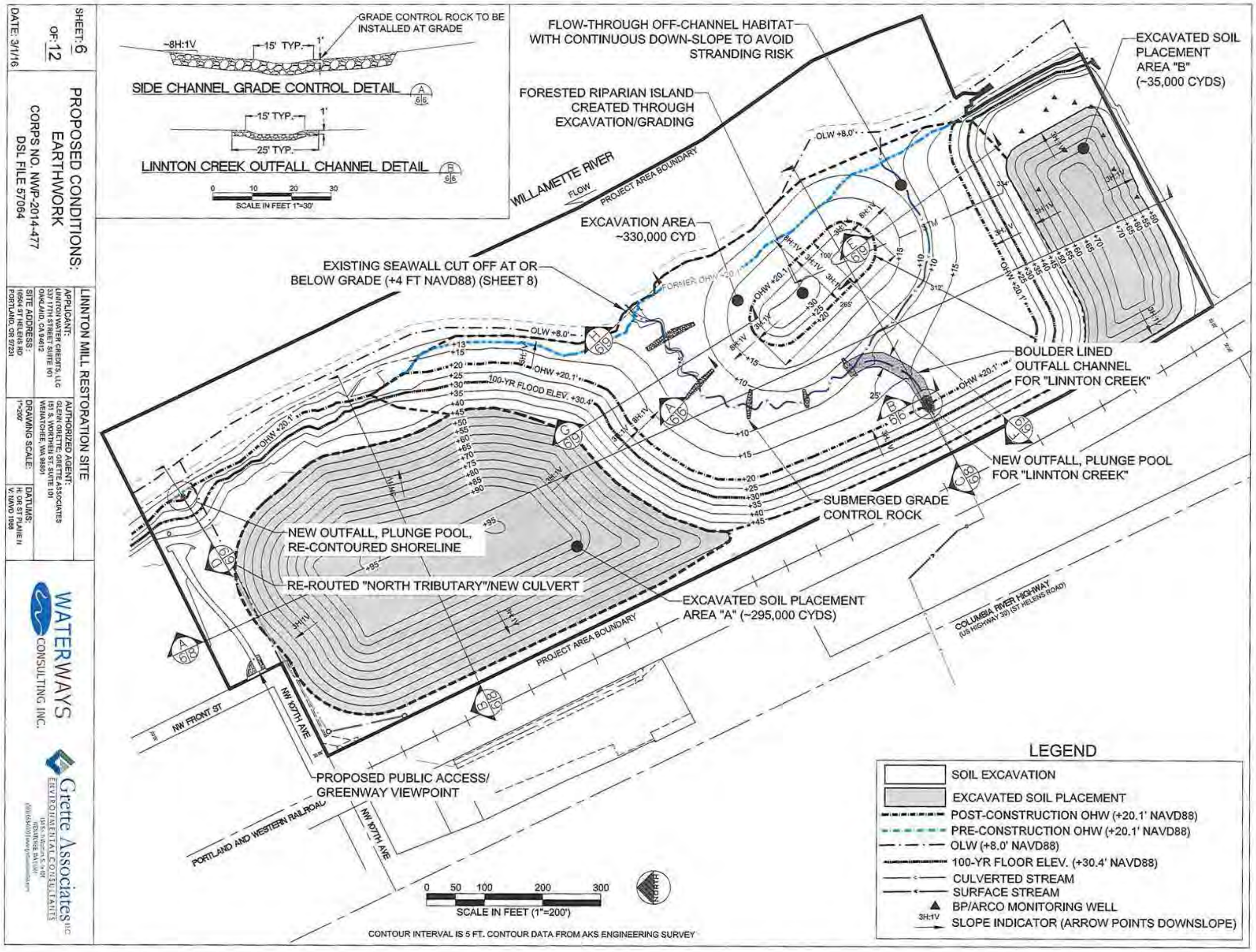

Figure 2. Proposed restoration design at the Linnton Mill site.

These project elements are discussed in detail below. NMFS considers all conservation measures and best management practices (BMPs) included in these elements to be part of the proposed action and, for purposes of our effects analysis and subsequent determination of the amount or extent of anticipated take, we assume that they are not discretionary and will be applied, in relevant part, to all work carried out under this opinion.

Sawmill and Infrastructure Removal

Grette Associates proposes to remove several structures on site. These structures include a sawmill, and associated outbuildings. All structures will be dismantled and removed from the site.

In- and Over-water Structure Removal

The site includes two pile-supported overwater structures: A loading dock with a conveyor structure, and a catwalk out to a fire suppression dock. Approximately 300 piles associated with these structures would be removed. An additional 500 piles in close proximity to the over-water structures will also be removed. Over-water structures and piles will be removed with barge-based equipment. Piles will be vibrated out. If the pile breaks, the pile will be cut 2 feet below the mudline, and will be disposed at an appropriate upland disposal site.

Excavation of Off-Channel Habitat

The applicant proposes to excavate an existing upland area to create 4.34 acres off-channel habitat with a high water flow-through channel. The high water flow through channel will be created by daylighting Linnton Creek, and an unnamed tributary to the Willamette River that are currently piped under the Linnton Mill site and outlet at the Willamette River. The unnamed tributary culvert will be replaced and realigned.

The off-channel habitat would extend 360 feet landward of the ordinary high water (OHW) of the Willamette River, and would be 700 feet wide. The downstream portion of off-channel habitat will be inundated 99% of the year, allowing for juvenile salmonid rearing during low water. This will provide cold water refugia with the input of cold water from Linnton Creek. The upstream portion of the off-channel habitat will be inundated 75-85% of the year, November through July. The channel will be a depth of 1 foot, and would be protected with five sub-grade controls, consisting of rocks that will be covered with sand and silt after the first inundation of the site. Fifteen LWD structures will be placed in the off-channel habitat, and will be pinned with rebar, and ballasted with boulders. LWD would be placed prior to connecting the off-channel habitat to the Willamette River.

An existing sheet pile wall and concrete seawall is present at the downstream end of the proposed off-channel habitat, extending up to + 35 ft NAVD88. The concrete seawall will be removed, and the sheet pile will be cut off at +5 ft NAVD88 to provide a sill at or below the finished grade. The sill would protect the outlet of the channel from head-cutting during periods of high flow through the channel. The top of the cut will be at mudline, and will not protrude above the surface.

A temporary isolation berm will be installed during the excavation work on Linnton Creek and the unnamed tributary. During the culvert removal on Linnton creek, the flow will be routed directly to the Willamette River. During the culvert realignment on the unnamed tributary, flow will be diverted to an existing on-site catch basin. Once the excavation work is completed, the berms will be removed, and the channels will be rewatered.

Willamette River Shoreline Habitat Improvement

The shoreline of the Willamette River at the Linnton Mill site is sloped at 2:1, armored with riprap, and has invasive vegetation. Excavation of the off-channel habitat would include removing approximately 1,000 linear feet of riprap on the shoreline. The shoreline would be regraded to 5:1-8:1 below OHW, and 3:1 above OHW.

Vegetation Establishment

Planting. The Linnton Mill site will be densely planted with native plants, shrubs, and trees, including emergent marsh, riparian forest, and upland forest.

Invasive and Non-native Plant Control. Invasive and non-native vegetation removal will include mechanical removal and herbicides. The following project design criteria (PDCs) are proposed for this project element:

Non-herbicide methods. The number of workers will be on-site will be minimized while treating areas within the riparian zone by manual and mechanical plant control (*e.g.*, hand pulling, clipping, stabbing, digging, brush-cutting, mulching or heating with radiant heat, pressurized hot water, or heated foam).

Power equipment. Gas-powered equipment with tanks larger than 5 gallons will be refueled in a vehicle staging area placed 150 feet or more from any natural waterbody, or in an isolated hard zone such as a paved parking lot.

Herbicide applicator qualifications. Herbicides will be applied only by an appropriately licensed applicator using an herbicide specifically targeted for a particular plant species that will cause the least impact. The applicator will be responsible for preparing and carrying out and the herbicide transportation and safely plan, as follows.

Herbicide transportation and safety plan. The applicator will prepare and carry out an herbicide safety/spill response plan to reduce the likelihood of spills or misapplication, to take remedial actions in the event of spills, and to fully report the event. At a minimum, the plan will: (a) Address spill prevention and containment; (b) estimate and limit the daily quantity of herbicides to be transported to treatment sites; (c) require that impervious material be placed beneath mixing areas in such a manner as to contain small spills associated with mixing/refilling; (d) require a spill cleanup kit be readily available for herbicide transportation, storage and application; (e) outline reporting procedures, including reporting spills to the appropriate regulatory agency; (f) ensure applicators are trained in safe handling and transportation procedures and spill cleanup; (g) require that equipment used in herbicide storage, transportation and handling are maintained in a leak proof condition; (h) address transportation routes so that hazardous conditions are avoided to the extent possible; (i) specify mixing and loading locations away from waterbodies so that accidental spills do not contaminate surface waters; (j) require that spray tanks be mixed or washed further than 150 feet of surface water; (k) ensure safe disposal of herbicide containers; (l) identify sites that may only be reached by water travel and limit the amount of herbicide that may be transported by watercraft.

Herbicides. The herbicides proposed for use under this opinion are (some common trade names are shown in parentheses):[1]

aquatic imazapyr (*e.g.*, Habitat™)
aquatic glyphosate (*e.g.*, AquaMaster™, AquaPro™)
aquatic triclopyr-TEA (*e.g.*, Renovate 3™)
chlorsulfuron (*e.g.*, Telar™, Glean™, Corsair™)
clopyralid (*e.g.*, Transline™)
glyphosate (*e.g.*, Rodeo™)
imazapic (*e.g.*, Plateau™)
imazapyr (*e.g.*, Arsenal™, Chopper™)
metsulfuron-methyl (*e.g.*, Escort™)
picloram (*e.g.*, Tordon™)
sethoxydim (*e.g.*, Poast™, Vantage™)
sulfometuron-methyl (*e.g.*, Oust™, Oust XP™)
triclopyr (*e.g.*, Garlon 3A™, Tahoe 3A™)

Herbicide adjuvenants. The adjuvenants proposed for use under this opinion are as follows (Table 1). Polyethoxylated tallow amine (POEA) surfactant and herbicides that contain POEA (*e.g.*, Roundup) will not be used.

Table 1. Herbicide adjuvenants, trade names, mixing rates, and application areas.

Adjuvant Type	Trade Name	Mixing Rate (per gallon)	Application Areas
Surfactants	Activator 90™	0.16 - 0.64 fl oz	Upland
	Agri-Dee™	0.16 - 0.48 fl oz	Riparian
	Hasten™	0.16 - 0.48 fl oz	Riparian
	LI 700™	0.16 - 0.48 fl oz	Riparian
	R 11™	0.16 - 1.28 11 oz	Riparian
	Super Spread™	0.16 - 0.32 fl oz	Riparian
	Syl-Tae™	0.16 - 0.48 fl oz	Upland
Drift Retardants	41-A™	0.03 - 0.06 fl oz	Riparian
	Vale™	0.16 fl oz	Upland

[1] The use of trade, firm, or corporation names in this opinion is for the information and convenience of the action agency and applicants and does not constitute an official endorsement or approval by the U.S. Department of Commerce or NMFS of any product or service to the exclusion of others that may be suitable.

Herbicide carriers. Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil.

Herbicide mixing. Herbicides will be mixed more than 150 feet from any natural waterbody to minimize the risk of an accidental discharge.

Herbicide application rates. Herbicides will be applied at the lowest effective label rates, including the typical and maximum rates given below (Table 2). For broadcast spraying, application of herbicide or surfactant will not exceed the typical label rates.

Table 2. Typical and maximum rates for herbicide applications.

Herbicide	**Typical Rate (pounds of active ingredient per acre)**	**Maximum Rate (pounds of active ingredient per acre)**
Imazapic	0.1	0.1875
Clopyralid	0.35	0.5
metsulfuron-methyl	0.03	0.15
Imazapyr	0.45	1.5
sulfometuron-methyl	0.045	0.38
chlorsulfuron	0.056	0.25
triclopyr	1.0	10.0
picloram	0.35	1.0
sethoxydim	0.3	0.45
glyphosate	2.0	8.0

Herbicide application methods. Liquid or granular forms of herbicides will be applied as follows: (a) Broadcast spraying – hand held nozzles attached to back pack tanks or vehicles, or by using vehicle mounted booms; (b) spot spraying – hand held nozzles attached to back pack tanks or vehicles, hand-pumped spray, or squirt bottles to spray herbicide directly onto small patches or individual plants using; (c) hand/selective – wicking and wiping, basal bark, fill ("hack and squirt"), stem injection, cut-stump; (d) triclopyr – will not be applied by broadcast spraying.

Minimization of herbicide drift and leaching. Herbicide drift and leaching will be minimized as follows: (a) Do not spray when wind speeds exceed 10 miles per hour, or are less than 2 miles per hour; (b) be aware of wind directions and potential for herbicides to affect aquatic habitat area downwind; (c) keep boom or spray as low as possible to reduce wind effects; (d) increase spray droplet size whenever possible by decreasing spray pressure, using high flow rate nozzles, using water diluents instead of oil, and adding thickening agents; (e) do not apply herbicides during temperature inversions, or when ground temperatures exceed 80 degrees Fahrenheit; (f) do not spray when rain, fog, or other precipitation is falling or is imminent. Wind and other weather data will be monitored and reported for all broadcast applications.

Herbicide buffer distances. The following no-application buffers, which are measured in feet and are based on herbicide formula, stream type, and application method, will be observed during herbicide applications (Table 3). Herbicide applications based on a combination of approved herbicides will use the most conservative buffer for any herbicide included. Buffer widths are in feet, measured as map distance perpendicular to the bankfull elevation for streams, the upland boundary for wetlands, or the upper bank for roadside ditches. Before herbicide application begins, the upland boundary of each applicable herbicide buffer will be flagged or marked to ensure that all buffers are in place and functional during treatment.

Table 3. No-application buffers for herbicides, by stream type and application method.

Herbicide	Perennial Streams and Wetlands, and Intermittent Streams and Roadside Ditches with flowing or standing water present			Dry Intermittent Streams, Dry Intermittent Wetlands, Dry Roadside Ditches		
	Broadcast Spraying	Spot Spraying	Hand Selective	Broadcast Spraying	Spot Spraying	Hand Selective
Labeled for Aquatic Use						
aquatic glyphosate	100	waterline	waterline	50	none	none
aquatic imazapyr	100	15	waterline	50	none	none
aquatic triclopyr-TEA	**Not Allowed**	15	waterline	**Not Allowed**	none	none
Low Risk to Aquatic Organisms						
Imazapic	100	15	bankfull elevation	50	None	none
Clopyralid	100	15	bankfull elevation	50	None	none
metsulfuron-methyl	100	15	bankfull elevation	50	None	none
Moderate Risk to Aquatic Organisms						
Imazapyr	100	50	bankfull elevation	50	15	bankfull elevation
sulfometuron-methyl	100	50	5	50	15	bankfull elevation
Chlorsulfuron	100	50	bankfull elevation	50	15	bankfull elevation
High Risk to Aquatic Organisms						
Triclopyr	**Not Allowed**	150	150	**Not Allowed**	150	150
Picloram	100	50	50	100	50	50
Sethoxydim	100	50	50	100	50	50
Glyphosate	100	50	50	100	50	50

Monitoring

Post-construction monitoring will include vegetation surveys, fisheries habitat use, benthic species composition, sediment dynamics, water quality and hydrology, and wildlife habitat use. Monitoring will occur for approximately 10 years post-construction. Monitoring activities will include foot traffic, use of hand tools, snorkeling, and seining.

Juvenile Salmonid Monitoring. Juvenile salmonid monitoring will be conducted to determine the presence or absence of juvenile salmonids. Monitoring could take place during years 1,3,5,7, and 10. Surveys will be conducted up to two times per months from February through May. Monitoring will be conducted using snorkel surveys or beach seining. Beach seining will only be conducted until juvenile salmonids are captured. Once juvenile salmonids are captured, beach seining will no longer continue. Snorkel surveys may continue through the remainder of the monitoring period.

Schedule

Upland activities, including demolition and earthwork that are not constrained by the in-water work window could start in 2017. Most construction activities within and connecting to the Willamette River are expected to occur during the in-water work window in 2017 and 2018. Piling removal is expected to occur during the in-water work window in 2017 or 2018.

Best Management Practices

The applicant proposes the following BMPs to minimize the effects of removing the in-and over-water structures:

- All in-water work will be completed during the summer in-water work window (July 1 to October 31).
- During construction, erosion and sediment will be controlled through the use of turbidity curtains on the Willamette River, rocked construction entrances at the access points, and installation of stormwater inlet filtration devices.
- Post construction erosion control methods will include installation of straw wattles, and seeding and mulching.
- A floating debris boom will be in place around the work area during pile and structure removal to capture any floating debris that falls in the water.
- During demolition work, some small materials may fall from the elevated deck into the water below. This material will likely consist of concrete, wood and steel that may fall as the structure fractures. The material will be retrieved where possible, using excavator mounted grippers. If the concrete is visible below the water surface, it will be removed, if this can be accomplished without compromising worker safety.
- A floating debris boom will be in place around the work area.
- Excavators will be located on the deck and on a barge. They will be well maintained, significantly reducing any risks of leaks. In addition, a spill kit will be on site with staff trained in its proper use.

1.4 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). The proposed project is located on the west bank of the Willamette River (Figure 3). For this consultation, the action area includes the streambeds, streambanks, riparian areas, and upland areas within the proposed project area. The action area also includes all such habitat 1,000 feet downstream of the project area (and/or to the limit of visible turbidity increases resulting from the in-water excavation and the removal of the pilings).

The action area is occupied by LCR Chinook salmon, LCR coho salmon, LCR steelhead, UWR Chinook salmon, and UWR steelhead, and their designated critical habitats. The action area is also designated EFH for Chinook salmon and coho salmon (Pacific Fishery Management Council 2014).

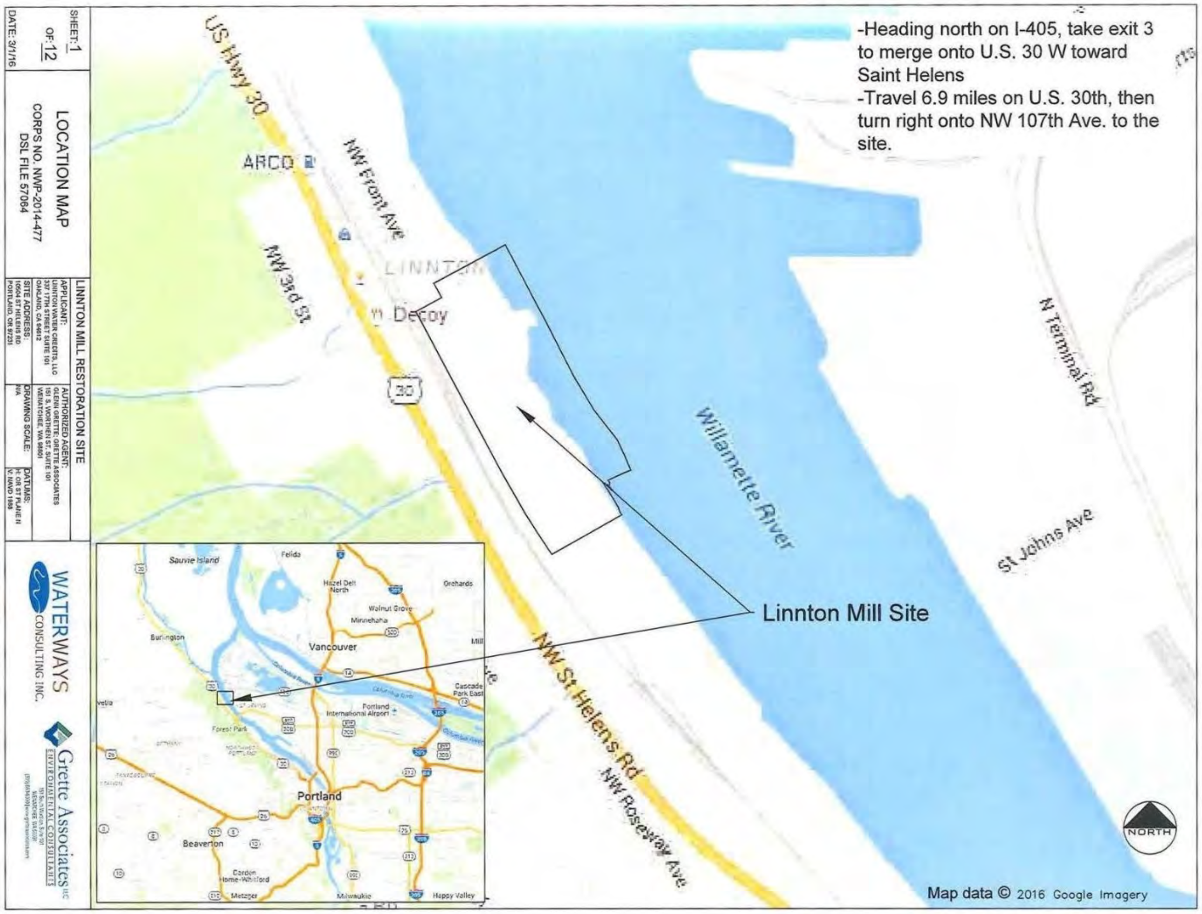

Figure 3. Project location for the Linnton Mill project.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, Federal agencies must 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. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement (ITS) that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures and terms and conditions to minimize such impacts.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis.

The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The adverse modification analysis considers the impacts of the Federal action on the conservation value of designated critical habitat. This biological opinion relies on the definition of "destruction or adverse modification", which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7414).

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define a reasonable and prudent alternative to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. Climate change is expected to make recovery targets for these listed species more difficult to achieve.

During the last century, average regional air temperatures increased by 1.5°F, and increased up to 4°F in some areas. Warming is likely to continue during the next century as average temperatures increase another 3 to 10°F. Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (U.S. Global Change Resarch Program – USGCRP - 2009).

Precipitation trends during the next century are less certain than for temperature but more precipitation is likely to occur during October through March and less during summer months, and more of the winter precipitation is likely to fall as rain rather than snow (ISAB 2007; USGCRP 2009). Where snow occurs, a warmer climate will cause earlier runoff so stream flows in late spring, summer, and fall will be lower and water temperatures will be warmer (ISAB 2007; USGCRP 2009).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend (Bindoff *et al.* 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and Williams 2005; Zabel *et al.* 2006; USGCRP 2009).

Ocean acidification resulting from the uptake of carbon dioxide by ocean waters threatens corals, shellfish, and other living things that form their shells and skeletons from calcium carbonate (Orr *et al.* 2005; Feely *et al.* 2012). Such ocean acidification is essentially irreversible over a time scale of centuries (Royal Society 2005). Increasing carbon dioxide concentrations are reducing ocean pH and dissolved carbonate ion concentrations, and thus levels of calcium carbonate saturation. Over the past several centuries, ocean pH has decreased by about 0.1 (an approximately 30 percent increase in acidity), and is projected to decline by another 0.3 to 0.4 pH units (approximately 100 to 150 percent increase in acidity) by the end of this century (Feely *et al.* 2012). As aqueous carbon dioxide concentrations increase, carbonate ion concentrations decrease, making it more difficult for marine calcifying organisms to form biogenic calcium carbonate needed for shell and skeleton formation. The reduction in pH also affects photosynthesis, growth, and reproduction. The upwelling of deeper ocean water, deficient in carbonate, and thus potentially detrimental to the food chains supporting juvenile salmon has recently been observed along the U.S. west coast (Feely *et al.* 2008).

2.2.1 Status of the Species

Table 4, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. These documents are available at the NMFS West Coast Region website (http://www.westcoast.fisheries.noaa.gov/).

Table 4. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River Chinook salmon	Threatened 6/28/05	NMFS 2013	NWFSC 2015	This ESU comprises 32 independent populations. Twenty-seven populations are at very high risk, 2 populations are at high risk, one population is at moderate risk, and 2 populations are at very low risk Overall, there was little change since the last status review in the biological status of this ESU, although there are some positive trends. Increases in abundance were noted in about 70% of the fall-run populations and decreases in hatchery contribution were noted for several populations. Relative to baseline VSP levels identified in the recovery plan, there has been an overall improvement in the status of a number of fall-run populations, although most are still far from the recovery plan goals.	• Reduced access to spawning and rearing habitat • Hatchery-related effects • Harvest-related effects on fall Chinook salmon • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Contaminant
Upper Willamette River Chinook salmon	Threatened 6/28/05	NMFS 2011	NWFSC 2015	This ESU comprises seven populations. Five populations are at very high risk, one population is at moderate risk (Clackamas River) and one population is at low risk (McKenzie River). Consideration of data collected since the last status review in 2010 indicates the fraction of hatchery origin fish in all populations remains high (even in Clackamas and McKenzie populations). The proportion of natural origin spawners improved in the North and South Santiam basins, but is still well below identified recovery goals. Abundance levels for five of the seven populations remain well below their recovery goals. Of these, the Calapooia River may be functionally extinct and the Molalla River remains critically low. Abundances in the North and South Santiam rivers have risen since the 2010 review, but still range only in the high hundreds of fish. The Clackamas and McKenzie populations have previously been viewed as natural population strongholds, but have both	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats • Altered food web due to reduced inputs of microdetritus • Predation by native and non-native species, including hatchery fish • Competition related to introduced salmon and steelhead • Altered population traits due to fisheries and bycatch

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				experienced declines in abundance despite having access to much of their historical spawning habitat. Overall, populations appear to be at either moderate or high risk, there has been likely little net change in the VSP score for the ESU since the last review, so the ESU remains at moderate risk.	
Lower Columbia River coho salmon	Threatened 6/28/05	NMFS 2013	NWFSC 2015	Of the 24 populations that make up this ESU, 21 populations are at very high risk, 1 population is at high risk, and 2 populations are at moderate risk. Recent recovery efforts may have contributed to the observed natural production, but in the absence of longer term data sets it is not possible to parse out these effects. Populations with longer term data sets exhibit stable or slightly positive abundance trends. Some trap and haul programs appear to be operating at or near replacement, although other programs still are far from that threshold and require supplementation with additional hatchery-origin spawners .Initiation of or improvement in the downstream juvenile facilities at Cowlitz Falls, Merwin, and North Fork Dam are likely to further improve the status of the associated upstream populations. While these and other recovery efforts have likely improved the status of a number of coho salmon populations, abundances are still at low levels and the majority of the populations remain at moderate or high risk. For the Lower Columbia River region land development and increasing human population pressures will likely continue to degrade habitat, especially in lowland areas. Although populations in this ESU have generally improved, especially in the 2013/14 and 2014/15 return years, recent poor ocean conditions suggest that population declines might occur in the upcoming return years	• Degraded estuarine and near-shore marine habitat • Fish passage barriers • Degraded freshwater habitat: Hatchery-related effects • Harvest-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River steelhead	Threatened 1/5/06	NMFS 2013	NWFSC 2015	This DPS comprises 23 historical populations, 17 winter-run populations and six summer-run populations. Nine populations are at very high risk, 7 populations are at high risk, 6 populations are at moderate risk, and 1 population is at low risk. The majority of winter-run steelhead populations in this DPS continue to persist at low abundances. Hatchery interactions remain a concern in select basins, but the overall situation is somewhat improved compared to prior reviews. Summer-run steelhead populations were similarly stable, but at low abundance levels. The decline in the Wind River summer-run population is a source of concern, given that this population has been considered one of the healthiest of the summer-runs; however, the most recent abundance estimates suggest that the decline was a single year aberration. Passage programs in the Cowlitz and Lewis basins have the potential to provide considerable improvements in abundance and spatial structure, but have not produced self-sustaining populations to date. Even with modest improvements in the status of several winter-run DIPs, none of the populations appear to be at fully viable status, and similarly none of the MPGs meet the criteria for viability.	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Reduced access to spawning and rearing habitat • Avian and marine mammal predation • Hatchery-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Upper Willamette River steelhead	Threatened 1/5/06	NMFS 2011	NWFSC 2015	This DPS has four demographically independent populations. Three populations are at low risk and one population is at moderate risk. Declines in abundance noted in the last status review continued through the period from 2010-2015. While rates of decline appear moderate, the DPS continues to demonstrate the overall low abundance pattern that was of concern during the last status review. The causes of these declines are not well understood, although much accessible habitat is degraded and under continued development pressure. The elimination of winter-run hatchery release in the basin reduces hatchery threats, but non-native summer	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats due to impaired passage at dams • Altered food web due to changes in inputs of microdetritus • Predation by native and non-native species, including hatchery fish and pinnipeds • Competition related to introduced salmon and steelhead

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				steelhead hatchery releases are still a concern for species diversity and a source of competition for the DPS. While the collective risk to the persistence of the DPS has not changed significantly in recent years, continued declines and potential negative impacts from climate change may cause increased risk in the near future.	• Altered population traits due to interbreeding with hatchery origin fish

2.2.2 Status of the Critical Habitat

Table 5, below summarizes the status of designated critical habitat affected by the proposed action by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (*e.g.*, sites with conditions that support spawning, rearing, migration and foraging).

For most salmon and steelhead, NMFS's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NMFS 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

Table 5. Designation date and Federal Register citation, features designated, and critical habitat status summary for each species considered in this opinion.

Species	Designation Date and Federal Register Citation	Features Designated	Critical Habitat Status Summary
Lower Columbia River Chinook salmon	9/02/05 70 FR 52630	Physical or biological features	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 47 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some, or high potential for improvement. We rated conservation value of HUC5 watersheds as high for 30 watersheds, medium for 13 watersheds, and low for four watersheds.
Upper Willamette River Chinook salmon	9/02/05 70 FR 52630	Physical or biological features	Critical habitat encompasses 10 subbasins in Oregon containing 56 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 22 watersheds, medium for 16 watersheds, and low for 18 watersheds.
Lower Columbia River coho salmon	2/24/16 81 FR 9252	Physical or biological features	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 55 occupied watersheds, as well as the lower Columbia River and estuary rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 34 watersheds, medium for 18 watersheds, and low for three watersheds.
Lower Columbia River steelhead	9/02/05 70 FR 52630	Physical or biological features	Critical habitat encompasses nine subbasins in Oregon and Washington containing 41 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 28 watersheds, medium for 11 watersheds, and low for two watersheds.
Upper Willamette River steelhead	9/02/05 70 FR 52630	Physical or biological features	Critical habitat encompasses seven subbasins in Oregon containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 25 watersheds, medium for 6 watersheds, and low for 3 watersheds.

2.3 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 climate change effects on the environmental baseline are described in Section 2.2 above.

Habitat conditions within the LWR are highly degraded. The streambanks have been channelized, off-channel areas removed, tributaries put into pipes, and the river disconnected from its floodplain as the lower valley was urbanized. Silt loading to the LWR has increased over historical levels due to logging, agriculture, road building, and urban and suburban development within the watershed. Limited opportunity exists for large wood recruitment to the LWR due to the paucity of mature trees along the shoreline, and the lack of relief along the shoreline to catch and hold the material. The LWR has been deepened and narrowed through channelization, diking and filling, and much of the shallow-water habitat (important for rearing juvenile salmonids) has been converted to deep water habitat; 79% of the shallow water through the lower river has been lost through historic channel deepening (Northwest Power and Conservation Council 2004). Most recently, the Federal Navigation Channel at Post Office Bar was dredged in October 2011. In addition, much of the historical off-channel habitat (also important habitat for juvenile salmonids) has been lost due to diking and filling of connected channels and wetlands. Gravel continues to be extracted from the river and floodplain and much of the sediment trying to move downstream in the Willamette River is blocked by dams. All of these river changes contribute to the factors limiting recovery of ESA-listed salmonids using the action area.

The LWR through the City of Portland is highly developed for industrial, commercial and residential purposes. Much of the river is fringed by seawalls or riprapped embankments. Water quality in the action area reach of the Willamette River reflects its urban location and disturbance history. The LWR is currently listed on the Oregon Department of Environmental Quality (DEQ) Clean Water Act 303(d) List of Water Quality Limited Water Bodies. DEQ-listed water quality problems identified in the action area include toxics, biological criteria (fish skeletal deformities), bacteria (fecal coliform), and temperature. Cleanup of contaminated sediments in the LWR is presently being addressed under the Federal Superfund process. The sediments in the action area were tested in 2006 via surface grab samples and no contaminants of concern were found.

Juvenile and adult Chinook salmon, coho salmon, and steelhead use this area as a migratory corridor and as rearing habitat for juveniles (Friesen 2005). All populations of UWR species use the action area, but only the Clackamas River populations of the LCR species occur here. The results of the Friesen study demonstrate that juvenile salmon and steelhead are present in the LWR nearly year-round. Of the more than 5,000 juvenile salmonids collected during the study, over 87% were Chinook salmon, 9% were coho salmon, and 3% were steelhead. Friesen concluded that the Chinook salmon juveniles were largely spring-run stocks that rear in fresh water for a year or more before migrating to the ocean. Chinook salmon juveniles caught exhibited a bimodal distribution in length, indicating the presence of both subyearlings and yearlings. Although at lower abundance, coho salmon juveniles also exhibited this bimodal distribution of yearlings and subyearlings. The abundance of all juvenile salmon and steelhead increased beginning in November, peaked in April, and declined to near zero by July. Some of the larger juveniles may spend extended periods of time in off-channel habitat. Mean migration rates of juvenile salmon and steelhead ranged from 1.68 miles/day for steelhead to 5.34 miles/day for sub-yearling Chinook salmon. Residence time in the LWR ranged from 4.9 days for Chinook to 15.8 days for steelhead. Catch rates of juvenile salmon were significantly higher at sites composed of natural habitat (*e.g.*, beaches and alcoves).

Steelhead are not known to spawn in the mainstem of the Willamette River in the vicinity of the action area. Chinook salmon may spawn upstream of the action area in the lower end of the Clackamas River or in the Willamette River just below Willamette Falls, where suitable gravel-type substrate for spawning may occur, and in Johnson Creek. Recent observations of coho salmon juveniles in Miller Creek (tributary at RM 3 on the Willamette River) and in Johnson Creek by City of Portland biologists suggest that coho spawning may occur in small tributaries in the LWR.

Adult Chinook salmon and steelhead have been documented holding in the LWR for a period of time before moving upriver. Adults migrate upstream to spawn during early spring (spring Chinook salmon), early fall (coho salmon), and late fall through winter (steelhead), and spawn in early to mid-fall (Chinook and coho salmon) and spring (steelhead). Adult steelhead have been documented entering the mouth of the Clackamas River with a darkened coloration, indicating that they have been in freshwater for some time.

Friesen (2005) contradicts the longstanding assumption that UWR Chinook salmon overwinter and grow in their natal streams, then pass quickly through the LWR corridor during a springtime migration toward the sea. Instead, he found juvenile hatchery and naturally-spawned Chinook salmon to be present and growing in the LWR during every month of the year, often at a faster rate than in other areas, although they were most abundant during winter and spring. In contrast, juvenile coho salmon and steelhead generally were rare except during winter and spring. Therefore, juvenile Chinook salmon will be present in the river during the proposed action, and there will likely be a few LCR coho salmon and steelhead juveniles present as well. Critical habitat in the action area provides a critical migration corridor and important rearing habitat with high conservation value.

2.4 Effects of the Action

Under the ESA, "effects of the action" means 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.

The presence/absence information for salmonids in the action area during the Willamette River summer in-water work window of July 1 through October 31 is provided in Table 6. The applicant proposes to complete all in-water and over-water work during this window. The peak upstream migration for adult LCR coho salmon and LCR Chinook salmon overlaps with the summer in-water work window, but otherwise, the overall number of listed salmonids in the LWR is at its lowest during this time. Densities of juvenile salmonids, the more sensitive and vulnerable life stage, are lowest in the summer months (Friesen 2005), and the summer in-water work window avoids peak smolt out-migration for juvenile ESA-listed salmonids that migrate through the action area.

Table 6. The presence/absence of ESA-listed salmonids in the LWR during the summer in-water work window (July 1 to October 31). 'Y' indicates the species is present, 'Y-' indicates that while the life stage may be present, peak migration is not at this time', 'N' indicates that the species is not likely to be present.

Species	**Summer In-water Work Window**	
	Adult Migration	**Juvenile Out-migration**
LCR Chinook salmon	Y	Y-
UWR Chinook salmon	N	Y-
LCR coho salmon	Y	Y-
UWR steelhead	N	Y-
LCR steelhead	Y-	Y-

2.4.1 Effects on Listed Species

Removal of Over-Water Structures. The applicant proposes to remove an over-water loading dock on the Willamette River. The dock is 0.36 acres.

The dock currently creates shadows that could allow predators to remain in darkened areas (barely visible to prey) and watch for prey to swim by against a bright background (high visibility). Prey species moving around structure(s) are unable to see the predators in the dark areas under or beside structure(s) and are therefore more susceptible to predation. Predator species, such as, bluegill (*Lepomis macrochirus*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), and pikeminnow (*Ptychocheilus oregonensis*) are associated with fresh water.

The presence of the dock may also disrupt migration of smaller juvenile salmonids that use nearshore areas. The presence of the dock may result in juvenile salmonid delaying passage or forcing them into deeper water areas in an attempt to go around the structures. Juvenile Chinook salmon and coho salmon use backwater areas during their outmigration (Parente and Smith 1981). Littoral areas are important for juvenile salmonid migration (Ward *et al.* 1994). McCabe *et al.* (1986) using a 50 m (164 feet) beach seine found extensive usage of nearshore areas in the Columbia River estuary by subyearling Chinook salmon. Ledgerwood *et al.*(1990) using a 95 m (312 feet) beach seine fishing in depths to 6 m (20 feet) found extensive use of nearshore habitat in the Lower Columbia River by subyearling Chinook salmon. Dawley *et al.* (1986) using a 95 m beach seine fishing in depths to 3 m (10 feet) found extensive use of nearshore habitat in the

Lower Columbia River by subyearling Chinook salmon. Sampling by them in 1968 found nearshore usage by subyearling Chinook salmon to be 15 times greater than in the adjacent channel area and that yearling Chinook salmon, coho salmon and steelhead were more often caught in deeper waters (Dawley *et al.* 1986).

Shading from the dock may also reduce juvenile salmonid prey organism abundance and the complexity of the habitat by reducing aquatic vegetation and phytoplankton abundance (Kahler *et al.* 2000).

In-water structures (tops of pilings) also provide perching platforms for avian predators such as double-crested cormorants (*Phalacrocorax auritis*) (Kahler *et al.* 2000), from which they can launch feeding forays.

Upon completion, there will be a removal of 0.36 acres an over-water structure. Removal of the dock will likely increase the salmonid prey organism abundance. The removal of the dock will result in an increase in the survival of juvenile salmonids from reducing piscivorous predators, reducing avian predators, and restoring migration and feeding patterns of juvenile salmonids. The removal of over-water structures at a small scale does not necessarily improve population spatial structure; however, it can potentially increase survival, population abundance and productivity.

Sediment Disturbance. Construction activities are likely to temporarily increase suspended sediment levels through the re-suspension of sediments from piling removal and excavation below OHW.

Potential effects from project-related increases in suspended sediment on ESA-listed species include, but are not limited to: (1) Reduction in feeding rates and growth, (2) physical injury, (3) physiological stress, (4) behavioral avoidance, and (5) reduction in macroinvertebrate populations.

An increase in turbidity from suspension of fine sediments can adversely affect fish macro-invertebrates downstream from the work site. At moderate levels, turbidity has the potential to reduce primary and secondary productivity; at higher levels, turbidity may interfere with feeding and may injure and even kill both juvenile and adult fish (Berg and Northcote 1985; Spence *et al.* 1996). However, Bjornn and Reiser (1991) found that adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that may be experienced during storm and snowmelt runoff episodes.

Exposure duration is a critical determinant of the occurrence and magnitude of turbidity caused by physical or behavioral turbidity effects (Newcombe and Jensen 1996). Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such seasonal high pulse exposures. However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Servizi and Martens 1991). In a review of 80 published reports of fish responses to suspended sediment in streams and estuaries, Newcombe and Jensen (1996) documented increasing severity of ill effects with increases in dose (concentration multiplied by exposure duration).

Behavioral avoidance of turbid waters by juvenile salmonids may be one of the most important effects of suspended sediments (Birtwell *et al.* 1984; DeVore *et al.* 1980; Scannell 1988). Salmonids have been observed to move laterally and downstream to avoid turbid plumes (Lloyd *et al.* 1987; McLeay *et al.* 1984; McLeay *et al.* 1987; Scannell 1988; Servizi and Martens 1991). If the turbidity is severe enough to affect a significant cross-section of the river, the behavioral avoidance of turbid waters may impede or delay downstream or upstream migrations of adult and juvenile ESA-listed species. Salmon rearing in the action area during construction may also be exposed to other stress factors which may impose a cumulative burden in combination with increases in turbidity.

The construction activities that will most likely result in elevated suspended sediment are the removal of piles and removal of native stream bank material. The project-related suspended sediment increases will be localized and take part in a small portion of the lateral extent of the Willamette River and Multnomah Channel. Rearing and foraging behavior of juvenile salmonids, and migrating adult salmonids will be altered during increased turbidity plumes for two weeks during construction. Turbidity created by the project will cause interruption of essential behaviors and could potentially injure or kill a few individuals. Although the effects of turbidity could potentially injure or kill a few individuals, the loss of individuals is not likely to decrease population abundance and productivity.

Contaminants from Heavy Equipment Use and Pile Removal. The proposed action included construction activities that will occur within and adjacent to the Willamette River. Use of heavy equipment during the proposed construction activities creates the opportunity for accidental spills of fuel, lubricants, hydraulic fluid, and other petroleum products, which, if spilled in the vicinity of the action area, could injure or kill aquatic organisms. In addition, the discharge of construction water used for vehicle washing, concrete washout, and other purposes can carry sediments and a variety of contaminants to the Willamette River. Petroleum-based contaminants contain PAHs, which can cause lethal as well as sublethal effects to fish and other aquatic organisms (Neff 1985).

Instream construction will elevate the risk for chemical contamination of the aquatic environment within the action area. The proposed conservation measures, such as, including staging vehicles and equipment fueling away from aquatic resources, will minimize the risk from chemical contamination during in-water work activities.

The proposed action will include the removal of treated piles. Although it is unknown which chemicals the piles are treated with, creosote, ammoniacal copper zinc arsenate (ACZA), and chromated copper arsenate (CCA) are common substances used to preserve wood.

Creosote is host to a variable mix of over 300 preservative compounds, including phenolic compounds and nitron- sulfer- or oxygenated heterocyclics, dissolved in an oil-based solvent (Poston 2001). Of the most significant concern to aquatic life are PAHs, which can make up 65-85% of creosote treatment. Creosote, or its PAH constituents, have been shown to be cytotoxic, genotoxic, mutagenic, and carcinogenic in a number of organisms, both in the laboratory and in the field (Malins *et al.* 1985; Von Burg and Stout 1992; Fournie and Vogelbein 1994; Gagne *et al.* 1995; Shugart 1995 as cited in Vines *et al.* 2000).

ACZA and CCA compounds contain heavy metals chromium, copper, and arsenic. As these metals occur naturally in the environment, organisms tend to metabolically regulate them to a prescribed level and when exposure exceeds the physiological ability to deal with the metals, toxicity occurs. Copper is the main metal of concern because unlike terrestrial organisms, aquatic organisms are particularly sensitive to its presence. Copper also leaches the most, followed by arsenic and chromium (Warner and Solomon 1990).

Likely effects of elevated water column and sediments concentrations of copper and PAHs to the salmonids include, but are not limited to: (1) Reduced growth and survival rates; (2) altered hematology; and (3) reproductive effects, including reduced frequency of spawning, reduced egg production, and increased deformities in fry (Sorensen 1991). The most probable route of exposure to leached or diffused contaminants from creosote treated wood for salmon is through the consumption of contaminated prey (Poston 2001). Hence, exposure is greatest for salmon when they are feeding in areas of sediment deposition immediately beside treated wood structures.

Treated wood piles will be removed using a vibratory hammer. If the piles break, they will be cut 2 feet below the mudline, and disposed of in an upland location. Although the preservatives are tightly bound to the wood fibers and leaching rates have diminished over time, the removal of treated wood piles is likely to temporarily (5 days) increase the exposure of aquatic organisms to these chemicals to. This is especially true if the piling is cut or broken and a new surface is exposed, or if contaminated wood fragments are introduced or left on the riverbed (Poston 2001), or if contaminated sediment is suspended. Any increase in contaminant exposure due to sediment re-suspension is expected to be short-term (5 days) and limited to the immediate vicinity of removal activity. Juvenile and adult life stages of salmonids could be exposed to sub-lethal concentrations of wood preservatives, which could reduce the survival of a few individuals. Although the effects of exposure to wood preservatives could potentially decrease survival of a few individuals, the effects are not likely to decrease population abundance and productivity.

The long-term release of toxic chemicals from treated wood piles have been known to occur, with the initial leaching rates the greatest and eventually diminishing over time (USACE 1997). Ingram *et al.* (1982) determined that even after 12 years, a creosote-treated pile leaches 8.0 $\mu g/cm^2$/day of creosote. Vines *et al.* (2000) has shown that pilings over 40 years of age still contain diffusible amounts of creosote that migrate from the product into the environment. Therefore, it is likely that the treated wood piles subject to the proposed action are consistent sources of chemical contaminants and the permanent removal of the piles will result in a long-term benefit to water quality.

Off- and Side-channel Habitat Restoration. Side channel wetlands and ponds provide important habitats for juvenile fish. Many historical off- and side-channels have been blocked from main stream channels for flood control or by other land management activities, or have ceased functioning due to other in-stream sediment imbalances. This proposed action includes the creation of new off- and side-channel habitats. When these areas are more regularly and permanently available, as in larger river basins, they can provide high value winter rearing habitat for salmon (Saldi-Caromile *et al.* 2004).

The effects of creating new off- and side-channel habitats will include relatively intense, but short-term restoration construction effects, as discussed above. The indirect effects are likely to include equally intense beneficial effects to habitat diversity and complexity (WDFW 2004), including increased overbank flow and greater potential for groundwater recharge in the floodplain; greater channel complexity and/or increased shoreline length; increased floodplain functionality; and increased width of riparian corridors. Improved riparian functions are likely to include increased shade and hence moderated water temperatures and microclimate; increased organic material supply; water quality improvement; filtering of sediment and nutrient inputs; more efficient nutrient cycling; and restoration of flood-flow refuge for ESA-listed fish (Saldi-Caromile *et al.* 2004).

Estuary areas are important transitional areas for all species of salmonids, (Groot and Margolis 1991). Side-and off-channel habitat are limited in the Lower Willamette River. The creation of these habitat types at a small scale does not necessarily improve population spatial structure; however, it does make available additional habitat that can potentially increase population abundance and productivity.

Herbicide Use. NMFS identified three scenarios for the analysis of herbicide application effects: (1) Runoff from riparian application; (2) application within perennial stream channels; and (3) runoff from ditches. Stream margins often provide shallow, low-flow conditions, may have a slow mixing rate with mainstem waters, and may also be the site at which subsurface runoff is introduced. Juvenile salmon and steelhead, particularly recently emerged fry, often use low-flow areas along stream margins. Chinook salmon rear near stream margins until they reach about 60 mm in length. As juveniles grow, they migrate away from stream margins and occupy habitats with progressively higher flow velocities. Nonetheless, stream margins continue to be used by larger salmon and steelhead for a variety of reasons, including nocturnal resting, summer and winter thermal refuge, predator avoidance, and flow refuge.

Spray and vapor drift are important pathways for herbicide entry into aquatic habitats. Several factors influence herbicide drift, including spray droplet size, wind and air stability, humidity and temperature, physical properties of herbicides and their formulations, and method of application. For example, the amount of herbicide lost from the target area and the distance the herbicide moves both increase as wind velocity increases. Under inversion conditions, when cool air is near the surface under a layer of warm air, little vertical mixing of air occurs. Spray drift is most severe under these conditions, since small spray droplets will fall slowly and move to adjoining areas even with very little wind. Low relative humidity and high temperature cause more rapid evaporation of spray droplets between sprayer and target. This reduces droplet size, resulting in increased potential for spray drift. Vapor drift can occur when an herbicide volatilizes. The formulation and volatility of the compound will determine its vapor drift potential. The potential for vapor drift is greatest under high air temperatures and with ester formulations. For example, ester formulations triclopyr are very susceptible to vapor drift, particularly at temperatures above 80°F.

When herbicides are applied with a sprayer, nozzle height controls the distance a droplet must fall before reaching the weeds or soil. Less distance means less travel time and less drift. Wind velocity is often greater as height above ground increases, so droplets from nozzles close to the ground would be exposed to lower wind speed. The higher that an application is made above the ground, the more likely it is to be above an inversion layer that will not allow herbicides to mix with lower air layers and will increase long distance drift. Several proposed PDCs address these concerns by ensuring that herbicide treatments will be made using ground equipment or by hand, under calm conditions, preferably when humidity is high and temperatures are relatively low. Ground equipment reduces the risk of drift, and hand equipment nearly eliminates it.

Surface water contamination with herbicides can occur when herbicides are applied intentionally or accidentally into ditches, irrigation channels or other bodies of water, or when soil-applied herbicides are carried away in runoff to surface waters. Direct application into water sources is generally used for control of aquatic species. Accidental contamination of surface waters can occur when irrigation ditches are sprayed with herbicides or when buffer zones around water sources are not wide enough. In these situations, use of hand application methods will greatly reduce the risk of surface water contamination.

The contribution from runoff will vary depending on site and application variables, although the highest pollutant concentrations generally occur early in the storm runoff period when the greatest amount of herbicide is available for dissolution. Lower exposures are likely when herbicide is applied to smaller areas, when intermittent stream channel or ditches are not completely treated, or when rainfall occurs more than 24 hours after application. Under the proposed action, some formulas of herbicide can be applied within the bankfull elevation of streams, in some cases up to the water’s edge. Any juvenile fish in the margins of those streams are more likely to be exposed to herbicides as a result of overspray, inundation of treatment sites, percolation, surface runoff, or a combination of these factors.

Groundwater contamination is another important pathway. Most herbicide groundwater contamination is caused by “point sources,” such as spills or leaks at storage and handling facilities, improperly discarded containers, and rinses of equipment in loading and handling areas, often into adjacent drainage ditches. Point sources are discrete, identifiable locations that discharge relatively high local concentrations. The proposed PDCs minimize these concerns by ensuing proper calibration, mixing, and cleaning of equipment. Non-point source groundwater contamination of herbicides is relatively uncommon but can occur when a mobile herbicide is applied in areas with a shallow water table. Proposed PDCs minimize this danger by restricting the formulas used, and the time, place and manner of their application to minimize offsite movement.

Herbicides and associated compounds are likely to affect listed fish through several pathways. Lethal or sub-lethal toxicity to listed fish result if concentrations are high. Bioaccumulation rates are low to very low for all herbicides in the proposed action, and bioaccumulation of herbicides is not expected to occur.

Herbicides and associated compounds are likely to affect periphyton, zooplankton, and macroinvertebrates in the stream. The use of herbicides near aquatic environments decreases biomass production of periphyton, zooplankton, and macroinvertebrates. Herbicides also decrease the species richness of zooplankton and macroinvertebrates (Relyea 2005). The reduction of periphyton, zooplankton, and macroinvertebrates will cause a decrease of prey organisms for juvenile salmonids. Potential effects to juvenile salmonids include a reduction in feeding rates and growth, which could potentially decrease survival of a few individuals.

The risk of acute indirect exposure to sub-lethal concentrations of herbicides is possible from the proposed vegetation treatments. Sub-lethal effects can include disruption of behavior such as migration, feeding, and predator avoidance (Meehan 1991; Sandahl *et al.* 2004; Scholz *et al.* 2000). Behavioral changes are driven by molecular-level physiological events, such as changes in enzymatic function, ligand-receptor interaction, or oxygen metabolism (Weis *et al.* 2001). Such small or subtle changes in physiological function can have biologically relevant consequences (McEwen and Wingfield 2003), even though they are difficult or impossible to measure. These changes could potentially injure a few individuals.

Juvenile and adult life stages of salmonids could be indirectly exposed to sub-lethal concentrations of herbicides or associated compounds. In addition, herbicides will likely reduce juvenile salmonid prey abundance and productivity. Herbicides will be used annually for a 10-year period. The proposed application methods, timing restrictions, buffers and other minimization measures will significantly reduce the likelihood of herbicides reaching the aquatic environment in concentrations that will kill or harm adult salmonids. However, herbicides that are applied to the water's edge will likely cause sub-lethal effects to juvenile salmonids that will significantly affect normal behavior patterns. Although the effects of herbicides could potentially injure a few individuals, they are unlikely to die. The proposed action will not decrease population abundance and productivity.

Juvenile Salmonid Monitoring. The primary effect of the proposed juvenile salmonid monitoring will be in the form of harassment, capturing, and handling fish. The following subsections describe the effects of each activity.

Observation. ESA-listed fish would be observed in-water (*e.g*., by snorkel surveys or from the banks). Direct observation is the least disruptive method for determining a species' presence/absence and estimating their relative numbers. Its effects are also generally the shortest-lived and least harmful of the monitoring activities discussed in this section because a cautious observer can effectively obtain data while only slightly disrupting the fishes' behavior. Fry and juveniles frightened by the turbulence and sound created by observers are likely to seek temporary refuge in deeper water or behind or under rocks or vegetation. In extreme cases, some individuals may leave a particular pool or habitat type and then return when observers leave the area. Harassment is the primary effect associated with these observation activities, and few if any injuries (and no deaths) are expected to occur—particularly in cases where monitoring is observed from the stream banks rather than in the water.

Capture/handling. Any physical handling or disturbance is known to be stressful to fish (Sharpe *et al.* 1998). The primary contributing factors to stress and death from handling are excessive doses of anesthetic, differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18ºC or dissolved oxygen is below saturation. The proposed action would only seine fish which could result in injury from entanglement in the seine and descaling from rubbing. High levels of stress can both immediately debilitate individuals and over a longer period, increase their vulnerability to physical and biological challenges (Sharpe *et al.* 1998).

2.4.2 Effects on Critical Habitat

Designated critical habitat within the action area for ESA-listed salmon and steelhead considered in this opinion consists of freshwater rearing sites and freshwater migration corridors and their essential physical and biological features (PBFs) as listed below. The effects of the proposed action on these features are summarized as a subset of the habitat-related effects of the action that were discussed more fully above.

Freshwater rearing sites.

Water quantity. Water quantity will be not affected.

Floodplain connectivity. No adverse effects to floodplain connectivity will occur, but long-term beneficial effects are expected from several activities including berm removal, and creation of side channels. These actions will restore interaction between the stream and its floodplain, raising the water table and improving general riparian function.

Water quality. Short-term adverse effects to water quality, as described above, will occur when near-water or in-water construction occurs. Increased turbidity and increased levels of chemical contaminants resulting from construction will last for a few hours to a maximum of a few weeks. Minor inputs of chemical herbicides as described earlier will degrade water quality for a period of hours to days for a 10 year period.

Forage. Minor reductions in invertebrate forage will occur as a result of increased fine sediment generated by construction activities. This will affect to a few hundred feet below construction sites, and these areas will be recolonized by invertebrates within a few months. Short-term reductions in algae and macroinvertebrates will occur as described in the analysis of herbicide effects.

In the long term, the restoration activities that improve riparian function help to encourage establishment of healthy riparian plant community. Food available to juveniles may increase from nutrient enrichment, and the relative abundance of aquatic invertebrates may change locally in response to physical changes in habitat. Where habitat complexity is increased, juveniles are likely to benefit from a wider array of prey species and improved efficiency while foraging.

Natural cover. In the long term, large wood placement and riparian planting will improve cover for salmon and steelhead.

Freshwater migration corridors.

Free passage. Free passage will not be affected.

Water quantity. Water quantity will not be affected.

Water quality. Water quality will be affected as described above.

Natural cover. Natural cover will be affected as described above.

In summary, the proposed action is likely to cause a minor, localized and temporary degradation of critical habitat PBFs for water quality, and forage. Due to their temporary nature, none of the effects are likely to reduce the quality and function of the PBFs within the action area. There will be a long-term benefit to floodplain connectivity, water quality, forage, and natural cover. The critical habitat in the action area will increase its ability to provide rearing sites and freshwater migration corridors for the species considered in this opinion.

2.5 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). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

The action area has a high population density because it is in the Portland metropolitan area. The past effect of that population is expressed as changes to physical habitat and loadings of pollutants contributed to the Willamette River. These changes were caused by residential, commercial, industrial, agricultural, and other land uses for economic development, and are described in the Environmental Baseline (Section 2.3). The collective effects of these activities tend to be expressed most strongly in lower river systems where the impacts of numerous upstream land management actions aggregate to influence natural habitat processes and water quality, including increased stream temperature, and increased contaminant levels.

This project is expected to become a mitigation bank designed to restore and protect natural functions. Cumulative effects from this project will be limited to short-term effects from construction (*e.g.*, increases in suspended sediment, and increases in contaminants), and effects from maintaining the restored area (*e.g.*, increased herbicide use).

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated critical habitat for the conservation of the species.

All adult UWR Chinook salmon and UWR steelhead must migrate through the action area to the Upper Willamette River basin and all juvenile UWR Chinook salmon and UWR steelhead must migrate from the Upper Willamette River basin to the ocean through the action area. Therefore, individuals from all populations of these two species could potentially be affected by the proposed action. The LCR Chinook salmon, LCR steelhead and LCR coho salmon individuals in the action area are likely to be from the Clackamas River populations and must also pass through the action area as juveniles and adults. Over the past several years, NMFS has engaged in various Section 7 consultations on Federal projects impacting these populations and their habitats, and those impacts have been taken into account in this opinion as part of the environmental baseline.

The current extinction risk for UWR Chinook salmon is very high and the recovery goal is for the extinction risk to become very low. The current extinction risk for UWR steelhead is low and the recovery goal is for the extinction risk to become very low. The current extinction risk for the Clackamas River population of LCR Chinook salmon is very high and the recovery goal is for the extinction risk to reduce to medium. The current extinction risk for the Clackamas River population of LCR coho salmon is medium and the recovery goal is for the extinction risk to become very low. The current extinction risk for the Clackamas River population of LCR steelhead is medium and the recovery goal is for the extinction risk to become low. The Clackamas River population is identified as a "core" population. To meet the ESU-viability criteria, representative populations, such as the Clackamas River population, need to achieve viability criteria or be maintained (ODFW 2010).

The environmental baseline is such that individual ESA-listed salmonids in the action area are exposed to reduced water quality, lack of suitable riparian and aquatic habitat and restricted movement due to developed urban areas and land use practices. These stressors, as well as those from climate change, already exist and are in addition to any adverse effects produced by the proposed action. Major factors limiting recovery of the ESA-listed salmonids considered in this opinion include degraded estuarine and nearshore habitat; degraded floodplain connectivity and function; channel structure and complexity; riparian areas and large wood recruitment; stream substrate, streamflow; fish passage; water quality; harvest and hatchery impacts; predation/competition; and disease.

The in-water work will occur when all species of juvenile salmonids could potentially be present during downstream migration, and UWR steelhead adults could potentially be present during construction. The herbicide application will take place annually for a 10 year period. Due to variable timing applications, all species of salmonids considered in this opinion could potentially be subject to the effects of herbicide application. Although the effects of the proposed action are likely to kill or injure a few fish, the effects will be too small to cause a biologically meaningful effect at the population scale. The overall percentage of individuals of each species that could be present, is small. This very small proportion of the number of individuals in each population will be adversely affected by capture, increased suspended sediment, and exposure to contaminants.

After construction, all species of salmonids will have access to newly created off-channel habitat. The removal of the dock and creation of the off-channel habitat will not necessarily improve salmonid population spatial structure; however, it does make available additional habitat that can potentially increase population and species abundance and productivity.

Therefore, the proposed action, taken with the environmental baseline and cumulative effects, is not likely to appreciably reduce the likelihood of survival and recovery of the species covered in this opinion.

Adverse effects to the quality and function of critical habitat PBFs influenced by this project will be minor and of a low intensity. The effects on water quality during construction from increased turbidity and exposure to contaminants will last for 4 months, but no long-term increase in turbidity will result from the proposed action. The effects on water quality from the use of herbicides will occur annually for 10 years. None of the anticipated short-term adverse effects will reach a magnitude such that the conservation role of critical habitat will be impaired. The lower Willamette/Columbia River corridor is of “high” conservation value for the watershed and this corridor is highly essential to nearly all individual of UWR species and a majority of LCR species. The removal of the dock and creation of off-channel habitat will improve the rearing and migration PBFs and have a long-term positive effect on the quality and function of critical habitat.

2.7 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS’ biological opinion that the proposed action is not likely to jeopardize the continued existence of LCR Chinook salmon, UWR Chinook salmon, LCR coho salmon, LCR steelhead, or UWR steelhead or to destroy or adversely modify critical habitat designated for these species.

2.8 Incidental Take Statement

Section 9 of the ESA and Federal regulations 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 regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). “Incidental take” is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

2.8.1 Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is likely to occur as follows:

- Harm and harassment to a few juveniles of all ESA-listed salmon and steelhead considered in this opinion due to snorkel monitoring, and seining.
- Harm among juveniles and adults of all ESA-listed salmon and steelhead considered in this opinion due to the application of herbicides.
- Harm to juveniles and adults of all ESA-listed salmon and steelhead considered in this opinion due to a temporary increase in suspended sediment from falling debris during demolition and its retrieval.

The distribution and abundance of fish that occur within an action area are 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 that will be within the action area at any given time cannot precisely predicted, nor can NMFS estimate the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action. In circumstances where NMFS cannot provide an amount of take that would be caused by the proposed action, an extent of take is provided instead.

The best available indicators for the extent of take are:

(1) The amount of take for juvenile salmonids is based on sampling data (Teel *et al.* 2009) conducted on off-channel site. Based on these data, juvenile salmonid monitoring is reasonable certain to capture or injure up to 31 juvenile Chinook salmon, 31 juvenile coho salmon, and 31 juvenile steelhead as a single occurrence within the 10 year monitoring period. Approximately one percent of the fish handled or captured will likely die (one fish per species). Seining, as a method of monitoring, will cease once any juveniles are captured.

(2) The best available indicator for the extent of take caused by in-water construction is the extent of suspended sediment plumes. This feature best integrates the likely take pathway associated with in and near water construction, is proportional to the anticipated amount of take, and is the most practical and feasible indicator to measure. Thus, the extent of take indicator that will be used as a reinitiation trigger for this consultation is increased suspended sediment from construction activities with suspended sediment plumes 1,000 feet from the boundary of construction activities at 10% over the background level.

(3) The best available indicator for the extent of take for herbicide application is the number of acres treated per year. This feature best integrates the likely take pathway associated with this action, is proportional to the anticipated amount of take, and is the most practical and feasible indicator to measure. Thus, the extent of take indicator that will be used as a reinitiation trigger for this consultation is herbicide application on a maximum of 60 acres per year.

2.8.2 Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species considered in this opinion or destruction or adverse modification of their critical habitat.

2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). The Corps shall:

1. Minimize incidental take from project-related activities by applying conditions to the proposed action that avoid or minimize adverse effects to water quality and the ecology of aquatic systems.
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.

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps or any applicant must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14). The Corps or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the following terms and conditions are not complied with, the protective coverage of section 7(o)(2) will likely lapse.

1. To implement reasonable and prudent measure #1, the Corps shall ensure that:

   a. Work Window. To minimize effects to juvenile salmonids, construction shall be limited to the in-water work window of July 1-October 31.

2. To implement reasonable and prudent measure #2, the Corps shall ensure that:

   a. Turbidity. Monitoring shall be conducted and recorded as described below. Monitoring shall occur each day during daylight hours when in-water work is being conducted.
      i. Representative background point. An observation must be taken every 2 hours at a relatively undisturbed area at least 600 feet upcurrent from in-water disturbance to establish background turbidity levels for each monitoring cycle. Background turbidity, location, time, and tidal stage must be recorded prior to monitoring downcurrent.
      ii. Compliance point. Monitoring shall occur every 2 hours approximately 1,000 feet downcurrent from the point of disturbance and be compared

against the background observation. The turbidity, location, time, and tidal stage must be recorded for each sample.

iii. Compliance. Results from the compliance points should be compared to the background levels taken during that monitoring interval. Turbidity may not exceed an increase of 10% above background at the compliance point during construction.

iv. Exceedance. If an exceedance occurs, the applicant must modify the activity and continue to monitor every 2 hours. If an exceedance over the background level continues after the second monitoring interval, the activity must stop until the turbidity levels return to background. If the exceedances continue, then work must be stopped and NMFS notified so that revisions to the BMPs can be evaluated.

v. If the weather conditions are unsuitable for monitoring (heavy fog, ice/snow, excessive winds, rough water, *etc*.), then operations must cease until conditions are suitable for monitoring.

vi. Copies of daily logs for turbidity monitoring shall be available to NMFS upon request.

b. Herbicide Application. Report the number of acres of herbicide application annually.

c. Juvenile Salmonid Monitoring. Report the following data for juvenile fish sampling:

i. Means of fish monitoring.

ii. Number of ESA-listed salmonids observed or captured.

iii. Condition of ESA-listed salmonids released.

iv. Any incidence of observed injury or mortality.

d. Reporting. The applicant reports all monitoring items, including turbidity observations to NMFS within 60 days of the close of any work window that had in-water work within it. Any exceedance of take covered by this opinion must be reported to NMFS immediately. The report will include a discussion of implementation of the terms and conditions in #1, above.

e. The applicant will submit monitoring reports to:

National Marine Fisheries Service
Oregon State Habitat Office
Attn: WCR-20170-6525
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232-2778

2.9 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. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). The following conservation recommendation is a discretionary measure that NMFS believes is consistent with this obligation and therefore should be carried out by the Corps or applicants should be encouraged to conduct these activities:

- Minimize the use of herbicides for non-native and invasive vegetation control by exploring alternative methods of vegetation control.

Please notify NMFS if the Corps carries 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.

2.10 Reinitiation of Consultation

This concludes formal consultation for the Linnton Mill Restoration project.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental taking specified in the incidental take statement is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect essential fish habitat (EFH). The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, 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 of it 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 can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the Corps and descriptions of EFH for Pacific coast salmon (Pacific Fishery Management Council 2014) contained in the fishery management plans developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

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 as identified in the Fishery Management Plan for Pacific coast salmon (Pacific Fishery Management Council 2014).

3.2 Adverse Effects on Essential Fish Habitat

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 adverse effects on EFH designated for Chinook and coho salmon. Adverse effects of the proposed action will include sub-lethal effects from exposure to contaminants to juvenile and adult Chinook and coho salmon, harassment and increased suspended sediment during construction on juvenile and adult Chinook and coho salmon, and delayed upstream migration of adult Chinook and coho salmon.

3.3 Essential Fish Habitat Conservation Recommendations

1. Follow term and condition 1 as presented in the ESA portion of this document to minimize adverse effects to water quality and the ecology of aquatic systems from project-related activities (implementation).
2. Follow term and condition 2 as presented in the ESA portion of this document to minimize adverse effects to water quality and the ecology of aquatic systems from project-related activities (general construction and in-water work).
3. Implement the conservation recommendation presented as part of the ESA portion of this document.

NMFS expects that fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2 above, approximately 1 acre of designated EFH for Pacific coast salmon.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Corps must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Corps have agreed to use alternative time frames for the Corps' response. The response must include a description of measures proposed by the Corps for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Corps must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

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.

3.5 Supplemental Consultation

The Corps 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)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the Corps and the applicant. Other interested users could include citizens of the affected area, and others interested in the conservation of the affected species. Individual copies of this opinion were provided to the Corps and the applicant. The format and naming adheres to conventional standards for style.

4.2 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.

4.3 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 NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and 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 West Coast Region ESA quality control and assurance processes.

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