Appendix D
Environmental Documents

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HGM Results Worksheet

	Existing 1-10	Existing 11-25	Existing 26-50	Existing Average Annual	Measure A1 Years 1-10	Measure A1 Years 11-25	Measure A1 Years 26-50	Measure A1 Average Annual	Measure B1 Years 1-10	Measure B1 Years 11-25	Measure B1 Years 26-50	Measure B1 Average Annual	Measure C1 Years 1-10	Measure C1 Years 11-25	Measure C1 Years 26-50	Measure C1 Average Annual	Measure D1 Years 1-10	Measure D1 Years 11-25	Measure D1 Years 26-50	Measure D1 Average Annual
Water Storage & Delay (ws)	0.28	0.28	0.28	0.28	0.40	0.40	0.40	0.40	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Sediment Stabilization & Phosphorus Retention (sp)	0.77	0.81	0.81	0.80	0.80	0.80	0.80	0.80	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Nitrogen Removal (n)	0.72	0.77	0.77	0.76	0.81	0.86	0.86	0.85	0.78	0.83	0.83	0.82	0.72	0.77	0.77	0.76	0.78	0.83	0.83	0.82
Thermoregulation (t)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Primary Production (pp)	0.75	0.79	0.79	0.78	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.76	0.76	0.76	0.76	0.78	0.78	0.78	0.78
Resident Fish Habitat Support (rf)	0.49	0.49	0.49	0.49	0.64	0.64	0.64	0.64	0.66	0.66	0.66	0.66	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Anadromous Fish Habitat Support (af)	0.64	0.68	0.68	0.67	0.73	0.77	0.77	0.76	0.68	0.72	0.72	0.71	0.57	0.61	0.61	0.61	0.57	0.61	0.61	0.60
Invertebrate Habitat Support (i)	0.63	0.63	0.63	0.63	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Amphibian & Turtle Habitat (at)	0.61	0.64	0.64	0.63	0.61	0.63	0.63	0.62	0.61	0.63	0.63	0.62	0.61	0.63	0.63	0.62	0.61	0.63	0.63	0.63
Breeding Waterbird Support (bw)	0.78	0.78	0.78	0.78	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.78	0.78	0.78	0.78	0.85	0.85	0.85	0.85
Wintering & Migrating Waterbird Support (ww)	0.93	0.69	0.69	0.74	0.98	0.98	0.98	0.98	0.90	0.90	0.90	0.90	0.93	0.93	0.93	0.93	0.95	0.95	0.95	0.95
Songbird Habitat Support (sb)	0.74	0.53	0.53	0.57	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Support of Characteristic Vegetation (v)	0.59	0.62	0.62	0.61	0.60	0.61	0.61	0.61	0.60	0.61	0.61	0.61	0.60	0.61	0.61	0.61	0.59	0.60	0.60	0.60
Sum	8.53	8.31	8.31	8.35	9.18	9.31	9.31	9.29	8.90	9.03	9.03	9.00	8.63	8.76	8.76	8.74	8.79	8.91	8.91	8.88
Average	0.66	0.64	0.64	0.64	0.71	0.72	0.72	0.71	0.68	0.69	0.69	0.69	0.66	0.67	0.67	0.67	0.68	0.69	0.69	0.68

	Measure E1 Years 1-10	Measure E1 Years 11-25	Measure E1 Years 26-50	Measure E1 Average Annual	Measure F1 Years 1-10	Measure F1 Years 11-25	Measure F1 Years 26-50	Measure F1 Average Annual	Measure G1 Years 1-10	Measure G1 Years 11-25	Measure G1 Years 26-50	Measure G1 Average Annual
Water Storage & Delay (ws)	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Sediment Stabilization & Phosphorus Retention (sp)	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Nitrogen Removal (n)	0.72	0.77	0.81	0.78	0.72	0.77	0.81	0.78	0.81	0.85	0.85	0.84
Thermoregulation (t)	0.70	0.80	0.80	0.78	0.60	0.60	0.60	0.60	0.70	0.70	0.70	0.70
Primary Production (pp)	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.79	0.79	0.79	0.79
Resident Fish Habitat Support (rf)	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.92	0.92	0.92	0.92
Anadromous Fish Habitat Support (af)	0.64	0.74	0.78	0.74	0.64	0.74	0.78	0.74	0.89	0.99	0.99	0.97
Invertebrate Habitat Support (i)	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.65	0.65	0.65	0.65
Amphibian & Turtle Habitat (at)	0.61	0.60	0.62	0.61	0.61	0.60	0.62	0.61	0.66	0.68	0.68	0.67
Breeding Waterbird Support (bw)	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.85	0.85	0.85	0.85
Wintering & Migrating Waterbird Support (ww)	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.95	0.95	0.95	0.95
Songbird Habitat Support (sb)	0.75	0.76	0.77	0.76	0.75	0.77	0.77	0.77	0.75	0.77	0.77	0.77
Support of Characteristic Vegetation (v)	0.83	0.85	0.86	0.85	0.84	0.85	0.86	0.85	0.67	0.68	0.68	0.68
Sum	8.89	9.16	9.28	9.17	8.80	8.97	9.09	8.88	9.69	9.88	9.88	9.84
Average	0.68	0.70	0.71	0.71	0.68	0.69	0.70	0.69	0.75	0.76	0.76	0.76

Code to Measures
Measure A1: Replace Culvert
Measure B1: Remove Water Control Structure
Measure C1: Replace Water Control Structure
Measure D1: Construction Berm Around Reservoir
Measure E1: Revegetate Perimeter of Reservoir
Measure F1: Revegetate Around Ponds
Measure G1: Excavate Tidal Slough Channel

Example HGM Scoring Worksheet

SHEET FOR AUTOMATIC CALCULATION OF FUNCTION SCORES - revised October 2005

Riverine Impounding subclass

Site Name: **Date:**

Starting in row 31, replace any values in green cells (mostly columns B and D) with your new data.
Blue cells will calculate automatically
It is recommended to do a "Save As" from this blank spreadsheet for each use, assigning different file names. This will help reduce the chance of confusing new data with previously entered data.
For reference, the function(s) addressed by each indicator are noted in column E. Codes are shown below next to the function names. The capital letter in the code (e.g., af-**B**) in column E refers to the code for the indicator in the published Volume IA.
HFR= scaled to highest functioning site of this subclass found by DSL; **LAR**= scaled to least-altered site of this subclass found by DSL Scores greater than 1 indicate the capacity of the function at the site you assessed may be greater than in all sites of this subclass assessed by the DSL team during model calibration.

Data **must** be entered for every indicator, unless the scale block for this subclass is shaded. Each value in column D must be less than or equal to 1.

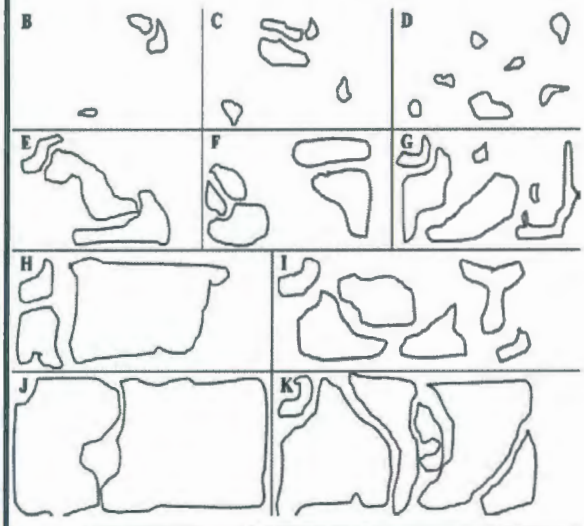
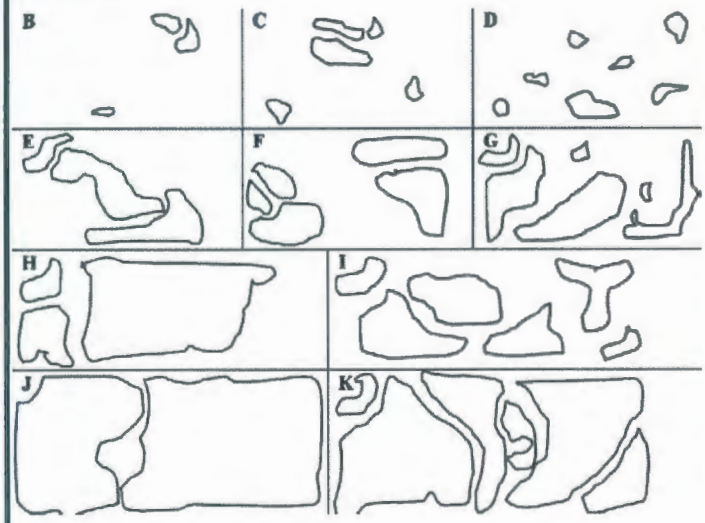
Function:	Calculated Function Capacity for RI sites if HFR:	if LAR:
Water Storage & Delay (ws)	0.28	0.28
Sediment Stabilization & Phosphorus Retention (sp)	0.77	0.77
Nitrogen Removal (n)	0.72	0.78
Thermoregulation (t)	0.60	0.60
Primary Production (pp)	0.75	0.75
Resident Fish Habitat Support (rf)	0.49	0.83
Anadromous Fish Habitat Support (af)	0.64	0.74
Invertebrate Habitat Support (i)	0.63	0.70
Amphibian & Turtle Habitat (at)	0.61	0.62
reeding Waterbird Support (bw)	0.78	0.80
Wintering & Migrating Waterbird Support (ww)	0.93	1.26
Songbird Habitat Support (sb)	0.74	0.78
Support of Characteristic Vegetation (v)	0.59	0.67

Note 1: Models and scores for ws, sp, n, and pp intentionally do not account for the area of the wetland, an especially important factor for these functions
Note 2: This method should be applied to an entire contiguous wetland, not just to the portion affected directly by a planned alteration or restoration.

Indicator	*Raw Datum*	*Scale for RI sites*	*Scaled Datum*	*Function*
Presence of permanent surface water (water year-round during most years)? (p. 82)	present	absent = 0 present = 1.0	1	sb-P rf-X
Site is permanently inundated and connected to other bodies of water by surface water during at least part of summer.	yes	Yes = 1 No = 0	1	t-X
Percent of permanent zone that is open water (i.e., lacking emergent and underwater plants) (p. 79) (answer "0" if no permanent zone is present)	100	100 =.1 80-99 =.8 60-80 = 1.0 40-60 =.8 20-40 =.4 1-20 =.2 0 = 0	0.1	at-M

Percent of site that is inundated only seasonally (i.e., watermarks, moss lines, debris lines, etc.) (p. 81)	70	none = 0 1-10 =.1 10-30 =.3 30-60 =.5 60-90 =.7 > 90 = 1.0	0.7	rf-D af-B
		none = 0 1-10 =.1 10-30 =.3 30-60 =.5 60-90 =.7 > 90 = 1.0	0.7	i-B n-A ws-A
		none = 0 1-20 =.5 20-40 =.7 40-60 =.8 60-80 =.9 >80 = 1.0	0.9	ww-A
At least 0.5 acre of surface water persists until at least July 1 and water is mostly wider than 10 ft?	yes	Yes = 1 No = 0	1	bw-X
Type of connection to associated channel: (p. 71, 85) PPD= perm diffuse connection to/from an onsite perm pool PPC= perm constricted connection from an onsite perm pool SPD= seas diffuse connection to/from an onsite perm pool SPC= seas constricted connection to/from onsite perm pools SSC= seas constricted connection to/from onsite seas pools SSD= seas diffuse connection to/from onsite seas pools (perm = permanent; seas = seasonal)	SSC	SSC/SSD= 0 PPD =.25 PPC =.5 SPD =.75 SPC = 1.0	0	rf-c
		none = 0 SPC =.2 PPC =.4 SPD =.6 SSC =.8 PPD/SSD = 1.0	0.8	af-A
		none = 0 SSC/SSD =.4 PPC/PPD =.8 SPC/SPD = 1.0	0.4	i-C
During high water, part of site is accessible to anadromous fish?	yes	Yes = 1 No = 0	1	af-X
Predominant water depth during biennial low water (p. 82)	6"	<1" =.1 1-2" =.2 2-24" =.7 24"-6' =.9 >6ft = 1.0	0.7	rf-A t-B
		0" = 0 1-2" =.6 2-24" = 1.0 2-6 ft =.8 >6 ft =.6	1	bw-D
		0 =.1 1-2" =.4 2-24" = 1.0 >24" =.8	1	i-D
Percent of site occupied by the most extensive depth category at this site during biennial low water. (p. 81). (Delimit the low water zone first, then break into these depth categories, then identify the category that predominates horizontally). (Possible categories are: 0 inches; 1-2 inches; 2-24 inches; 2-6 feet; < 6 feet)	20	100 = 0 80-100 =.1 50-80 =.4 30-50 =.8 <30 = 1.0	1	bw-B

Percent of surface water in the 2-6 ft depth category during biennial low water (p. 80)	0	0 = 0 1-10 =.4 10-30 =.6 >30 = 1.0	0	rf-B
Difference between the predominating biennial high and low water levels (p. 71) 0) = No change 1) = Difference of 1 class 2) = Difference of 2 classes 3) = Difference of 3 classes 4) = Difference of 4 classes Class 1 = 0 inches Class 2 = 1-2 inches Class 3 = 2-24 inches Class 4 = 2-6 feet Class 5 = > 6 feet	3	0) = 0 1) =.3 2) =.5 3) =.8 4) = 1.0	0.8	n-B at-E bw-E
		0) = 0 1) = .25 2) = .5 3) = .75 4) = 1.0	0.75	ww-F
Predominant vertical increase in surface water level (ft) in most of the seasonal zone (i.e., water marks, moss lines, debris lines, etc. Look at the highest point for 2 year flood and measure the difference from biennial low)	2	<2 =.2 2-3 =.4 4-6 =.6 7-10=.8 >10=1.0	0.4	ws-B
Number of depth categories during biennial high water. (p. 77) Categories are: ___ 1 - 2 inches ___ 2 - 24 inches ___ 2 – 6 ft ___ > 6 ft	2	1 = 0 2 =.3 3 =.6 4 = 1.0	0.3	bw-C
		1 = .1 2 = .3 3 = .6 4 = 1.0	0.3	ww-E

Percent & distribution of pools during biennial high water. If none, answer "A". See p. 80 for enlargement of diagram. Note: if site is > 1 acre, select the condition that predominates in 1 acre sub-units of the site.  	H	A = 0 B =.1 C =.2 D =.3 E =.4 F =.5 J =.6 H =.7 I =.8 K =.9 G = 1.0	0.7	sp-C ww-D i-E, at-A. af-D
Percent & distribution of pools during biennial low water. (p. 80) (Note: if site is > 1 acre, select the condition that predominates in 1 acre sub-units of the site.) A = None  	B	A = 0 B =.1 C =.2 D =.3 E =.4 F =.5 J =.6 H =.7 I =.8 K =.9 G = 1.0	0.1	bw-A, pp-E, n-I

Maximum annual extent of vernal pools/ shorebird scrapes and mudflats: (p. 76) A = none B = 1 – 100 sq. ft. C = 100-1000 sq. ft. D = 1000 – 10,000 sq. ft. E = >10,000 sq. ft Must meet ALL of the following: a) herbs are generally < 4" and comprise < 80% ground cover during winter or early spring b) topography is basically flat c) inundated to a depth of < 6" for 2 or more continuous weeks d) never shaded by trees, shrubs, or buildings e) not entirely a constructed ditch	D	A = 0 B =.7 C =.8 D =.9 E = 1.0	0.9	ww-B
Presence of logs, boulders, or other underwater features that could provide shelter for fish?	absent	absent = 0 present = 1.0	0	af-E rf-E
Presence of logs that extend above the surface of permanent water (p. 84)	absent	absent = 0 present = 1.0	0	at-G
Predominant soil texture: (p 83) GC= gravel or cobble SA=sand, sandy loam, or loamy sand L= loam, silty loam, gravelly loam C= clay, sandy clay, silty clay, clay loam, silty clay loam O= organic particles<1mm Guidance: 1. Soil remains in a ball when squeezed YES…Go to 3; NO …Go to 2 2. > 50% of the particles (by weight) are > 1 mm YES…"GC"; NO …"SA" 3. Squeezed soil forms an even ribbon YES…Go to 4; NO …"SA" 4. Soil ribbon extended > 1" without breaking YES…"C/O"; NO …Go to 5 5. Soils feels very gritty YES... "SA"; NO…"L"	L	GC =.1 SA =.2 L =.8 C/O = 1.0	0.8	sp-D
Presence of some mottling and/or other features that indicate oxygen deficits, or, permanent water is present	present	absent = 0 present = 1.0	1	n-X
Mapped soil series is hydric (not simply a hydric inclusion). See county soil map and p. 75.	yes	1= yes 0= no	1	v-C at-D ww-G i-I
Percent of site that was constructed on former uplands (non-hydric soil) (p. 81): 6) = recent, >90% of site 5) = recent, 10-90% of site 4) = recent, 1-10% of site 3) = >5 years ago, >90% of site 2) = >5 years ago, 10-90% of site 1) = >5 years ago, 1-10% of site 0) = none	1	6) = 0 5) = .1 4) = .2 3) = .3 2) = .4 1) = .5 0) = 1.0	0.5	i-J at-K v-K n-D

Tally the percent of surrounding land cover (exclude the site itself) as exists during a typical May. Answer each row independently. ***They do not necessarily sum to 100%.***

within 200 ft of the site boundary:

a. % Water, wetland =	25
b. % Grassland, water, wetland =	0
c. % Grassland, row crops =	10
d. % Wooded =	50
e. % Natural (not lawn, cropland, paved, buildings)=	85

within 1000 ft:

f. % Water, wetland =	30
g. % Grassland, water, wetland =	0
h. % Grassland, row crops =	5
i. % Wooded =	20
j. % Natural =	55

within 5,280 ft:

k. % Water, wetland =	30
l. % Grassland, row crops =	5
m. % Wooded =	20

In column D, enter the scaled value for the number in column B (= a), above)	25	0 = 0 1–10 =.4 10-20 =.8 >20 = 1.0	1	bw-I ww-I
In column D, enter the scaled value for the number in column B (=(b), above)	4	<10 =.1 10-20 =.2 20-40 =.4 40-60 =.6 60-80 =.8 >80 = 1.0	0.1	sb-N
In column D, enter the scaled value for the number in column B (=(c), above)	10	<10 = 0 10-20 = .1 20-40 = .3 40-80 = .5 80-90 = .7 90-100 = 1.0	0.1	ww-K
In column D, enter the scaled value for the number in column B (=(d), above)	50	0 = 0 1-10 =.1 10-20 =.2 20-40 =.4 40-60 =.6 60-80 =.8 >80 = 1.0	0.6	sb-I
In column D, enter the scaled value for the number in column B (=(e), above)	85	<10 = 0 10-20 = .1 20-40 = .3 40-80 = .5 80-90 = .7 90-100 = 1.0	0.7	i-L at-O v-R
In column D, enter the scaled value for the number in column B (=(a+f+k)/3), above)	28	none = 0 1 – 10 =.4 10-20 =.8 >20 = 1.0	1	ww-H bw-J

In column D, enter the scaled value for the number in column B (=(c+h+l)/3), above)	7	<10 = 0 10-20 = .1 20-40 = .3 40-80 = .5 80-90 = .7 90-100 = 1.0	0	ww-J
In column D, enter the scaled value for the number in column B (= (d+i+m)/3), above)	30	<10 =.1 10-20 =.2 20-40 =.4 40-60 =.6 60-80 =.8 >80 = 1.0	0.4	sb-J
In column D, enter the scaled value for the number in column B (= (e+j)/2), above)	70	<10 = 0 10-20 = .1 20-40 = .3 40-80 = .5 80-90 = .7 90-100 = 1.0	0.5	bw-K
In column D, enter the scaled value for the number in column B (= (b+g)/2), above)	2.5	<10 =.1 10-20 =.2 20-40 =.4 40-60 =.6 60-80 =.8 >80 = 1.0	0.1	sb-O

Percent of land cover within 200 ft (but only in the contributing watershed) that is "natural" – that is, NOT cropland, lawns, pavement, or buildings (p. 79)	85	<10 = 0 10-20 =.1 20-40 =.3 40-90 =.5 90-100 = 1.0	0.5	pp-F
		<10 = 0 10-20 =.1 20-40 =.3 40-90 =.5 90-99 =.9 100 = 1.0	0.5	rf-f at-Q af-G
		<10 = 0 10-20 =.1 20-40 =.3 40-90 =.5 90-99 =.9 100 = 1.0	0.5	i-M v-Q
Percent woodland divided by percent grassland-crops within 200 ft of the site (p. 71)	5	<.1 =.1 0.1-0.8 =.6 0.8-1.2 = 1.0 1.2 –2.0 =.6 >2.0 =.1	0.1	at-P
Distance (ft) to nearest busy road (p. 71) This includes a) any road or parking lot in a develop area that contains >4 buildings per acre, b) any road with a maximum traffic rate of > 6 vehicles per minute, during an average day during the summer	600	<100 = 0 100-300 =.3 300-600 =.5 600-1200 =.7 1200-2400 =.8 2400-4800 =.9 >4800 = 1.0	0.7	bw-G at-N v-P sb-R

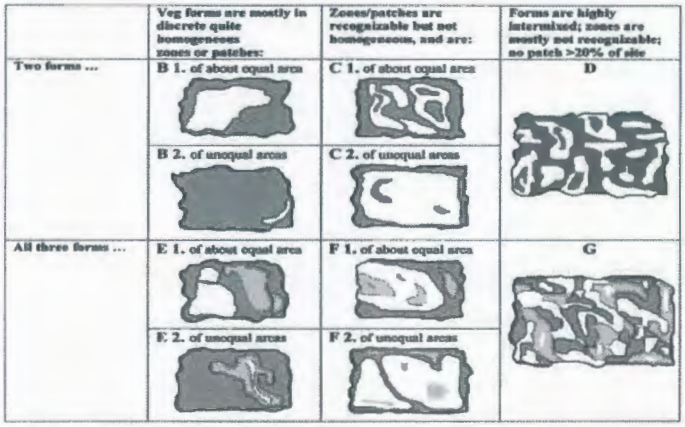
Note: The following 5 rows must sum to 100%. The **number** of visitors is immaterial.

Percent of site including 100-ft buffer that is visited 365 days a year or almost so =	50
Percent of site including 100-ft buffer that is visited more than 80 days a year (>20% of year), but less than daily =	0
Percent of site including 100-ft buffer that is visited 20-80 days a year (e.g., about once a week) =	50
Percent of site including 100-ft buffer that is visited just a few days a year =	0
Percent of site including 100-ft buffer that is almost never visited =	0

(see p. 72 for assistance interpreting the above)

Scale the value in column B (to the right) and enter in column D.	200	100-200 = 0 200-300 =.3 300-400 =.7 400-500 =1.0	0.3	bw-H v-O sb-Q
Percent of site affected by soil leveling (i.e., portion previously leveled by equipment for use as cropland)	0	100 =.1 10-99 =.3 1-10 =.6 0 = 1.0	1	at-C i-G pp-D sp-F n-H

Percent of site currently affected by soil compaction: (i.e., by equipment, vehicles, livestock, humans, fill) 6 = recent, at >90% of site 5 = recent, at 10-90% of site 4 = recent, at 1-10% of site 3 = >5 years ago, >90% of site 2 = >5 years ago, 10-90% of site 1 = >5 years ago, 1-10% of site 0 = none	1	5/6) =.1 4) =.2 3) =.4 2) =.6 1) =.8 0) = 1.0	0.8	sp-G v-M sb-K
Percent of site's vegetation that is mowed or subject to extreme grazing at least annually (p. 81)	0	>90 = 0 10-90 =.2 1-10 =.4 none = 1.0	1	sb-L v-N
Percent of site currently affected by soil mixing (plowing, excavation, bulldozing, etc.): (p. 81) 6 = recent, at >90% of site 5 = recent, at 10-90% of site 4 = recent, at 1-10% of site 3 = >5 years ago, >90% of site 2 = >5 years ago, 10-90% of site 1 = >5 years ago, 1-10% of site 0 = none	0	5 or 6) =.1 4) =.2 3) =.4 2) =.6 1) =.8 0) = 1.0	1	at-f i-H v-L pp-A n-C sp-E
Percent of the site that is vegetated (including submersed aquatics) (p. 82)	80	<10 =.1 10-20 =.2 20-40 =.4 40-60 =.6 60-80 =.8 >80 = 1.0	0.8	sb-A v-A
ercent of site with woody vegetation (p. 82)	50	<10 =.1 10-20 =.2 20-40 =.4 40-60 =.6 60-80 =.8 >80 = 1.0	0.6	sb-b
Percent of seasonal zone that is bare during most of the dry season. (i.e., devoid of vegetation, except trees) (Answer "0" if no seasonal zone)	10	>80 = 0 60-80 =.2 40-60 =.4 20-40 =.6 1-20 =.8 0 = 1.0	0.8	pp-G sp-H
Percent of site that is inundated permanently and contains emergent, floating, or submersed plants (p. 72)	0	0 = 0 1-10 =.9 >10 = 1.0	0	i-A
		0 = 0 1-10 =.4 10-30 =.8 30-60 = 1.0 60-90 =.9 >90 =.4	0	bw-F
Percent cover of emergent plants (and woody plants <2 ft tall) within the seasonal zone (p. 72)	60	0 = 0 1-20 =.1 20-40 =.6 40-60 =.75 60-80 =.85 80-100 = 1.0	0.75	at-L

Percent of whole site that has a closed canopy (p. 80)	30	<10 =.1 10-20 =.2 20-40 =.4 40-60 =.6 60-80 =.8 >80 = 1.0	0.4	sb-C
Percent of the site that is inundated only seasonally and contains a closed canopy (p. 80)	10	0 = 0 1-20 =.7 20-80 = 1.0 >80 = .9	0.7	af-C
Percent of permanent zone shaded by woody or emergent plants (p. 80)	20	1-10 =.4 10-20 =.6 20-40 =.7 40-60 =.8 60-80 =.9 >80 = 1.0	0.6	t-A
Percent understory shrub & vine cover beneath the drip line of trees (p. 82) (Answer "0" if no wooded areas)	30	<10 =.1 10-20 =.2 20-40 =.4 40-60 =.6 60-80 =.8 >80 = 1.0	0.4	sb-D
Number & distribution of vegetation forms --- herbs, shrubs, trees. If only one form, answer "A". To count, the patch must comprise >0.5 acre or >5% of vegetated area. See p. 77 for enlargement of diagram.  	E1	A = 0 B2 =.60 C2 =.65 B1 =.70 C1,D =.75 E2 =.80 F2 =.85 E1 =.90 F1 =.95 G = 1.0	0.9	pp-B v-B at-J i-K sb-H
Number of woody species (p. 82)	7	unwooded = 0 1-3 =.1 4-7 =.25 8-11 =.5 12-14 =.75 15-20 =.9 >20 = 1.0	0.25	sb-E
Number of native woody species (p. 78)	5	0 = 0 1-3 =.1 4-5 =.25 6-8 =.5 9-12 =.75 13-15 =.9 >15 = 1.0	0.25	v-F

Percent of woody species list consisting of species that are native (p. 78)	75	0 = 0 1-56 =.1 57-72 =.25 73-78 =.5 79-85 =.75 86-99 =.9 100 = 1.0	0.5	v-g
Percent of woody cover within stratum that is comprised of non-native species (p. 82) (Use the greater of the tree, understory shrub, or open shrub stratum's percent)	50	100 = 0 40-99 =.1 20-39 =.25 10-19 =.5 5-9 =.75 1-4 =.9 0 = 1.0	0.1	v-H
Spatial predominance of non-native herbs (p. 84) A = Non-natives predominate B = Cannot determine (about equal) C = Natives predominate	A	A = 0 B =.5 C = 1.0	0	v-D
Percent of herb species list comprised of species that are non-native (p. 80)	90	100 = 0 85-99 =.1 75-84 =.25 63-74 =.5 50-62 =.75 34-49 =.9 0 -33 = 1.0	0.1	v-E
Average diameter (inches) of the 3 largest trees. (p. 71)	24"	none = 0 1-12 =.1 13-19 =.25 20-27 =.5 28-44 =.75 45-52 =.9 >52 = 1.0	0.5	sb-G v-J at-l n-F
Number of deadwood types. Potentially 12 types: (p. 77) ___ Class 1: freshly fallen, have bark & branches, 4-8" ___ Class 1: freshly fallen, have bark & branches, 8-20" ___ Class 1: freshly fallen, have bark & branches, >20" ___ Class 2: mildly rotted and mostly on ground: 4-8" ___ Class 2: mildly rotted and mostly on ground: 8-20" ___ Class 2: mildly rotted and mostly on ground: >20" ___ Class 3: well rotted, losing shape: 4-8" ___ Class 3: well rotted, losing shape: 8-20" ___ Class 3: well rotted, losing shape: >20" ___ Standing stumps/snags: 4-8" ___ Standing stumps/snags: 8-20" ___ Standing stumps/snags: >20" ___ Artificial debris – check only if no others present Class 1 Class 2 Class 3 	4	0 = 0 1-2 =.1 3-5 =.25 6-8 =.5 9-10 =.75 11-12 =1.0	0.25	sb-F v-I n-E af-F at-H

Oaks Bottom Section 206 Habitat Restoration Project

Portland, Oregon

404(b)(1) Analysis

December 2015

SECTION 1. INTRODUCTION

This Clean Water Act Section 404(b)(1) Alternatives Analysis (cited herein as "Alternatives Analysis") demonstrates compliance with the Section 404(b)(1) Guidelines for the Section 536 Oaks Bottom Habitat Restoration Project.

Section 404 of the Clean Water Act regulates discharge of dredged material and placement of fill within waters of the United States (40 Code of Federal Regulations [CFR] Parts 230 and 232). The Willamette River is a navigable waterbody and therefore a "water of the United States." Section 404(b)(1) requires that alternatives be considered that could avoid or minimize adverse impacts to aquatic resources and waters of the United States. This document evaluates "practicable alternatives" that would have less impact on the aquatic system.

The Oaks Bottom Habitat Restoration Project proposes to reconnect the Oaks Bottom Wildlife Refuge to the Lower Willamette River to provide unhindered fish and wildlife passage and to also enhance a variety of slough and wetland habitats within the City of Portland, Oregon (Figure 1-1). This Alternatives Analysis addresses the No Action Alternative and the restoration alternatives considered.

The Oaks Bottom Wildlife Refuge is a 160-acre floodplain and surrounding area located along the east bank of the Lower Willamette River at approximately River Mile (RM) 16 in southeast Portland, Oregon. The project area is within the 100-year floodplain of the Willamette River, which is within the tidal zone of the Columbia River. The Willamette River merges with the Columbia River approximately 16 miles downstream of the project site. Daily freshwater tidal fluctuations typically range up to 2.5 feet in the project area. Oaks Bottom Wildlife Refuge (hereafter referred to as Oaks Bottom) is owned and operated by the City of Portland Parks and Recreation and was the first wildlife refuge designated within the city. Oaks Bottom offers a unique opportunity for a large, natural, tidally influenced floodplain and wetland area to be restored in the heart of the city.

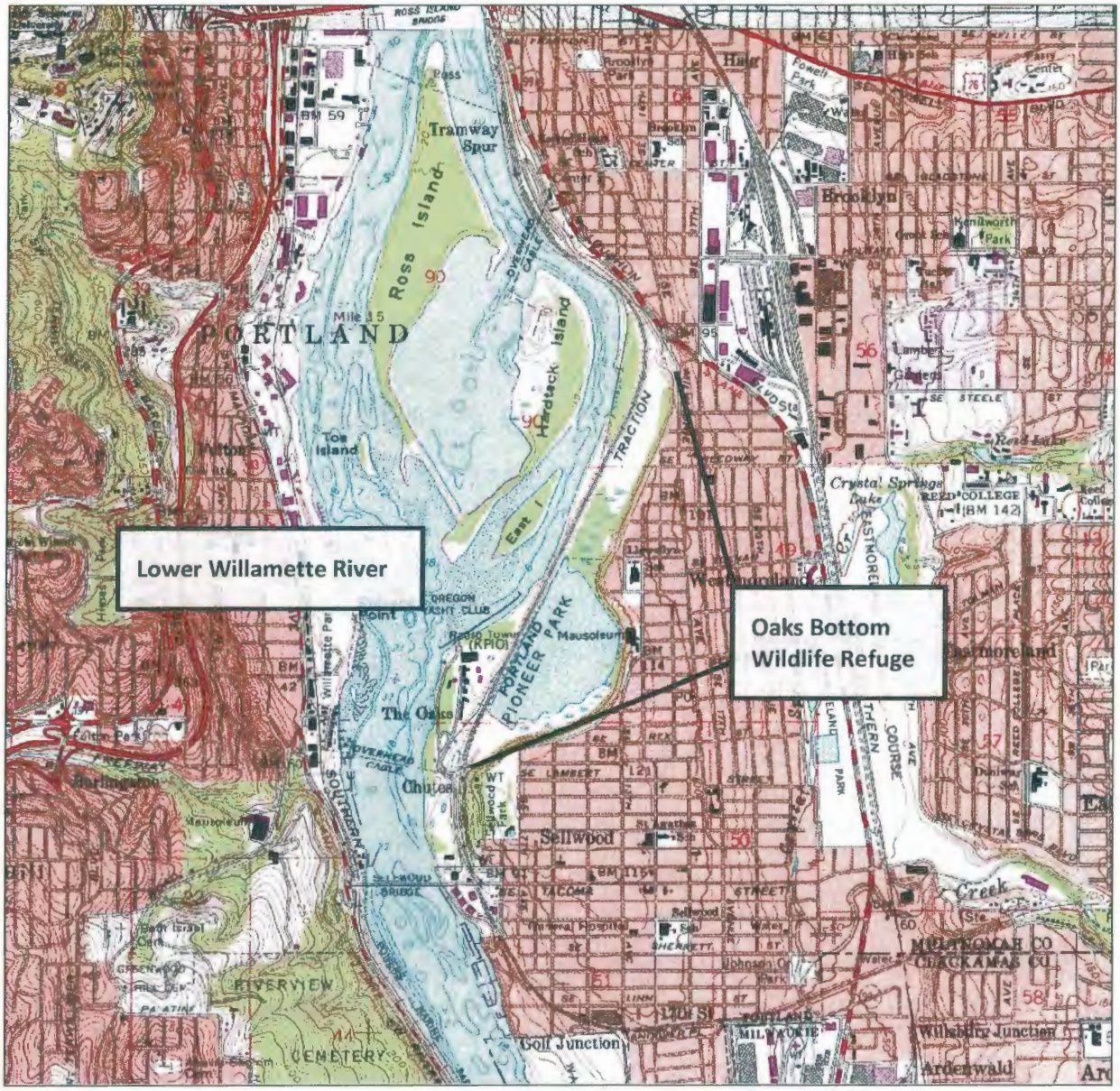


Figure 1-1. Oaks Bottom Habitat Restoration Project Vicinity Map

1.1 BACKGROUND

Historically, the Oaks Bottom study area was part of the Lower Willamette River floodplain and subject to natural river meandering, flooding, and daily tidal fluctuations. Oaks Bottom was then largely isolated from the river by the construction of a railroad embankment along the entire western perimeter of the site.

The Oregon Pacific Railroad Line was constructed along the Lower Willamette River in the early 1900s; this includes a raised berm and likely buried trestle that effectively separate Oaks Bottom from the natural hydrologic fluctuations of the Willamette River. A 5-foot-diameter culvert (invert elevation 7.2 feet City of Portland [COP] datum[1] at upstream end, which is just below the daily mean water surface elevation) exists and was likely installed through the embankment to allow drainage from Oaks Bottom out to the Willamette River, although it is not known precisely when or by whom the culvert was installed. However, the culvert does not provide effective fish access under most conditions and likely causes stranding of the few fish that do manage to enter due to limited outflows. The potential stranding of salmonids likely causes increased mortality to the populations that use the Lower Willamette River. Figure 1-2 shows the location of the project components.

Following construction of the railroad berm, portions of the project site were used as a landfill, including the north and south fill areas, thus reducing the floodplain. The City of Portland acquired the south landfill property from the Donald M. Drake Company in 1969 in order to block its development as an industrial park. The area was believed to be one of the few remaining tidal marshland areas in Portland, and local residents were strongly opposed to its development as an industrial property. Local residents, students, and other groups campaigned during the 1970s to protect the wildlife habitat and provide park amenities. In 1988, Oaks Bottom was designated as the City's first wildlife refuge.

A water control structure was constructed in 1988 to allow a reservoir to be maintained within the Oaks Bottom Wildlife Refuge, the benefits of which included an increase in the area of open water habitat for waterfowl, reduction in the area of non-native reed canary grass and what was perceived to be thickly overgrown willows, and a reduction in mosquito populations (City of Portland 1988). The reservoir can be managed between elevation 8 and 14 feet (COP datum) by the placement and removal of flash boards within the structure, which isolate the reservoir levels from tidal fluctuations. The water control structure and reservoir have not been successful in reducing non-native plant species, and another invasive species, purple loosestrife, has become dominant within the reservoir. More recently, Portland Parks and Recreation initiated additional vegetation management, particularly in the upland prairie and oak savannah habitats, to promote native species and reduce blackberries and other invasive species.

The scope of this ecosystem restoration action would include restoration of a natural tidal hydrologic regime to the site (to allow daily tidal fluctuations [tidal range about 2.5 feet] and riverine connections) and access to approximately 60 acres of aquatic and floodplain wetland habitat that is currently inaccessible to fish species during the primary juvenile salmonid rearing and refuge season (defined for the purposes of the project as November to June). It would also improve wildlife habitat and migratory corridors, and restore associated native vegetation communities.

[1] The City of Portland (COP) uses its own datum that is 1.375 feet above National Geodetic Vertical Datum or NGVD 1929 and 2.10 feet below North American Vertical Datum or NAVD 1988. All elevations in this document are in the COP datum because the City requires all project designs to be recorded in its own datum to allow direct comparisons to City infrastructure and other data.

Figure 1-2 Project Features (reservoir area outlined in blue)

1.2 DEVELOPMENT AND EVALUATION OF ALTERNATIVES

This section presents the plan formulation process used in the development and screening of alternatives for the study area. The process was followed to develop measures that address the goals and objectives identified for the site and to ultimately evaluate those measures against each other to select a plan recommended for implementation.

1.2.1 Problems, Opportunities, Constraints, and Objectives

This section identifies the problems and opportunities based on the assessment of existing and expected future without-project conditions in the study area. In the planning setting, a problem can be thought of as an undesirable condition, while the objective is the statement of overcoming the problem, and the opportunity is the means for overcoming that problem. Identification of problems and opportunities gives focus to the planning effort. Problems and opportunities can also be viewed as local and regional resource conditions that could be modified in response to expressed public concerns.

1.2.1.1 Problems and Opportunities

1. *Tidal hydrologic connectivity with the Willamette River is impaired.*

Oaks Bottom is separated from the Willamette River by railroad tracks on a high berm and the perched 5-foot-diameter culvert is the only hydrologic connection between the river and floodplain. This disconnects Oaks Bottom from the river during approximately 50 percent of the tidal cycles and causes high velocities and turbulent flows whenever there is a head differential between the river and Oaks Bottom. The City periodically removes debris from the culvert, thus the primary issue with disconnection is related to the invert elevation and size of the culvert. The opportunity exists to replace and lower the culvert invert elevation to allow daily low-velocity tidal exchange throughout the entire tidal cycle into the refuge.

2. *Fish passage is currently limited and stranding and mortality is likely.*

Salmonids and other fish species may occasionally enter the channel through the culvert but cannot pass farther upstream during much of the year due to the presence of the water control structure immediately upstream of the culvert; only about 0.02 acre of habitat is accessible downstream of the structure. During flood events that raise water surface elevations above the water control structure, salmonids could enter the reservoir; however, once fish enter the reservoir, they likely become trapped behind the water control structure as there is limited outflow and subsurface piping of the flow. Furthermore, lethal or sub-lethal water temperatures (temperatures up to 90°F [32°C]), predators, and low water levels contribute to mortality if they do become trapped behind the water control structure. The opportunity exists at the refuge to replace and lower the culvert invert elevation and also modify or remove the existing water control structure to allow unimpeded fish passage into and out of the channel, reservoir, and wetland areas.

3. *Existing habitat within the refuge has been degraded.*

Currently, the refuge is composed of several habitat types, including an open water reservoir, emergent wetlands, scrub-shrub and forested wetlands, two higher elevation upland fill areas, and upland oak savannah (bluff slopes). Between and surrounding these areas are riparian and upland forests. Within the reservoir are a variety of habitats, including mudflats and emergent wetlands. Many of these habitats have been formed or degraded by disturbance and fill. Although numerous wildlife species such as native amphibians, migratory songbirds and waterfowl utilize the area, there are opportunities for the existing habitats to be substantially improved to benefit native fish and wildlife species.

4. *Exotic plant and animal species are common throughout the project area.*

Exotic plants and animals are common throughout the project area, including bullfrogs, nutria, reed canary grass, purple loosestrife, English ivy, clematis, locust, and Himalayan blackberry. Portland Parks has

operated the reservoir water level in an attempt to reduce the coverage and presence of non-native or pest species. In particular, the primary management concerns have been the control of mosquitoes and reed canary grass. However, management efforts have been largely unsuccessful. An opportunity exists to remove non-native plant species and to create a more natural tidal hydrologic regime that would foster native species.

5. *Habitat deterioration is resulting in diminishing functions for a variety of native bird species.*

The reservoir is increasingly becoming choked with purple loosestrife and reed canary grass, and the open water habitats that support waterfowl are becoming reduced. These non-native plant species also tend to prevent native shrub and tree species from becoming established and prevent the development of a diverse multi-story plant community to benefit multiple bird species for nesting, perching, and overwintering. The opportunity exists to preserve and improve these natural habitats for continued use by waterfowl, shorebirds, raptors, and songbirds.

1.2.1.2 Constraints and Other Considerations

Constraints represent restrictions that cannot be violated, such as the limits identified within Federal laws, Executive Orders and Corps regulations, or which are needed to maintain safety. Considerations are those issues that should be followed in order to meet the objectives identified above. Considerations identified by the project team and stakeholders include a desire for minimal operation or maintenance of the project, and the preservation of a small reservoir area as waterfowl and shore bird habitat.

1.2.1.2.1 Constraints

1. *Springwater Trail Use and Public Safety*

The most feasible access route during construction is via the Springwater Trail. In order to maintain public safety during construction, it will be necessary to close the Springwater Trail to accomplish the replacement of the culvert and to provide a haul route for equipment and materials. The only other option for access to the work area is by barge, and barge access would not provide a means to drive pilings through the embankment or bring in all equipment necessary. There is no reasonable on-site detour for the trail during construction without requiring extensive fill or construction in the Willamette River due to the high embankment and the proximity of the river and wetlands. Because the Springwater Trail is a heavily used commuter and recreational trail, it is highly desirable to ensure the closure period is as short as feasible to complete the construction. It will not be acceptable to have a closure longer than the 4-month fish window (July 1 to October 31), and it is desirable to have a shorter closure if possible. The City is developing a bike detour route on surface streets for temporary use, but these are considered much less safe and efficient for either commuter or recreational use.

2. *Maintain Railroad Operations*

The Oregon Pacific Railroad line that runs along the embankment is a commercial freight line. The railroad owner has indicated it is imperative to maintain at least some usability even during the construction period. His primary business is delivering frozen foods to restaurant and grocery distribution hubs in Milwaukie, Oregon, south of the project site. The City has evaluated alternative shipping methods including trucking, but the regulations surrounding frozen food items are very strict and the facilities that would need to be provided are quite costly to construct and operate for only a temporary closure. At this time, a plan to maintain railroad access is a temporary bridge that would be fabricated and placed by the railroad owner to cross over the culvert work area one day per week (Sundays) during construction. This would allow the railroad to continue deliveries of perishable food products once per week.

3. *Clean Water Act*

The CWA regulates the discharge of pollutants into Waters of the U.S. The soil and water quality sampling conducted in the refuge has identified the presence of several contaminants of concern within the refuge, primarily DDT and its breakdown products; however, tissue analysis has shown there is limited uptake into the biota. Best Management Practices (BMP) during construction and upland disposal will be implemented to help ensure that contaminants do not become resuspended into the water column and flushed into the Willamette River. Additionally, any excavated contaminated sediments would be disposed of in an appropriate landfill. The new surface after excavation is below the contaminated surface soils and will be further sampled during construction to ensure that a clean surface is left behind. The intent of the project is not to remove all contaminated soils, but to remove the material within the excavation footprint and reduce the future potential for export of contaminants to the Willamette River.

4. *Protection of Wetlands (EO 11990)*

Restoration measures should not result in adverse changes to the existing groundwater table and surface water within the project area. Specifically, existing wetlands must not be altered to the point where they are no longer classified as wetlands. Measures that result in lowering of the water table or dewatering of a wetland are also not desirable.

5. *Endangered Species Act*

Protection of fish and wildlife during restoration would be achieved through following the laws, executive orders, and Federal and permit regulations applicable to floodplain restoration plans, including working within the regulated fish window and implementation of BMPs. These measures would eliminate the potential for "take" or harm of a federally protected species.

1.2.1.2.2 Other Considerations

1. *Operation and Maintenance*

Restoration elements should be designed to minimize the need for subsequent operation and maintenance of the project. The non-Federal sponsors are slated to manage the area following restoration and, in the interest of conserving budget and resources, desire an outcome that requires minimal maintenance over time and is sustainable.

2. *Reservoir Habitat and Desired Future Conditions*

The local community has expressed a wish to maintain a suitable environment for bird watching by retaining open water to the extent necessary to allow viewing from hiking trails. The restoration plan should maintain a minimum area of open water and mudflat habitats (4 to 6 acres), which attract wading birds, shorebirds, and waterfowl and facilitate this recreation and educational experience.

1.2.1.3 Objectives

In response to analysis of the problems and determination of their associated opportunities described above, a total of four primary objectives were identified for this restoration project. Objectives for this project result from a combination of reservoir management needs, fish and wildlife habitat improvement, and local stakeholder preferences. In designing restoration for Oaks Bottom, four primary objectives were identified, including:

1. ***Restore Natural Tidal Hydrology to Allow Salmonid Access and Minimize Stranding of Salmonids***

The refuge is separated from the Willamette River by railroad tracks on a high berm that inhibits natural tidal fluctuations of surface waters. A 5-foot-diameter culvert below the railroad provides the only surface

water connection between the river and the floodplain, and the invert is located at 7.2 feet in elevation that only allows tidal connection about 50 percent of the time. The tidal connection is further regulated with a water control structure that prevents natural hydrologic exchange and fish passage so only about 0.02 acre of habitat below the structure are accessible until water surface elevations exceed the 14-foot water control structure (5 percent of the time). Water flows out of the reservoir through a narrow channel year-round, except during summer when the surface water in the reservoir becomes too low to connect to the outlet channel. The outlet channel is spanned by a 6-foot-high water control structure that is located 50 feet upstream of the railroad berm culvert. The structure is equipped with 13 flashboards that can be added or removed to control the reservoir levels.

Salmonids may enter the channel through the culvert. However, passage up the channel to the reservoir is blocked at normal tidal fluctuations when the flashboards are in place in the water control structure (normally October through May, which is the primary rearing and refuge period for juvenile salmonids). During high water events that raise water elevations above the water control structure, salmonids could enter the reservoir. However, the culvert would be submerged under these conditions and salmonids would need to dive down to the culvert depth and swim through the culvert. This is assumed to occur only rarely. Salmonids may also enter the project area during flood events that overtop the railroad berm. However, according to the hydrologic analysis, the railroad berm is only overtopped by floods greater than the 100-year event. Passage into the reservoir is thus currently limited.

However, for those few fish that may enter the reservoir, passage out of the reservoir is very difficult. Once salmonids do enter the reservoir, they may become trapped behind the water control structure, since the outflow is very small and flow is often through leaks between flashboards or in channels undermining the structure. Furthermore, lethal water temperatures (up to 90°F [32°C]), predators, and low water levels contribute to mortality of salmonids if they do become trapped behind the water control structure.

Measures that will restore natural tidal fluctuations and improve fish passage include replacement of the existing culvert with a larger culvert that reduces high velocities and allows connections throughout the entire tidal and normal riverine cycle (ranges from about 5 feet to 18 feet in elevation), removal or modification of the water control structure to allow fish passage throughout the entire tidal cycle, excavation to expand or create freshwater tidal sloughs, and contouring of the reservoir bottom to facilitate fish movement outward from the reservoir as water levels decline.

2. *Improve Habitat for Fish and Wildlife Species*

Currently, Oaks Bottom has several habitat types, including the open water reservoir, a lower elevation scrub-shrub and semi-forested transitional area, and two higher elevation fill areas. Between and around these areas are riparian and upland forests. The south fill consists of open grassland habitat composed of upland weedy species. The north fill has a combination of riparian and upland species and has small isolated wetlands where soils are highly compacted and ephemeral ponds form during seasonal rainfall. Bluffs to the east of the refuge are composed of sparse Douglas fir and oak-madrone savannah, interspersed with many non-native and ornamental species. Within and around the reservoir are a variety of habitats, including mudflats, emergent wetlands, scrub-shrub wetlands, and forested riparian. Between the reservoir and north fill is a transitional area composed of trees, shrubs, wetlands, and ponds.

Each of these habitats has been degraded by historic motorized vehicle use, the placement of fill on the north and south areas of the refuge, and the introduction and spread of invasive species. Although native amphibians, migratory songbirds, and waterfowl utilize the area for foraging, nesting, stopovers, or overwintering, the habitats could be substantially improved to attract a greater diversity of native fish and wildlife species and provide more habitat for nesting. Restoration measures that benefit wildlife species such as improved riparian habitats would also provide benefits to salmonids, and vice versa.

Proposed restoration measures would include measures to create additional acres of specific habitats as well as improve the quality of existing habitats. Potential restoration measures could include:

- Improving hydrologic connectivity of the refuge to the Willamette River, through modifications to the existing culvert and water control structure to restore natural inundation frequencies. Water depths of 6 inches or more would be provided in the culvert up to 95 percent of all flows.
- Increasing aquatic habitat diversity in the reservoir and at the ponds to the north of the reservoir, primarily through excavation of channels, creation of ephemeral ponds, and placement of large woody debris. This would provide multiple types of aquatic habitats interspersed with riparian and upland forest.
- Increasing terrestrial habitat diversity, through control of non-native plants and plantings of native riparian and upland species. This would restore the shrub and riparian forest communities as well as native wetland communities to provide nesting and foraging habitat for multiple native amphibians, birds, and mammals.

3. Control Non-Native or Pest Populations

Exotic plants and animals are common throughout the project area, including carp, nutria, reed canary grass, purple loosestrife, English ivy, clematis, locust, and Himalayan blackberry. The reservoir has been managed to reduce the coverage and presence of non-native or pest species. In particular, the primary management concerns have been the control of mosquitoes and reed canary grass.

In the late 1980s, the addition of the water control structure allowed filling of the approximately 40-acre reservoir area in the refuge. Inundation successfully suppressed certain nuisance mosquito populations and some areas of reed canary grass. Flooding is still used as a measure to suppress reed canary grass, which quickly becomes established in areas with little vegetation and only seasonal or shallow flooding. However, mosquito control has become much more difficult to achieve through reservoir management, as a result of the variety of species that breed at the refuge and their wide range of preferred habitats. Controlling reservoir water levels for one species of mosquito may now provide better habitat for another species. In particular, because of the concern about West Nile virus, it may be more effective to reduce open water areas to reduce breeding habitat for the species that carries West Nile virus.

Flooding of the reservoir can be used to suppress non-native plants, such as reed canary grass. However, purple loosestrife and some other invasive species prefer inundated areas and have now become dominant in the reservoir. It is an objective of this project to maintain flooding in some areas for control of these species, while introducing other options of control, such as: (1) mechanical removal of non-native plant species, (2) revegetation with native species that can outcompete non-native species, and (3) reduce the area of the reservoir and restore natural tidal fluctuations to reduce preferred habitat of non-native fish species.

The City tried the use of beetles as a biological control measure for purple loosestrife a few years ago, but the beetles generally died because the Willamette River experiences its highest stages during the late spring/early summer runoff from the Columbia River when the beetles need to hatch and feed on the loosestrife. This late spring high water stage delays leaf-out of the loosestrife and causes inundated conditions that do not favor the beetles. Thus, biological control is not considered as a primary control measure.

4. Maintain and Improve Quality of Bird Habitats

Oaks Bottom is a highly popular feature of the Sellwood-Moreland neighborhood in southeast Portland. It is a unique and popular recreation area with several trails, including the paved bike trail adjacent to the railroad line. The reservoir has become the centerpiece of the refuge, in particular, due to the large number of birds that visit the area throughout the year. Waterfowl, wading birds, shorebirds, songbirds, and raptors are all visitors to the refuge. The great blue heron is a common visitor and is the official bird of the City of Portland. It is an objective of this project to maintain the recreational and bird watching value of the refuge by enhancing habitat for these bird species. Also, the local community has expressed a wish to maintain a suitable environment for bird watching by retaining some open water to allow viewing from hiking trails.

For these reasons, the selection of any recommended plan will maintain a minimum of 4 to 6 acres of open water habitat by maintaining a high point in the outlet channel at about 9 feet in elevation. This high point could occur at a new water control structure or at the upper end of the channel through the use of step weirs/riffles.

SECTION 2. SUMMARY OF PROPOSED ACTION

2.1 PURPOSE AND NEED

The purpose of the proposed action is to restore a more natural tidal hydrologic connection between Oaks Bottom and the Lower Willamette River, improve fish and wildlife habitats, reduce non-native species populations, and provide unhindered fish and wildlife passage into and out of Oaks Bottom.

This restoration project is needed because Oaks Bottom is one of the last remaining tidal floodplain habitats in the Lower Willamette River and could provide a substantial area for juvenile salmon rearing and refuge habitat. Under current conditions, the site is mostly inaccessible to salmon due to a large railroad berm with a small culvert that precludes salmon access with high velocities and/or poor positioning (disconnected during low tides and submerged at high tides). In addition, much of Oaks Bottom is dominated by non-native fish and plant species that have reduced habitat values for native fish and wildlife. If no action were taken, the habitats would continue to remain mostly disconnected from the river, continuing to cause fish stranding and mortality, and become ever more dominated by non-native plant and animal species, further reducing habitat values for native species.

2.2 WATER-DEPENDENCY OF THE PROPOSED ACTION

As the project purpose is to restore natural tidal and riverine connections between Oaks Bottom Wildlife Refuge and the Lower Willamette River including unhindered fish and wildlife passage and enhancement of tidal slough habitats, the project necessarily would occur in aquatic and floodplain habitats, including wetlands. Restoration measures would include: 1) removal of invasive plant species; 2) riparian and wetland plantings; 3) replacement of the existing small and perched culvert with an 11 foot by 16 foot arch culvert with a natural substrate bed; 4) excavation of tidal slough channels; 4) removal of the water control structure; and 6) installation of wood. These measures would provide: a surface water connection between the river and Oaks Bottom during the majority of the year and particularly during typical winter/spring flows for juvenile fish to access off-channel habitats; enhanced wetland and shallow water habitat; diversified aquatic habitat and cover via riffles and large wood; promote natural habitat forming processes in the refuge via the more natural hydrology; and enhance riparian and floodplain habitats by removing/controlling invasive species such as reed canary grass and purple loosestrife that form monocultures and prevent natural succession, followed by native plantings that would increase cover and shading for the off-channel habitats and provide future recruitment of large wood to the ecosystem. These measures are all intended to significantly improve fish and wildlife access to off-channel and refuge habitats and allow more natural hydrologic/hydraulic processes to occur.

The measures that do not require excavation or fill in waters of the U.S. include the removal of invasive species and riparian/floodplain plantings. While these measures would enhance fish and wildlife habitat, they do not address the key issue of fish access. In order to restore fish access and provide refuge and rearing habitat, it is necessary to conduct excavation activities in waters of the U.S., thus is a water dependent use.

2.3 DESCRIPTION OF PROPOSED PROJECT

The recommended restoration plan as evaluated and derived from the project design criteria, supplemental technical studies, and project team review is presented in this section by key design element.

2.3.1 Culvert Replacement

The proposed replacement culvert is a precast, reinforced 16-foot span by 13-foot rise (including 3-foot stem wall) concrete three-sided arch culvert. The culvert is to be furnished by a culvert manufacturer/vendor

according to design criteria specified in the final version of this report and the plans and specifications. The proposed culvert is 90 feet long and would be placed horizontally (with no slope) to facilitate construction. The inside of the culvert is to be back-filled with two feet of streambed material including a mixed gradation of gravel and cobbles with boulders placed throughout. The slope and grade of the streambed inside the culvert is to match that of the continuous tidal channel on the upstream and downstream ends. The streambed material would be stable under expected velocities (typically less than 2 fps); some seasonal deposition of sand is likely under low flow conditions.

The Springwater Trail and Oregon Pacific Railroad berm is to be reconstructed with a top of berm elevation and slopes (side slopes) similar to those of the existing berm in order to match grades and slopes on either side of the construction limits. The existing and proposed top of berm elevation at the proposed culvert crossing is at an elevation of approximately 34 feet COP and the existing and proposed slope along the trail and railroad alignment is flat (zero slope). The proposed berm side slopes on the downstream (west) and upstream (east) sides are 2 horizontal to 1 vertical (1.5H:1V) to conform to permanent fill slope recommendations for geotechnical stability.

2.3.1.1 Structural Design Features

Culvert

Several options have been reviewed for the proposed culvert system, consisting of the following:

- Steel plate rectangular three-sided arch (with an open bottom) set on precast footings
- Precast concrete box culvert
- Precast concrete arch culvert (shown on the drawings in Appendix C)
- Precast concrete clamshell (two 3-sided boxes)
- Corrugated metal arch culvert

In all cases, a criterion of selection is the ease and speed of installation. A cast-in-place option was considered less desirable because it requires a longer construction period (to allow the concrete to cure), whereas the other options do not require curing in-place. Most of the potential options offer the desired width of channel and overhead clearances (8 to 10 feet measured at the center). Box-shape culverts are generally difficult to find in spans greater than 12. The advantage of the square box and rectangular 3-sided culverts is a uniform vertical ceiling in the culvert section. However, these sections are not preferred by some agencies due to a history of cracking in the corners and the resulting maintenance issues.

There is also a difference in costs between the precast concrete and the corrugated metal arch options. The metal culvert would be approximately 30 percent of the cost of the precast concrete arch option. There could be concerns related to corrosion from a metal culvert as well, thus the concrete culvert is proposed in this study.

In all of the potential options, the design criteria include earth-loading, train loads from the railroad tracks, and pedestrian/vehicle loads from the Springwater Trail.

Options to Minimize Effects on the Railroad

Several options are being considered to minimize effects on the operation of the Oregon Pacific Railroad. One option is to install a temporary bridge, to be fabricated by the Oregon Pacific Railroad, that they could install one day per week to allow their operations to continue each week. Another option is to expedite the culvert replacement to less than one month to minimize closure. Options to provide a temporary hauling service for specific customers is also being considered.

2.3.2 Tidal Slough Channels and Grade Control Riffles

Proposed tidal slough channels (channels) are to be excavated. Channel A would connect the culvert to the reservoir, and Channel B splits from Channel A and extends north for approximately 300 feet (see Plans, Sheet C01). Both channel alignments are to follow the existing wetland channels. Channel A is to include grade control structures (riffles) to provide positive drainage from the reservoir to the culvert, while Channel B would have a constant slope without grade control structures. Channel A would have a bottom width of 12 feet for continuity with the channel through the proposed culvert. Channel B would be regraded for positive drainage to Channel A, and thus would require excavation from its intersection with Channel A to the end of the channel at approximately elevation 10 feet COP. The channels and their design features are described in more detail in the following sections.

2.3.3 Channel to Reservoir – Channel A

Channel A begins downstream of the proposed culvert at Station 10+84.49 where it intersects the existing ground, extends through the culvert, and ends slightly upstream of Station 27+00, where its elevation is set at 9.5 feet COP (see Plans, Sheet C01). The downstream control elevation is at the upstream face of the culvert (Station 12+28.55), where the elevation is set at 5.5 feet COP to meet fish access requirements. The resulting slope between these locations is 0.003 feet per feet (0.3 percent).

Grade Control Riffles

Grade control riffles constructed of rock are proposed along Channel A to control the grade to ensure positive drainage out of the culvert as the water level recedes and to prevent headcutting of the channel in order to preserve the minimum 4 acre reservoir. The rock riffles are designed so that the maximum vertical drop between adjacent riffles is approximately 0.5 feet (see Plans, Sheet C07). The tops of the riffles are to be constructed flush with the finish grade of the channel so that the structure is in line with the overall channel slope of 0.003 ft/ft. The drop may be exposed if the channel incises over time. The elevation of the rock riffles are set to limit changes in channel bed elevation to approximately 0.5 feet or less.

The actual locations and vertical drops of the riffles along the Channel A alignment were designed to:

- Approximately match the 0.5 feet elevation drop target, and
- Be correctly located in planform from a geomorphic perspective.

Riffles are located at inflection points of adjacent curves along the alignment because this is typically where grade control points occur in natural channels. Placement of riffles at inflection points also reduces the risk of scour along the outside of a meander bend where hydraulic shear forces are greatest. In order to meet these objectives, in some cases it was necessary to space adjacent riffles slightly farther apart such that the vertical drop would be greater than 0.5 feet (yet still not greater than 0.6 feet). The maximum potential drop between adjacent riffles is 0.54 feet (6.5 inches), and the minimum drop is 0.41 feet (5.0 inches).

The riffle structure is composed of 2 parts riprap (D-100 of 14 inches, D-50 of 8 inches) to one part of 8-10 inch minus cobbles and gravels on top of a 4 inch thick layer of bedding material (3/8 inch minus) and geotextile. The cobble/gravel mix with boulders has been designed to resist scour at design velocities of 3 fps. Boulders are to be placed throughout the riffle as shown on the Plans. Boulders are to continue up the side slopes and provide a key-in to the bank to prevent scour around the structure.

Over time, sediment would likely deposit on some of the riffles so that they are not visible. At locations that may become slightly scoured, portions of the riffle may be visible.

2.3.1 Channel to the North – Channel B

The primary purpose of Channel B is to reconnect the south pond and regrade for positive drainage towards the culvert to minimize fish stranding as well as reducing habitat suitability for nutria. Excavation would be required in Channel B to connect to Channel A at the location where they intersect; however, the extent of excavation in the channel is minimized to reduce impacts to wetland areas north of Channel B.

Channel B begins at station 15+67.25 of Channel A, and continues upstream approximately 300 feet, from Station 2+00 to Station 4+92.79 of Channel B (see Plans, Sheet C01). This channel is 12-feet wide for continuity with Channel A, and it has a constant slope of 0.012 ft/ft (1.2 percent). Channel B begins at an elevation of 6.77 feet COP, and ends where it intersects the existing ground at an elevation of 10.0 feet COP and Station 4+92.79.

Channel B construction would also include re-grading the pond region to the west of Channel B near Stations 3+00 to 4+50. The existing channel at this location would be excavated to match the proposed invert elevation of Channel A for continuity in slope. The high islands within the pond would be excavated to create a lower wetland area that would be revegetated with willows.

2.3.2 Vegetative Berms – Margins of Channel A

As part of the construction of Channel A, vegetated margins at the tops of the left and right bank of the channel would be constructed to reduce the risk of flanking or avulsion of the channel during high river stage events. Vegetated margins would include the placement of prevegetated mat strips, approximately 5-feet wide of relatively dense emergent vegetation seeded and grown into a coir fabric mat with the specific purpose to resist erosion at the tops of bank of the channel until the vegetation can naturally grow in densely to resist erosion. Channel avulsion and the potential for formation of other drainage channels outside of the designed riffles might cause headcutting and the drainage of the reservoir, potential stranding issues, and other problems. The earthen berms that were previously considered to prevent channel flanking are not necessary because they would not be more effective than vegetated margins, and would be much more difficult to construct and have higher impacts to the existing wetland habitat.

The vegetated margins would be constructed approximately six inches above existing grade and would include stripping off the reed canary grass rootmat, placement of prevegetated coir mats (with the wetland seed mix pre-grown to minimum 2 inch height). Willow and cottonwood cuttings would also be installed along the channel slopes. The margins would parallel the proposed channel top of bank for approximately 275 feet of Channel A on the left bank (looking downstream) and for approximately 400 feet along the right bank. Downstream of the sections where the prevegetated mats would be installed, the channel banks would be revegetated with seeding of native grasses and sedges and willow cuttings.

2.3.3 Large Wood and Boulders within the Channels

Large woody debris (LWD) and boulders would be placed within the wetland channel as habitat features to enhance stream complexity and provide cover. Wood could be either imported or from salvage. Trees removed and salvaged during grading activities that meet specified requirements and approved by the City of Portland construction manager will be reused as LWD. These trees would have rootwads intact, and would be either Douglas fir or Oregon ash. The number and arrangement of logs would be varied throughout the channel to mimic naturally occurring woody debris. Current plans show one to three logs per cluster. Logs would be substantially buried into the channel bank and ballasted with boulders (referred to as Ballast Boulders on the Plans) to prevent movement when inundated. Mechanical anchoring of the logs is not necessary in the relatively low-energy channel system.

Boulders would also be placed adjacent to the LWD clusters to promote varying areas of scour (pools) and deposition within the channel. These boulders are referred to as Habitat Boulders on the Plans. These

boulders would vary in size from approximately two to five feet in diameter. Boulders salvaged during channel and embankment excavation may be used for habitat boulders as approved by the Government.

2.3.4 Boulders for Boater Exclusion

In order to deter boaters from entering the culvert, several large boulders (Boater Exclusion Boulders) and a few pieces of large wood will be placed at the mouth of the culvert along the bank of the river. Several boulders (same size as Habitat Boulders) and boulder clusters would be placed in a natural orientation and also somewhat offset relative to adjacent boulders over a width of 20 feet. The spacing would be such that canoe, kayaks and similar small watercraft would have difficulty navigating through the field of boulders (i.e., maximum distance about 4 feet apart). The appearance and layout of the boulders would be as natural as possible. The existing large boulders currently at the culvert mouth will be reused if possible.

2.3.5 Removal of Invasives and Revegetation

The overall revegetation plan for the reservoir will be prepared by the City of Portland staff during final design. Areas proposed for revegetation include all areas disturbed during construction and around the perimeter of the reservoir. In general, an approximately 100-foot-wide zone along the proposed Channels A and B would be cleared of reed canary grass during the channel excavation activities and then replanted with native species to achieve an appropriate native plant community for the ground elevation and flooding frequency. The channel margins would be seeded with a native grass and sedge mix and then willow and cottonwood cuttings would be installed along the channel slopes and tops of banks. At the area of the access ramp off of the embankment, the ramp would be removed and restored to the original contours and then replanted with a native grass seed mix and native Pacific willow and black cottonwood woodland plant communities. The willow community would include Oregon ash, Pacific willow, Scouler's willow, Columbia River willow, red osier dogwood, and ninebark. The cottonwood community would include Oregon ash, Douglas' hawthorn, red osier dogwood, elderberry, and peafruit rose. The railroad embankment area disturbed during construction would be protected with jute matting and seeded with a native upland grass mix following completion of grading.

Invasive species control and revegetation would occur around the perimeter of the reservoir. Portland Parks' Desired Future Condition plan for the refuge calls for the re-establishment of three plant communities: willow and cottonwood woodlands and emergent marsh.

2.3.6 Recreation Features and Springwater Trail Repaving

Viewing platforms features are proposed at two locations within the project. One location is immediately south of the proposed culvert, at the southwest edge of the Springwater Trail as shown on the plans. A second platform and interpretive station is proposed immediately north of the trail ramp from Oaks Amusement Park. Construction access to both platforms would be the same as that for the culvert construction. Current plans have the viewing platforms at 30 feet in length by 8.75 feet in width with an ADA accessible ramp up to the elevated platform, approximately 40 feet in length. They would include railings and bike lock-ups and the City will design and install interpretive signage and information after the project is complete.

The Springwater Trail will need to be repaved along the entire access route to the culvert following construction to repair damages associated with truck traffic.

2.3.7 Utilities

Various utilities are present in the project vicinity. These include a power transmission tower located at the eastern toe of the embankment, just south of the proposed culvert. The tower supports overhead transmission lines that run parallel to the embankment. The lines are likely high enough that they will not

impact crane operation during construction, but staging and access will need to be designed to avoid impacts to the tower and lines.

There is also an abandoned gas main pipeline to be demolished and capped. The gas main is a steel pipe, approximately 18 inches in diameter. The pipe is exposed on the east side of the embankment, located above the existing culvert. Roughly 100 feet of this line would be demolished, and the opposing ends would be capped and remain in place.

Table 2-1 below provides quantities of excavation and fill for the project.

Table 2-1. Excavation and Fill Quantities

Excavation in Wetlands	Excavation below OHW	Total Excavation	Fill in Wetlands	Fill below OHW	Total Fill	Total Project Footprint in Wetlands or below OHW
CY	CY	CY	CY	CY	CY	AC
2,500	6,300	8,800	1,000	1,600	2,600	2.4

2.4 CONSTRUCTION METHODS

Both in-water and upland construction would be required for the various actions such as removal of invasive species, channel excavation, and culver replacement. Specific equipment used would depend on contractor preferences and experience. Equipment may include, but is not limited to, the following:

- Cranes: for lifting and placing materials such as culverts, bridges, large wood.
- Pile installation equipment: vibratory driving of piles for temporary shoring and temporary railroad bridge.
- Excavators: long-reach excavators for excavating channels and placing rock and wood.
- Dozers: for grading of slopes and upland ramps and access routes.

2.4.1 General Construction Sequencing

The likely sequence of construction would be:

a) Close Springwater Trail and provide detours, signage, fencing, etc.
b) Install staging area on south end, provide containment and fencing.
c) Install project limit fencing, mark trees for removal, salvage, or to protect.
d) Remove rails and fencing for vehicular access.
e) Clear access ramp locations and install ramps and associated BMPs.
f) Install coffer dams and diversion system; remove fish and wildlife from work area.
g) Clear and grub work area.
h) Install pilings and shoring for embankment excavation.
i) Excavate embankment and haul away unsuitable material for backfill; demolish and remove existing culvert, water control structure, and abandoned gas line.
j) Stockpile suitable material for reuse in embankment.
k) Excavate for culvert placement and install suitable subgrade and bedding.
l) Install footings and culvert.
m) Install streambed substrate mix through culvert.
n) Backfill around and above culvert and compact.

o) Move coffer dams and diversion system as appropriate to conduct channel excavation.

p) Place silt fencing and other turbidity control materials as appropriate for channel excavation.

q) Excavate channels and install riffles and large woody debris.

r) Remove contaminated sediments off-site to an approved disposal location.

s) Remove coffer dams and diversion system.

t) Place pre-vegetated mats, mulching and seeding along channel and in buffer.

u) Install viewing platforms.

v) Remove ramps and any other temporary material.

w) Mulch and seed ramp areas and other disturbed areas.

x) Remove erosion control measures when ground is sufficiently covered to prevent runoff of turbid water.

y) Plant riparian, wetland plantings in October.

z) City continues plantings and maintenance over 5-year period.

2.4.2 Sediment Quality

The proposed excavation and placement of habitat fill material and clean substrates would occur in a tidal floodplain and wetland area that was subjected to historic spraying of DDT. During construction of the project, BMPs would be implemented to protect and minimize disturbance of soils and the potential for resultant releases to the aquatic environment. Sediment quality sampling in the past (Corps 2003) had indicated several contaminants of concern present in sediments at Oaks Bottom including DDT, DDD, DDE or dichloro diphenyl dichloro ethylene, dieldrin, PCBs, and gamma-chlordane. The City conducted additional sediment sampling throughout the site in 2006, 2007, 2009, and 2010. Several 2006 samples from the landfill had levels of arsenic and lead above screening levels. Chromium and cadmium were detected above screening levels in one sample each. DDD was detected above screening levels in one sample.

The City conducted more comprehensive sediment sampling in 2007 to identify the presence and levels of contaminants of concern specifically in areas of proposed excavation, including the reservoir, channel, and culvert area. The contaminants detected above screening levels included pesticides, DDT, DDD, DDE, and chlordane. The DDT suite was detected in several samples. This information was incorporated into a Level 1 Assessment prepared by the City (2010c). The receptors of concern at Oaks Bottom include benthic organisms, fish, and birds. Benthic organisms and fish are potentially at risk through dermal contact or ingestion of sediments. Birds are potentially at risk from consuming benthic organisms or fish.

Additional sampling was then conducted in 2009 and 2010 based on the Level 1 Assessment and the Sampling and Analysis Plan developed for and reviewed by the regulatory agencies. The areas of proposed excavation were sampled at the existing surface and at the depth of the proposed "new surface" that would be exposed after excavation. Additional areas not currently included in the proposed project design, but which could be considered in the design, were also sampled. The results of this sampling indicate that DDT, DDD, and DDE (collectively DDx) are present in both the channel and in the reservoir at the existing surface, and that zinc, chlordane, and PCBs are present at levels above screening criteria. However, the proposed "new surface" locations had no contaminants. Areas proposed for excavation will reveal clean substrate.

The City completed an Ecological Risk Assessment in 2010 (GeoEngineers 2010) based on the previous sediment sampling. The purpose of the assessment was to evaluate the potential risks to fish and piscivorous wildlife following construction of the proposed restoration project. The existing invertebrate and fish populations are exposed to the chemicals of concern via dermal exposure and ingestion of sediment.

Piscivorous birds, wildlife, and shorebirds may be bioaccumulating chemicals of concern by consuming invertebrates or fish under current conditions. The risk assessment concluded that, when modeled using "site-specific" variables, fish and wildlife within Oaks Bottom were at moderate to low potential risk from the presence of DDx, and that chlordane presented low to no potential risk.

Following review of the Ecological Risk Assessment and the Biological Assessment submitted by the City in 2010, NOAA requested that the City conduct fish tissue sampling to identify if any bioaccumulation was occurring in fish in Oaks Bottom. The City and NOAA conducted fish sampling in June 2011 (GeoEngineers 2011). No salmonids were collected, but three-spine stickleback were captured and are considered by NOAA as a suitable surrogate for juvenile salmon because they use similar prey species and are of similar size as juvenile salmon. Tissue samples from stickleback indicated that DDx was present in fish tissue at low levels ranging from 29 to 44 µg/kg (wet weight). These levels are all lower than either generic or site-specific critical tissue levels that represent tissue levels at or below which approximately 95 percent of the organisms bearing this residue would be highly unlikely to experience adverse health effects. The conclusion from the fish tissue sampling is that fish in Oaks Bottom are unlikely to bioaccumulate DDx at levels that would cause adverse health effects, and that the levels present in the fish are well below the levels estimated for the risk assessment. Thus, the risk to salmonids is low from contaminant levels in Oaks Bottom.

Organochlorine pesticide concentrations have been declining slowly since DDT and other persistent pesticides were banned in 1972. Henny et al. (2008) found that osprey populations increased substantially along the Lower Columbia River between 1998 and 2004 (including the Portland area), and the organochlorine pesticide burden (such as from DDx) has decreased in eggs. An osprey nest has been located immediately adjacent to the project site along the Springwater Trail for the past several years, and has successfully fledged young each year.

With the proposed project, approximately 4,500 cubic yards of sediments would be excavated from the tidal slough channels that would remove currently contaminated sediments and leave a clean surface. This would remove contamination from the area that would be used most frequently by fish species, although the fish tissue sampling indicates that there is only low risk to fish from exposure to the concentrations found in the sediments. The wetting and drying hydrologic cycle that would be reintroduced to the project area is further expected to help in the breakdown of the remaining DDT and its breakdown products. Overall, the project should improve sediment quality.

2.5 TIMING OF DISCHARGE AND FILL

All in-water work would occur during the designated in-water work window between July 1 and October 31. Work that is in uplands or is otherwise isolated from the river could occur outside of the in-water work window. However, due to the interest in reopening the Springwater Trail and railroad line as soon as possible, it is anticipated that construction would not extend outside of the in-water work window, except for fall planting.

2.6 SOURCES AND GENERAL CHARACTERISTICS OF DREDGE/FILL MATERIAL

All fill material would come from two sources: 1) either on-site reuse of railroad embankment material; or from 2) a commercial source that meets the standards for suitability of clean material. This would generally mean that any materials imported to the project area would have low or non-detectable levels of contaminants that are not expected to have significant adverse impacts on water quality or biota in the short or long term.

SECTION 3. EVALUATION CRITERIA

The 404(b)(1) Guidelines require evaluation of the aquatic impacts associated with the discharge of dredged or fill material. The purpose of the CWA Section 404(b)(1) as per 40 CFR Section 230.1(a) "is to restore and maintain the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredged or fill material." Specifically, 40 CFR Section 230.1(c) states that "dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge would not have an unacceptable adverse impact."

Section 230.11 of Subpart B of the Guidelines provides the following four conditions that must be satisfied in order to make a finding that a proposed discharge complies with the requirements described in 40 CFR Section 230:

1. No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental impacts (see Sections 4, 5, and 6).
2. No discharge of dredged or fill material shall be permitted if it violates any water quality standards, jeopardizes any endangered or threatened species, or disturbs any marine sanctuaries (see Sections 4, 5, and 6).
3. No discharge of dredged or fill material shall be permitted that would result in significant degradation of any waters of the United States, including adverse effects on human health or welfare, effects on municipal water supplies, aquatic organisms, wildlife, or special aquatic sites (see Sections 4, 5, 6 and 7).
4. No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken that would minimize potential adverse impacts (see Sections 8, 9, and 10).

The potential impacts of the proposed actions are evaluated based on conditions set forth in 40 CFR Subpart B Section 230.11, and the factual determination and discussion of conditions for compliance are provided in Sections 11 and 12. Findings of compliance or non-compliance with the restrictions on discharge, pursuant to 40 CFR 230.12, are provided in Section 13.

SECTION 4. POTENTIAL IMPACTS ON PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM (SUBPART C)

4.1 SUBSTRATE

4.1.1 Existing Conditions

The primary substrates found in the project footprint include topsoil, sand, gravel, and silt. Fine sediments, found in the reservoir and existing channel, include the deposited organic material that tends to settle in quiescent waters (i.e., dead and decaying plankton and leaf litter). Although DDT and its breakdown products have been sampled, the fish tissue sampling data indicates that risks to fish and other species is low from exposure to these legacy pollutants.

4.1.2 Potential Impacts

4.1.2.1 No Action Alternative

The No Action Alternative would result in no substantial changes to substrate.

4.1.2.2 Proposed Restoration Plan

During construction, the proposed restoration plan would include excavation, removal, and placement of substrates at the culvert and water control structure locations and to excavate the tidal slough channels, and also require localized excavation of river and bank sediments to install the culvert and place the boater deterrence boulders on the river side of the culvert. The proposed restoration plan would redistribute both coarse and fine substrates via regrading and installation of riffle structures along the tidal slough channels. The project would remove approximately 4,500 CY of sediments contaminated with low levels of DDx further reducing pollutants in the refuge. The project would also include revegetation with riparian and floodplain vegetation that would tend to stabilize and reduce erosion of riparian and floodplain areas. Overall, there would be minor improvements in substrate quality and slightly more diversity of substrate types by placement of the riffle structures.

4.2 SUSPENDED PARTICULATES/TURBIDITY

4.2.1 Existing Conditions

Turbidity is related to the amount of suspended particulate matter in the water, and is defined as an optical measurement of light that is scattered and absorbed, rather than directly transmitted, as it passes through water. Turbidity is measured in nephelometric turbidity units (NTUs). The Lower Willamette River below Willamette Falls meets water quality standards for turbidity.

4.2.2 Potential Impacts

4.2.2.1 No Action Alternative

The No Action Alternative would result in no substantial changes to turbidity or suspended particulates.

4.2.2.2 Proposed Restoration Plan

During construction, there would be the potential for minor, temporary and localized increases in turbidity and suspended sediments due to runoff from the construction area or work within the river. BMPs would be implemented during construction to minimize the potential for any increases in turbidity and monitoring would be conducted as required by ODEQ to comply with the water quality certification. For the long-term, the proposed restoration plan would likely help incrementally reduce turbidity levels by restoring riparian and floodplain vegetation and reducing high velocities and scour at the culvert.

4.3 WATER QUALITY

4.3.1 Existing Conditions

The DEQ ambient water quality monitoring site on the Lower Willamette River is located at the Hawthorne Bridge. This site scored 84 points on the Oregon Water Quality Index and showed an increasing trend in the score over the past 10 years. This site is ranked in the 'fair' category (ODEQ 2013).

The DEQ 303(d) list of water quality impaired waterbodies from 2010 (ODEQ 2010) includes the Lower Willamette River for a number of pollutants. A Total Maximum Daily Load (TMDL) has already been approved for the Lower Willamette for temperature, E. coli, dioxin, and mercury. Category 5 pollutants that need a TMDL include chlorophyll a (in summer), manganese, iron, hexachlorobenzene, cyanide, and biological criteria. Pollutants present that meet most standards, but may not attain all beneficial uses (Category 2) include ammonia, chromium (hex), copper, lead, nickel, pH, selenium, zinc, and dissolved oxygen. Other 303(d) listed pollutants include aldrin, PAHs, PCBs, pentachlorophenol, dieldrin, DDT and DDE. A number of other pollutants have been identified in one or more samples, but there is not sufficient data available for listing.

The City conducted water temperature monitoring from May through October 2008 and captured representative low flow (summer/fall) temperatures for groundwater, the reservoir, and within the channel at both the water control structure and culvert. Temperatures during the winter months are typically cold. Flows passing through the culvert were also monitored. Over the period of monitoring, groundwater temperatures only varied within a range of 50° to 55°F (10° to 13°C) and showed no daily fluctuation. However, surface water temperatures varied widely and showed a great deal of daily fluctuation up to as high as 90°F (32°C). Being a shallow and open water body, the reservoir naturally heats up and its temperatures were on average about 7°F (4°C) higher than those at the culvert. In 2011, the City conducted a Forward-Looking Infrared or FLIR mapping that showed several cool inflows between the pond and the culvert (Figure 4-1). This suggests that a relatively steady supply of cooler groundwater is surfacing between the pond and culvert, contributing to the culvert's total flow and to the somewhat cooler water temperatures within the channel as compared to either the reservoir or the river.

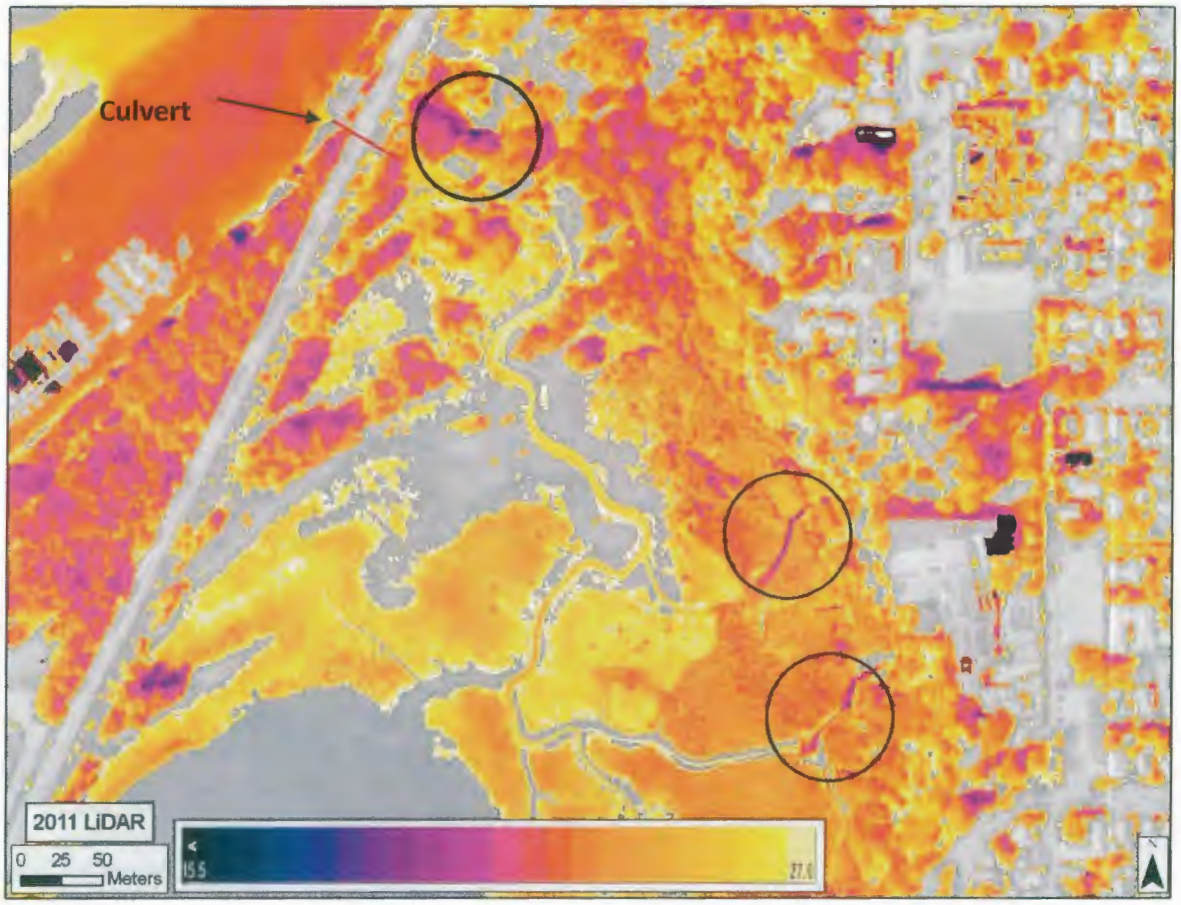


Figure 4-1. Forward-Looking Infrared Image of Oaks Bottom Showing Water Temperatures

(Circles show key cooler water inputs from springs and groundwater flow.)

Water within the reservoir varied from 50° to 90°F (10 to 32°C) over the year, while water passing through the channel at the water control structure varied from 46° to 84°F (8 to 29°C) over the year. Water temperature at the culvert varied from 50° to 81°F (10 to 27°C) over the year and reflects inflows from the Willamette River as well as outflows from the reservoir and groundwater flows. Temperatures at the culvert (river-dominated) are typically less than 59°F (15°C) from October to mid-June and increase as river flows decrease and temperatures in the reservoir increase throughout the summer and early fall prior to the onset of the rainy season. Past sampling in the Lower Willamette River has indicated the river temperatures immediately outside the culvert can exceed 77°F (25°C) during the summer (City of Portland 2010d). Salmonids typically prefer water temperatures below 61°F (16°C) (Bjornn & Reiser 1991) and naturally move out of floodplain habitats as water temperatures rise when access is unimpeded. Oregon water quality standards for salmonid rearing and migration require temperatures less than 64°F (18°C) (Oregon Department of Environmental Quality [ODEQ] 2012).

The City conducted sampling in 2009 for conventionals, petroleum hydrocarbons, metals, PCBs, volatile organic compounds, semi-volatile organic compounds, and pesticides. The results of the 2009 water quality sampling indicated that lead was the only contaminant of concern above published levels or screening criteria at Oaks Bottom, and that it was present at Site 8 in the reservoir at levels of 2.97 micrograms per liter (µg/L), which is only slightly above the freshwater screening criteria of 2.5 µg/L (City of Portland

2010a). It appears the natural breakdown of chemicals over time and/or flushing has substantially reduced the presence of contaminants of concern in surface waters at Oaks Bottom.

Groundwater was sampled from a boring in the south landfill in 2009 (City of Portland 2010b) and from the seeps emerging from the landfill to identify if contaminants might be seeping from the landfill into the reservoir area. The groundwater samples from the landfill exceeded screening criteria for arsenic. However, arsenic was not detected above screening levels in the reservoir, so it does not appear to be migrating from the landfill. Though one reservoir sample was above the screening level for lead, this contaminant was not found in the seep sample or other samples, so it likewise does not appear that lead is migrating from groundwater in the landfill to surface waters.

4.3.2 Potential Impacts

4.3.2.1 No Action Alternative

The No Action Alternative would result in no substantial changes to water quality in the project area. Existing water quality problems would continue, except for some improvements resulting from actions taken by other entities to address the TMDLs.

4.3.2.2 Proposed Restoration Plan

While water quality improvements are not a specific project purpose, there are likely to be water quality improvements that occur as a long-term result of the restoration plan. Reducing the size of the reservoir is expected to reduce the heating that currently occurs in the wide shallow impoundment and allow the spring flows with cool temperatures to contribute more to the overall conditions in the channel, making conditions more suitable for salmonid rearing. Additionally, by allowing daily tidal and river exchange, the river will also dominate water quality conditions more under the proposed conditions.

There could be temporary impacts to water quality, mainly turbidity as mentioned above, during construction of the project. These impacts would be minimized by isolating construction activities from adjacent receiving waters by the use of coffer dams and implementation of construction stormwater best management practices (BMPs) to the maximum extent practicable. These BMPs would likely include surface stabilization (i.e. mulches), silt fence and other sediment barriers, and by maintaining booms, silt curtains, and absorbent pads on site and implementing source-control program to prevent the generation or release of potential pollutants. Water quality monitoring would take place to meet permit requirements. If the standards are exceeded then construction will be halted until additional BMPs can be installed to ensure standards are met.

Construction equipment may release small amounts of pollutants into the water, including oils and grease or other contaminants, as a result of spills and leakages or the existence of contaminants on machinery that is used within the water column. Contained staging areas and the pollution prevention plan would be used to identify methods and procedures to control contaminants from entering the water through leaks or spills. Machinery and materials used for restoration would be clean from approved sources.

4.4 CURRENT PATTERNS, WATER CIRCULATION, AND FLUCTUATIONS

4.4.1 Existing Conditions

The Willamette River Basin drains over 11,000 square miles of the Coast Range, Cascade Mountains, western foothills, and the Willamette Valley. The mainstem Willamette flows for 185 miles from the confluence of the Middle and Coast Forks of the Willamette, and is the largest river wholly contained within the State of Oregon (WRI 2004). The Lower Willamette River extends from the confluence with the Columbia upstream to Willamette Falls (at RM 27) and is tidally influenced through the Columbia River,

which flows out to the ocean. Daily tides range from 1 to 2.5 feet in the vicinity of Oaks Bottom. Oaks Bottom collects runoff from a small basin of approximately 240 acres that includes the entire refuge and a small fringe of the bluff surrounding the site. A number of springs are present along the bluff that provide continuous flow year-round to Oaks Bottom.

The City and others have conducted monitoring of surface and groundwater elevations in the project area and at the outlet of the culvert along the Willamette River. Figure 4-2 shows the water surface elevation frequency curve for the Lower Willamette River on a daily average basis throughout the year and then for the November 1 to June 15 juvenile salmonid rearing season. The median daily mean water surface elevation is approximately 7.7 feet (exceeded 50 percent of the time), which would provide approximately 6 inches of depth at the upstream end of the existing culvert (7.2 feet elevation) approximately 50 percent of the time. The rearing season median daily mean water surface elevation is approximately 8.7 feet, which provides approximately 18 inches of depth at the upstream end of the existing culvert approximately 50 percent of the time. The existing culvert has been observed to have very high with hazardous velocities when there is a foot or more of head difference between the river stage and the water level in Oaks Bottom. Velocities in the culvert exceed 2 feet per second (fps) from 30 to 70 percent of the time, depending on the hydrology in the Willamette River, which can preclude fish passage.

In addition, the water control structure immediately upstream of the culvert blocks tidal flow from coming into Oaks Bottom and prevents fish passage into the site until the Willamette River exceeds the elevation of the water control structure. The top elevation of the water control structure is 14 feet, which is only equaled or exceeded less than 5 percent of the time. As high flows recede below 14 feet, any fish that may have passed into the reservoir would almost certainly become trapped behind the water control structure because the primary outflow is via small channels undermining the structure or via spill over the top of the structure that drops onto rocks below.

The reservoir can impound up to 60 acres when all of the flashboards are installed. Additionally, when the Lower Willamette River stage is above ordinary high water (calculated to be at 18.2 feet), up to 88 acres of the refuge can be inundated (Figure 4-3). An existing high spot along the channel from the reservoir to the culvert generally maintains the reservoir at a minimum size of 4 to 5 acres even when all the flashboards at the water control structure are removed.

Groundwater monitoring from piezometers installed in the refuge have indicated there is an overall net outflow of groundwater from the bluff toward the river. A minimum of 0.2 cubic feet per second (cfs) of groundwater flow exits as surface water into the channel from the reservoir on an average annual basis. Figure 4-4 shows the estimated water budget for the project site.

The hydrology of riverine and tidal systems is the primary driving force in habitat development. Complex hydrologic forces are required to maintain diverse habitats that meet the needs of each life stage of salmonids. Persistent shallow or slack water habitats are especially important for survival of early life history stages of fishes. Regular scour and meandering of a natural system regulates growth of native and non-native plant species. Altered hydrology and loss of tidal floodplain inundation have resulted in environmental conditions to which native species are not well adapted. This has created opportunities for non-native plants to outcompete native plants and non-native fish to outcompete native fish.

Habitat diversity along the heavily urbanized Willamette River has been substantially reduced as a consequence of upstream hydrologic regulation, bank armoring, and floodplain filling/development. Tidal backwater rearing habitat is now extremely rare in the area.

Summary Statistics (Period of Record)

	Daily WSE (ft, COP Datum)		
	Daily Avg.	Low Tide	High Tide
Min.	3.99	2.37	4.51
Max.	30.12	29.35	30.67
Mean	8.46	7.38	9.75
Median	7.73	6.61	9.18

Summary Statistics (Nov-Jun Rearing Season)

	Daily WSE (ft, COP Datum)		
	Daily Avg.	Low Tide	High Tide
Min.	3.99	2.67	4.51
Max.	30.12	29.35	30.67
Mean	9.47	8.55	10.53
Median	8.77	7.82	9.91

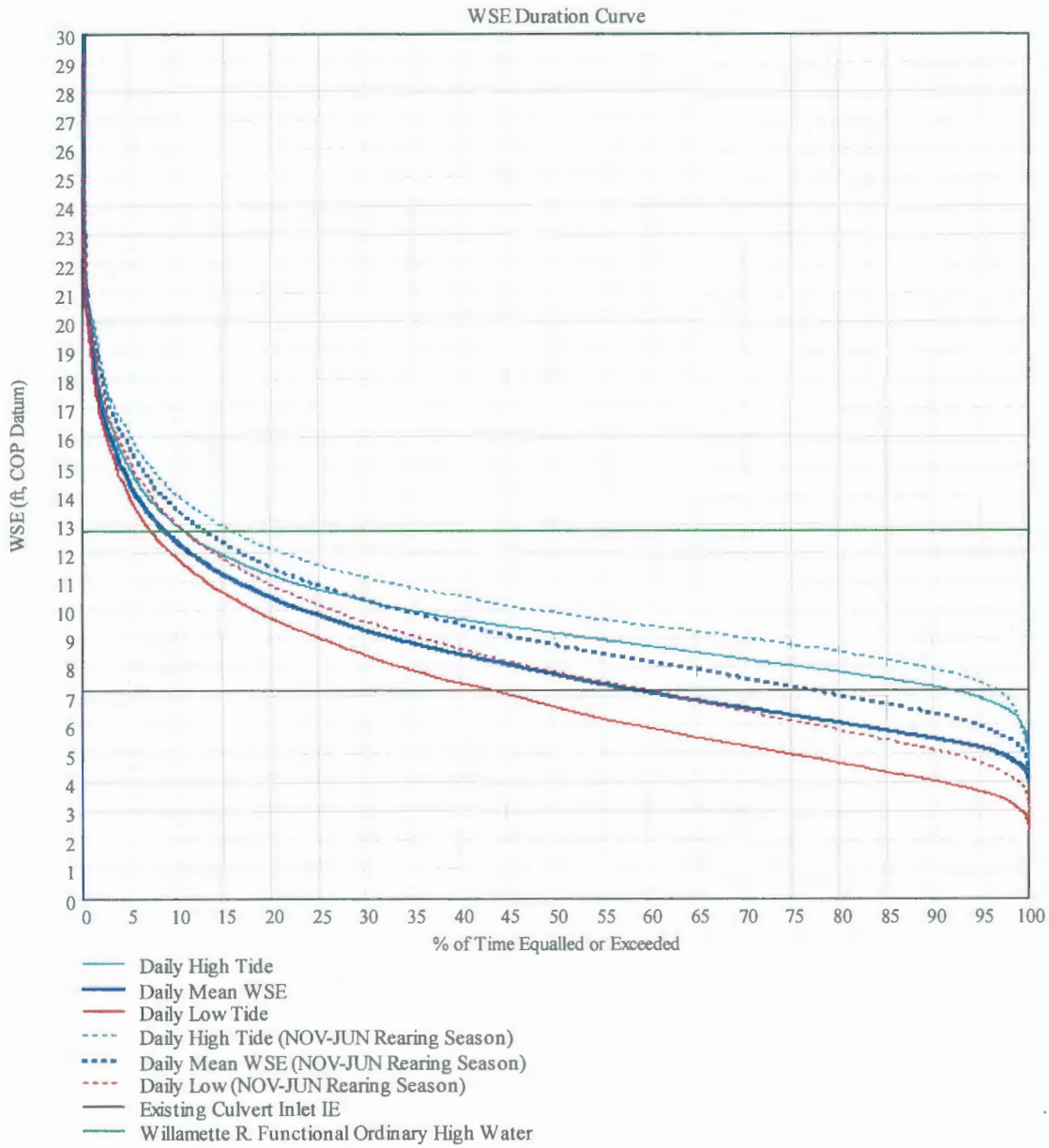


Figure 4-2 Water Surface Elevation (WSE) Frequency Curves, Lower Willamette at Oaks Bottom

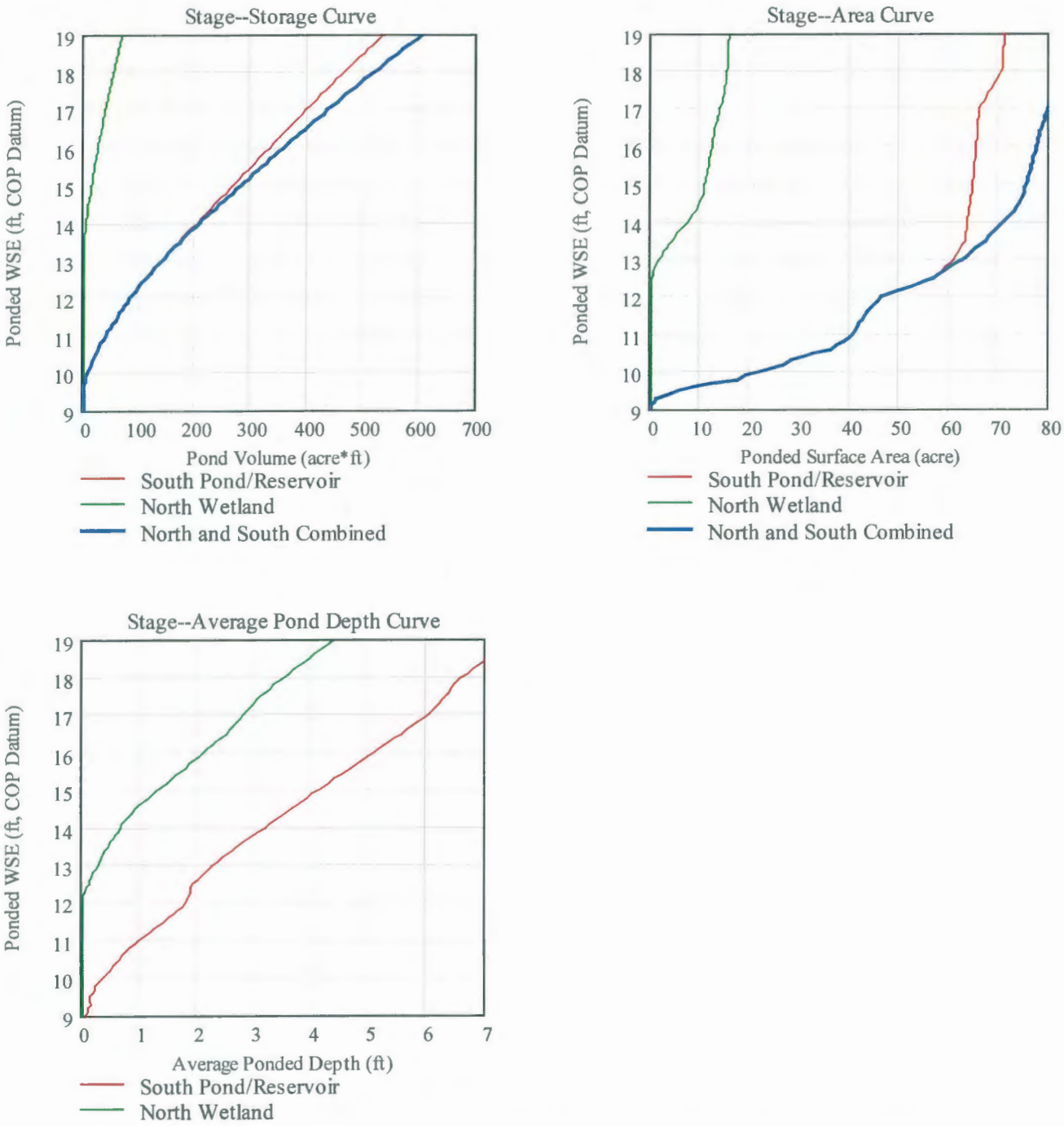
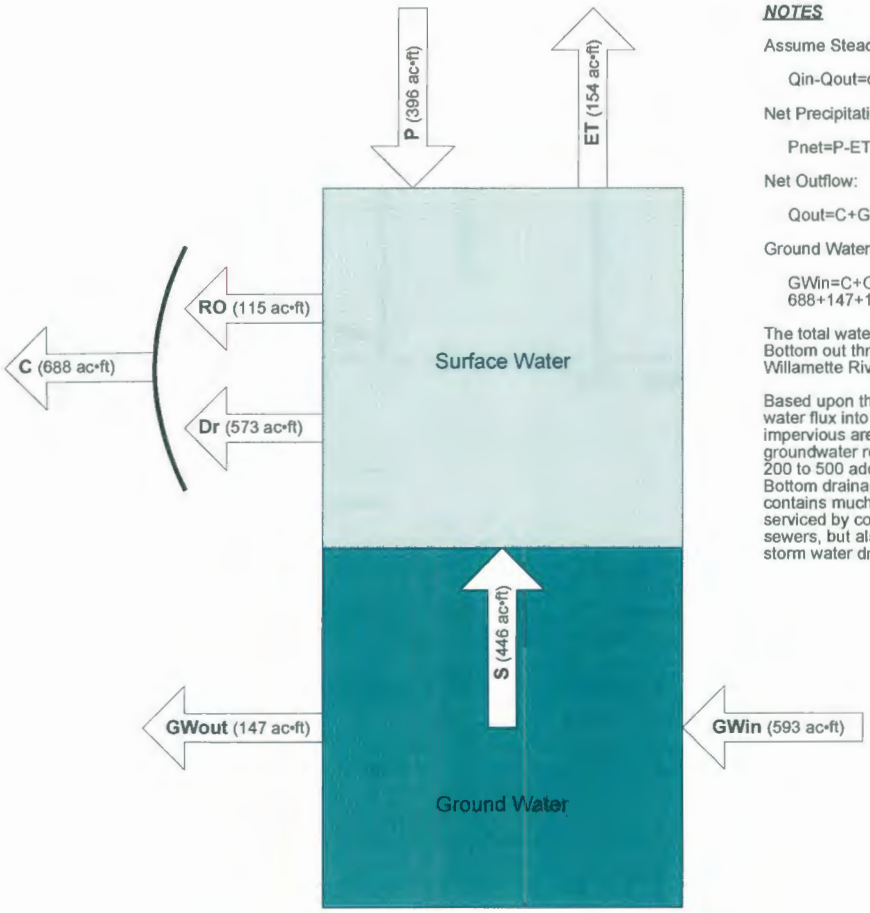


Figure 4-3 Reservoir Volume Storage Curve, Surface Area Curve, and Average Pond Depth Curves

Estimated Annual Water Budget for Oaks Bottom: Preliminary Analysis



NOTES

Assume Steady-state Conditions:

Qin-Qout=dVol/dt=0

Net Precipitation:

Pnet=P-ET ==> 396-154=242 ac•ft

Net Outflow:

Qout=C+GWout ==> 688+147=835 ac•ft

Ground Water Influx:

GWin=C+GWout+ET-P ==>
688+147+154-396=593 ac•ft

The total watershed area draining to Oaks Bottom out through the culvert and to the Willamette River is about 125 acres.

Based upon the computed value for the ground water flux into the site (assuming a mapped impervious area of about 35%), the groundwater recharge area is an approximate 200 to 500 additional acres outside of the Oaks Bottom drainage. The presumed recharge area contains much of the Sellwood district which is serviced by combined sanitary and storm sewers, but also has a significant number of storm water drywells/sumps (a.k.a., UIC's).

Variable	Description	Data Source	Annual Volume (ac•ft)	Average Flow/Flux (ft^3/s)
P	Total Precipitation	Rainfall Record	396	0.55
ET	Evapotranspiration	City MIKE-SHE Modeling	154	0.21
RO	Direct Rainfall Runoff	City MIKE-SHE Modeling	115	0.16
C	Culvert Out Flow	Monitoring Data	688	0.95
Dr	Drainage	Computed (Dr=C-RO)	573	0.79
S	Seepage	Computed (S=GWin-GWout)	446	0.62
GWin	Ground Water Influx	Computed (See Notes)	593	0.82
GWout	Ground Water Outflux	IGW Modeling	147	0.20

Figure 4-4 Water Budget

4.4.2 Potential Impacts

4.4.2.1 No Action Alternative

The No Action alternative would continue the existing condition where the culvert is disconnected from the Willamette River approximately 50 percent of the time. Although the water control structure management can be changed by the City (via removal of flashboards), without fundamental modifications, the culvert and water control structure would continue to preclude fish ingress and egress to Oaks Bottom, except at high flows, and would continue to be a stranding hazard. It is likely that this hydrologic regime would result in further increased densities of non-native fish and plant species that are able to outcompete native species and salmonids would generally not be able to use the site.

4.4.2.2 Proposed Restoration Plan

The recommended alternative would include the replacement of the existing 5-foot-diameter culvert with a 16-foot-wide by 10-foot-high culvert that would provide unhindered fish and wildlife passage between the Lower Willamette River and Oaks Bottom. The water control structure would be removed, and the channels and reservoir would flood and drain based on natural hydrologic cycles from the river and tides. This would cause more frequent wetting and drying of the floodplain as opposed to the relatively static regime that now occurs when the flashboards impound water and then the rapid drying that occurs when the flashboards are removed. Overall, the project is specifically intended to restore this more natural hydrologic regime to the project area and these effects are expected to be beneficial. The proposed change to a more natural hydrologic regime may require that Multnomah County Vector Control provide more spot treatments of mosquito larvae during the spring to control floodwater mosquitoes. The proposed hydrologic regime would tend to discourage the mosquito species that spreads West Nile virus and may have beneficial effects.

4.5 SALINITY

Not applicable as the project site is well upstream of the salt wedge in the Lower Columbia River Estuary.

SECTION 5. POTENTIAL IMPACTS ON BIOLOGICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM (SUBPART D)

5.1 THREATENED AND ENDANGERED SPECIES

5.1.1 Existing Conditions

Thirteen threatened or endangered species may be found in the project area, as well as four species that are candidates for Federal protection (Table 5-1). Based on previous data collection efforts and data within the Oregon Biodiversity Information Center (OBIC) database, there are only six species that have been known to occur within Oaks Bottom, including Lower Columbia Chinook salmon, Upper Willamette River Chinook salmon, Lower Columbia coho salmon, Columbia River chum salmon, Lower Columbia River steelhead, and Upper Willamette River steelhead. All other species are unlikely to be present in the project area, and have not historically been documented there (OBIC 2010), and are not discussed in further detail herein.

TABLE 5-1 POTENTIALLY OCCURRING LISTED SPECIES

Species	Listing Status	Critical Habitat	Presence in Project Area	Managing Agency
Columbian white-tailed deer *Odocoileus virginianus leucurus*	Endangered	Not Designated	Unlikely	USFWS
Northern spotted owl *Strix occidentalis caurina*	Threatened	Designated	Unlikely	USFWS
Streaked horned lark *Eremophila alpestris strigata*	Threatened	Designated	Unlikely	USFWS
Oregon spotted frog *Rana pretiosa*	Threatened	Designated	Unlikely	USFWS
Lower Columbia Chinook salmon *Oncorhynchus tshawytscha*	Threatened	Designated	Present	NOAA
Upper Willamette River Chinook salmon *O. tshawytscha*	Threatened	Designated	Present	NOAA
Lower Columbia coho salmon *Oncorhynchus kisutch*	Threatened	Proposed	Present	NOAA
Columbia River chum salmon *Oncorhynchus keta*	Threatened	Designated	Unlikely	NOAA
Lower Columbia River steelhead *Oncorhynchus mykiss*	Threatened	Designated	Present	NOAA
Upper Willamette River steelhead *O. mykiss*	Threatened	Designated	Present	NOAA
Willamette daisy *Erigeron decumbens var. decumbens*	Endangered	Designated	Unlikely	USFWS
Water howellia *Howellia aquatilis*	Threatened	Not Designated	Unlikely	USFWS
Bradshaw's desert parsley *Lomatium bradshawii*	Endangered	Not Designated	Unlikely	USFWS

TABLE 5-1 POTENTIALLY OCCURRING LISTED SPECIES

Species	Listing Status	Critical Habitat	Presence in Project Area	Managing Agency
Kincaid's lupine *Lupinus sulphureus ssp. Kincaidii*	Threatened	Designated	Unlikely	USFWS
Nelson's checker-mallow *Sidalcea nelsoniana*	Threatened	Not Designated	Unlikely	USFWS
North American wolverine *Gulo gulo luscus*	Proposed, Withdrawn	N/A	Unlikely	USFWS
Yellow-billed cuckoo *Coccyzus americanus*	Proposed	Proposed	Unlikely	USFWS
Red tree vole *Arborimus longicaudus*	Candidate	N/A	Unlikely	USFWS
Northern wormwood *Artemisia campestris var. wormskioldii*	Candidate	N/A	Unlikely	USFWS

Extensive planning efforts have been under way throughout the Lower Columbia River estuary, particularly since the development of the *Lower Columbia River Estuary Comprehensive Conservation and Management Plan* and *Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan*, to address the loss of fish and wildlife and their habitat throughout the Lower Columbia River corridor. Under the guidance of these reports, there are many recovery measures taking place for listed species, particularly salmonids. Restoration efforts elsewhere in the estuary are expected to slowly increase the essential wetland and off-channel floodplain habitats necessary for recovery of threatened and endangered species. However, within the Oaks Bottom Wildlife Refuge, Federally protected salmonid species would continue to experience reduced rearing/refuge opportunities and increased mortality from entrapment behind the water control structure due to high temperatures and predation. Overall, the availability of floodplain habitats along the Lower Willamette River would remain limited, as most areas of the floodplain have been developed.

5.1.2 Potential Impacts

5.1.2.1 No Action Alternative

The No Action Alternative would result in no substantial impacts to ESA-listed species. Because this largest remaining tidal floodplain site on the Lower Willamette River would not be restored, the listed species would continue to be adversely affected by the lack of off-channel rearing and refuge habitat as well as the lack of suitable floodplain and wetland habitats for wildlife species.

5.1.2.2 Proposed Restoration Plan

No effects are anticipated to any of the USFWS listed species as they are not known to occur in the project vicinity. ESA consultation was conducted with NOAA Fisheries for the species under their authority and a Biological Opinion was received on August 27, 2012.

A summary of the final determination of findings is provided in Table 5-2 below.

TABLE 5-2. DETERMINATION OF EFFECTS SUMMARY		
Species	**Effect Determination**	**Critical Habitat Determination**
Columbian white-tailed deer	No effect	--
Northern spotted owl	No effect	No effect
Streaked horned lark	No effect	No effect
Oregon spotted frog	No effect	No effect
Lower Columbia River Chinook salmon	Likely to adversely affect	Not likely to adversely affect
Upper Willamette River Chinook salmon	Likely to adversely affect	Not likely to adversely affect
Lower Columbia River Coho salmon	Likely to adversely affect	--
Lower Columbia River steelhead trout	Likely to adversely affect	Not likely to adversely affect
Upper Willamette River steelhead trout	Likely to adversely affect	Not likely to adversely affect
Willamette daisy	No effect	No effect
Water howellia	No effect	--
Bradshaw's lomatium	No effect	--
Kincaid's lupine	No effect	No effect
Nelson's checker mallow	No effect	--

A number of BMPs and conservation measures, would be undertaken to avoid and minimize adverse effects including only working in water during the designated in-water work window, implementation of a Stormwater Pollution Prevention Plan (SWPPP), use of silt curtains and other erosion control elements, use of vibratory pile driving equipment, compliance with water quality standards, implementation of a dewatering management plan, water quality monitoring, implementation of an approved fish handling and removal plan by qualified biologists, use of clean materials in construction, careful placement of materials in water to reduce resuspension of sediments, and compliance with all other ESA and permit conditions.

Although some individual organisms may experience short-term adverse effects; overall, the proposed action would provide long-term benefits for listed species by creating enhanced habitat in the project area. Through the use of BMPs and avoidance and minimization measures, the overall impact of the completed restoration project on ESA-listed species is anticipated to result in a net benefit in the long term to threatened and endangered species.

5.2 AQUATIC FOOD WEB

The aquatic food web in the project area is expected to be degraded in the Lower Willamette River as a result of the highly urbanized condition and lack of riparian areas and wetlands. Within the refuge, a diverse insect and aquatic macroinvertebrate community is likely to occur due to the extensive vegetation and wetland habitats. Existing conditions that affect the aquatic food web include water quality conditions, sediment quality conditions, riparian conditions, dredging, loss of floodplain and wetlands, and flow modifications upstream.

5.2.1 Potential Impacts

5.2.1.1 No Action Alternative

The No Action Alternative would result in no impacts to the aquatic food web but would maintain the degraded condition in the Lower Willamette River and not result in the opportunity for juvenile salmonids to access and rear in the productive Oaks Bottom habitats.

5.2.1.2 Proposed Restoration Plan

The proposed construction activities associated with the build alternatives may have short-term in-water impacts on primary and secondary productivity and benthic organisms from excavation/removal of benthic substrate, and potential increases in turbidity. Short-term upland impacts on terrestrial vegetation (i.e. removal of invasive species) may temporarily reduce primary productivity and detrital inputs, but this is expected to recover quickly via plantings of native riparian and floodplain species. Long-term effects include improved riparian conditions, reconnection of Oaks Bottom to the Lower Willamette River, and fish access into the productive wetland habitats for rearing and refuge. Construction impacts would be temporary and less than significant and improved habitat would represent a long-term benefit. BMPs would be implemented during construction to minimize potential impacts to the aquatic food web.

5.3 WILDLIFE

Because Oaks Bottom is within the City of Portland, there are limited habitat areas available for mammals, but deer, coyote, river otter, beaver, skunk, possum, squirrels, and nutria all occur in the refuge. Several bat species are also known to occur in Oaks Bottom. Seven native amphibian species occur in the refuge including red-legged frog and chorus frog. Over 157 bird species have been identified in the project area, including a wide variety of waterfowl, shorebirds, raptors, and songbirds. Oaks Bottom is a premier bird-watching destination in the area and a favorite of residents and visitors alike.

5.3.1 Potential Impacts

5.3.1.1 No Action Alternative

The No Action Alternative would result in no impacts to wildlife, but would not enhance any floodplain or riparian habitats that are of critical importance to many sensitive species. Under the no action alternative, high water temperatures, restricted tidal fluctuation, and expansion of non-native species would all cumulatively contribute to a continued reduction in the availability of habitat for native wildlife species. Currently, native frogs are affected in part due to the presence of the non-native bullfrog, which is better adapted to the warm waters of the reservoir. Bullfrogs often eat smaller frogs, and even small bullfrogs, turtles, and fish. Non-native fish species compete with native fish and damage native fish habitats. Native migratory birds and mammals that nest in the area would occur less and less as native riparian habitat is further encroached upon by purple loosestrife and reed canary grass that tend to prevent succession of woody vegetation. A mostly non-native assemblage of fish and bullfrogs within the reservoir would still attract foraging wading birds and waterfowl and may also continue to supply food for the nearby nesting osprey. However, nesting opportunities would decline for species dependent on native vegetation for nest building, such as songbirds. It is expected that the diversity and abundance of native birds, mammals, and amphibians would continue to decline with no action.

5.3.1.2 Proposed Restoration Plan

The proposed project would include the removal of invasive species in the area of construction, restore a riparian corridor along the slough channels and also enhance wetlands around the reservoir and pond areas

with native vegetation. This would enhance habitat for native amphibians. It is expected that bird species, particularly Neotropical migratory birds, would be beneficiaries of this project. Waterfowl habitat would be reduced as a result of reducing the size of the reservoir. However, the reservoir would still seasonally flood to its existing maximum extent and promote a more natural distribution of plant communities and their associated wildlife species.

During construction there would be increased disturbance. The City has conducted monitoring of wildlife in the project area to identify which species may be present and to identify methods to minimize effects during construction. Otters, beaver, mink and nutria are present near the culvert outlet, but also appear to use a larger area of the refuge and river, including Ross Island. To minimize effects on these species, the City will conduct some disturbance actions early in the spring prior to construction to help prevent these species from denning in the project area. Fencing or other features may be installed as well to help prevent these species from utilizing the area. If any native amphibians or other wildlife species are observed during construction they will be removed, as necessary, and relocated elsewhere in the refuge. Overall, this project is expected to substantially benefit native fish and wildlife species and provide a good migration corridor between the Lower Willamette River and the wildlife refuge.

SECTION 6. POTENTIAL IMPACTS ON SPECIAL AQUATIC SITES (SUBPART E)

6.1 SANCTUARIES AND REFUGES

6.1.1 Existing Conditions

Sanctuaries and refuges are defined in 40 CFR §230.40(a) as "areas designated under State and Federal laws or local ordinances to be managed principally for the preservation and use of fish and wildlife resources." The entire project area is within the City designated Oaks Bottom Wildlife Refuge.

6.1.2 Potential Impacts

The proposed project would enhance native species within Oaks Bottom Wildlife Refuge and is supported by Portland Parks that manages the property for wildlife preservation values.

6.2 WETLANDS

6.2.1 Existing Conditions

Section 404 of the CWA regulates the discharge of fill into waters, including wetlands, of the United States. There are wetlands present in the majority of the project area, including open water, palustrine emergent, palustrine scrub-shrub, palustrine forested, and riverine.

6.2.2 Potential Impacts

The proposed project is not intended to eliminate any of these wetlands, but would enhance these wetlands by providing more natural tidal and riverine hydrology and the removal of invasive species. During construction, wetlands would be disturbed by equipment, removal and fill of material, removal of invasive species, placement of large wood, and native plantings. The removal and fill actions may change the water depths inundating the wetlands, and thus the plant communities may change, but the project would provide an overall enhancement of wetlands.

6.3 MUDFLATS

6.3.1 Existing Conditions

Mudflats are defined in 40 CFR §230.42 as "broad flat areas along the sea coast and in coastal rivers to the head of tidal influence and in inland lakes, ponds, and riverine systems."

6.3.2 Potential Impacts

A portion of the reservoir area is considered mudflat that is seasonally ponded and then dries down later in the summer/fall season. This habitat would remain very similar to existing conditions as no project activities would occur in these areas. The removal of the water control structure would restore a more natural hydrologic regime, which would still include seasonal inundation and then dry down later in the summer/fall season.

6.4 VEGETATED SHALLOWS

6.4.1 Existing Conditions

Vegetated shallows are defined in 40 CFR §230.43 as "permanently inundated areas that under normal circumstances support communities of rooted aquatic vegetation, such as turtle grass and eelgrass in estuarine or marine systems as well as a number freshwater species in rivers and lakes." All existing vegetation in the wildlife refuge would be considered emergent rather than rooted aquatic vegetation.

6.4.2 Potential Impacts

As there are no areas of vegetated shallows, there would be no effects on vegetated shallows from any of the alternatives.

6.5 CORAL REEFS

Not applicable.

6.6 RIFFLE AND POOL COMPLEXES

6.6.1 Existing Conditions

Riffle and pool complexes are not present as the project area is a tidal floodplain with wetland habitats.

6.6.2 Potential Impacts

The proposed project includes the installation of riffle structures for grade control purposes in the tidal slough channel, but would not create riffle/pool complexes. No effects on riffle/pool complexes would occur from any of the alternatives

SECTION 7. POTENTIAL EFFECTS ON HUMAN USE CHARACTERISTICS (SUBPART F)

7.1 MUNICIPAL AND PRIVATE WATER SUPPLIES

7.1.1 Existing Conditions

There are no municipal or private water supplies in the project area. The City of Portland obtains its water supply from the Bull Run watershed near Mt. Hood.

7.1.2 Potential Impacts

There would be no effects on municipal or private water supplies from any of the project alternatives.

7.2 RECREATIONAL AND COMMERCIAL FISHERIES

7.2.1 Existing Conditions

Recreational fishing for salmon and other species occurs in the Willamette River. No fishing is allowed in Oaks Bottom Wildlife Refuge.

7.2.2 Potential Impacts

As all construction work would be conducted isolated by coffer dams or other measures from the Lower Willamette River, there is likely to be no effect on recreational fishing in the Willamette River during construction. As the project purpose is to provide rearing and refuge habitat for juvenile salmon from the Willamette and Columbia River basins, there could be slight beneficial long-term effects on recreational fishing from increased fish populations.

7.3 WATER-RELATED RECREATION

7.3.1 Existing Conditions

Recreational boating occurs on the Lower Willamette River. Recreational boating is not allowed within Oaks Bottom Wildlife Refuge. Bird-watching and other passive recreation occurs in Oaks Bottom (i.e. hiking).

7.3.2 Potential Impacts

As all construction work would be conducted isolated by coffer dams or other measures from the Lower Willamette River, there is likely to be no effect on boating in the Willamette River during construction. Boater deterrence boulders would be installed to prevent boaters from accessing Oaks Bottom Wildlife Refuge in keeping with current management for sensitive wildlife species. During construction, pedestrian use and bird-watching would be restricted in some areas, but other areas of the refuge would remain open for use. This is unlikely to be a significant effect on recreation. Over the long-term, bird-watching would be enhanced as a result of the construction of viewing platforms that overlook the refuge and river.

7.4 AESTHETICS

7.4.1 Existing Conditions

The existing visual character and quality of the project area are formed by a composition of natural and urban features—water, vegetation, sky, residential neighborhoods, river commercial and industrial uses, and roads, bridges, and highways. Non-native species such as reed canary grass degrade aesthetic conditions by forming dense monocultures in many areas.

7.4.2 Potential Impacts

The proposed restoration plan removal of invasive species and revegetation of the wetlands and riparian zone and restore conditions to more natural vegetated tidal floodplain characteristics. There would be temporary effects during construction from fencing, equipment, and excavation. However, this would be temporary. Overall, there should be a beneficial effect on aesthetics on the project site, as well as improved viewing capabilities with the viewing platforms.

7.5 PARKS, NATURAL AND HISTORIC MONUMENTS, NATIONAL SEASHORES, WILDERNESS AREAS, RESEARCH SITES, AND SIMILAR PRESERVES

7.5.1 Existing Conditions

Oaks Bottom Wildlife Refuge is a City park.

7.5.2 Potential Impacts

The proposed project would enhance native species within Oaks Bottom Wildlife Refuge and is supported by Portland Parks that manages the property for wildlife preservation values.

7.6 OTHER FACTORS IN THE PUBLIC INTEREST

7.6.1 Cultural Resources

7.6.1.1 Existing Conditions

The Oaks Bottom Wildlife Refuge occurs in a small remnant of the cottonwood/willow bottomland riparian zone that historically lined much of the Lower Willamette River prior to urban development (Loy et al. 2001). Native vegetation communities mapped in the 1850s were composed of riparian woodlands, sloughs, and ponds, with prairies present on the higher terraces (Pacific Northwest Ecosystem Research Consortium 2011). The original bottomlands would have supported a variety of wetland plants that were important for native subsistence. A diverse array of mammals, fish, shellfish, and birds would have been present and important to the native inhabitants (Heritage Research Associates, Inc. 2010)

Chinookan peoples occupied the Lower Columbia valley at the time of Euro-American contact. The Chinookans inhabited areas along both banks of the river from the Pacific Ocean upstream to The Dalles (Silverstein 1990). Because of the favorable climatic and resource conditions, the region was estimated to have had one of the highest pre-contact native population densities in North America (Kroeber 1939). However, because Chinookan territory centered on the Columbia River, which was used as the main transportation route in the region during early Euro-American contact and settlement, the Chinookan peoples were dramatically affected and seriously reduced in population by introduced diseases.

Archaeological research in the Portland Basin indicates that Native American peoples have inhabited the area for at least the past 9,000 to 10,000 years. The best evidence of human occupation in the Portland Basin is represented at a handful of sites located in settings away from the major rivers. These sites are undated, but common artifacts include large leaf-shaped, broad stemmed, and corner-notched projectile points, unifacially flaked cobbles, foliate bifaces, and bola stones. These types of stone tools all suggest occupations prior to 3,000 years ago (Pettigrew 1990). The archaeological record for the Portland Basin during the last 3,000 years has better evidence and radiocarbon dating at many of the sites. The local cultural sequence, developed during the 1970s, begins with the Merrybell Phase (2,550-1,750 Before Present [BP]), characterized by broad-necked projectile points, followed by the Multnomah Phase (1,750-100 BP), characterized by narrow-necked points, and after historic contact, by the introduction of materials of Euro-American manufacture (Pettigrew 1981).

Early maps of the project area indicate that what is now Oaks Bottom Wildlife Refuge consisted of an interconnected network of sloughs, marshes, and ponds, with a large lake and the northern drainage channel (Ives 1852). The project area was part of the 640-acre Alfred Llewellyn Donation Land Claim (Claim 49), and the 1852 plat of survey shows the house and the field of Alfred Llewellyn on the upper terrace east of the project area.

The 1914 U.S. Geological Survey (USGS) 15-minute Oregon City quadrangle shows the presence of an expansive lake and two other ponds in the project area, with higher ground separating the ponds in the area of the present drainage channel. The north floodplain area is shown as a large marsh. The railroad tracks are shown bordering the lake on the west. These maps indicate that the site has been fairly stable for at least the past 150 years. Thus, the banks along the drainage channel have the potential to contain intact cultural deposits.

A review of the archaeological site records indicates that no prehistoric or early historical sites have been recorded in the vicinity of the project area (Heritage Research Associates, Inc. 2010). The Oregon Pacific Railroad has not been designated as a historic resource. The nearest recorded sites are located across the Willamette River and a number of prehistoric sites have been reported on the terraces of the Willamette River south of the project area. This evidence indicates, although much of it is unsubstantiated, that a number of prehistoric sites were located along the banks of both the Willamette and Clackamas Rivers between Ross Island and Willamette Falls (Woodward 1974).

In 2010, Heritage Research Associates, Inc. conducted a pedestrian survey along both sides of the drainage channel, south pond, and culvert area. The ground was obscured by dense vegetation in much of the area, except for the mudflats to the south of the channel around the reservoir. A few items of recent discard such as beer cans and other garbage were observed, but no evidence of prehistoric or early historical artifacts or deposits were noted. If previously undiscovered resources are present, they are anticipated to remain undisturbed in their current condition under the No Action alternative.

7.6.1.2 Potential Impacts

Oaks Bottom Wildlife Refuge may have historic surfaces that existed in nearly the same form over 150 years ago near the beginning or before Euro-American contact. Thus, there may be cultural resources present in the project site. There are no records of cultural or historic resources. The railroad embankment and buried trestle are more than 50 years old and may be eligible for National Register listing. However, both the embankment and trestle have been substantially modified during their lifetimes.

Additional subsurface sampling was conducted in July 2010 and no evidence of cultural resources was discovered. Coordination has occurred with the Oregon State Historic Preservation Office for its concurrence.

If any cultural or historic resources are discovered during construction, then work will be halted until a qualified archaeologist can come to site to document any artifacts inadvertently discovered. The State Historic Preservation Office would be immediately contacted if any artifacts are discovered.

7.6.2 Activities Affecting Coastal Zones

Not applicable.

7.6.3 Navigation

7.6.3.1 Existing Conditions

Recreational boating occurs on the Lower Willamette River. Recreational boating is not allowed within Oaks Bottom Wildlife Refuge.

7.6.3.2 Potential Impacts

As all construction work would be conducted isolated by coffer dams or other measures from the Lower Willamette River, there is likely to be no effect on boating in the Willamette River during construction. Boater deterrence boulders would be installed to prevent boaters from accessing Oaks Bottom Wildlife Refuge in keeping with current management for sensitive wildlife species.

SECTION 8. EVALUATION AND TESTING OF DISCHARGE OR FILL MATERIAL (SUBPART G)

The evaluation procedures and testing sequences outlined in Subpart G are intended to support the determinations concerning the suitability of the material proposed for discharge into waters of the United States.

8.1 GENERAL EVALUATION OF DREDGED OR FILL MATERIAL

All materials discharged as fill would be obtained from on-site or a source that meets the standards for suitability of material. This would generally mean that any materials imported to the project area would have low or non-detectable levels of contaminants that are not expected to have significant adverse impacts on water quality or biota in the short or long term.

SECTION 9. ACTIONS TO MINIMIZE ADVERSE EFFECTS TO THE AQUATIC ENVIRONMENT (SUBPART H)

9.1 GENERAL

Environmental impacts have been carefully considered through the planning and design process to avoid and reduce impacts to sensitive resources while maintaining and improving the functionality of the ecosystem. Measures proposed to avoid or minimize adverse impacts to the aquatic environment include removing invasive species, revegetation with native species, removal of low-level contaminated sediments, reconnection of tidal and riverine hydrology, and placement of large wood.

Additional measures to reduce or eliminate disturbance, turbidity, removal of biota, noise, fish handling, and juvenile fish stranding would be implemented during construction, including:

a. Work Window. To minimize effects to juvenile salmonids, construction shall be limited to the in-water work window of July 1-October 31.
b. Notice to Contractors. Before beginning work, all contractors working on site shall be provided with a complete list of Corps permit special conditions, reasonable and prudent measures, and terms and conditions intended to minimize the amount and extent of take resulting from in-water work.
c. Minimize Impact Area. The applicant will confine construction impacts to the minimum area necessary to complete the project.
d. Fish Capture and Removal. Whenever work isolation is required and ESA-listed fish are likely to be present, the applicant must attempt to capture and remove the fish as follows:
    i. A fishery biologist experienced with work area isolation and competent to ensure the safe capture, handling and release of all fish will supervise this part of the action.
    ii. Any fish trapped within the isolated work area must be captured and released using a trap, seine, electrofishing, or other methods as prudent to minimize the risk of injury, then released at a safe release site.
    iii. If electrofishing is used to capture fish, that work must consistent with NMFS' electrofishing guidelines.
e. Pile Driving. No impact hammer will be used to drive piles in any water that could contain ESA-listed salmonids.
f. 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 during any activity that could generate turbidity approximately 100 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.

g. Pollution Control Plan. The applicant will implement a pollution control plan (PCP) to prevent pollution caused by construction activities from entering the river. The PCP must have the following components:

i. The name and address of the party responsible for accomplishment of the PCP.

ii. Practices to prevent contaminant releases associated with equipment and material storage sites and fueling staging areas.

iii. A description of any regulated or hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring.

iv. A spill containment and control plan with notification procedures, specific cleanup and disposal instructions for different products, quick response containment and cleanup measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment.

v. Practices to prevent debris from dropping into any stream or waterbody, and to remove any material that does drop with a minimum disturbance to the streambed and water quality.

vi. During construction activities, monitoring will be done as often as necessary to ensure the controls discussed above are working properly. If monitoring or inspection shows that the controls are ineffective, work crews will be mobilized immediately to make repairs, install replacements, or install additional controls as necessary.

h. The applicant will maintain an absorptive boom during all in-water activities to capture contaminants that may be floating on the water surface as a consequence of construction activities.

9.2 MONITORING, ADAPTIVE MANAGEMENT, AND MAINTENANCE

This monitoring and adaptive management plan has been developed to assess the success of the recommended restoration plan in meeting project objectives and a process to identify if any adaptive management actions are warranted. The proposed monitoring plan will measure the following key elements: vegetation, tidal hydrology and hydraulics, and salmonids. The methods are described in this section. Photo-monitoring will also be conducted to document site changes over time including vegetation establishment and physical habitat features.

Project Objectives:

1. Restore natural tidal regime to improve salmonid access and reduce stranding of salmonids
2. Improve habitat for fish and wildlife species
3. Control non-native or pest populations
4. Maintain and improve quality of bird habitats

The monitoring elements described below are proposed for monitoring the success in meeting each objective.

Restore natural tidal regime to improve salmonid access and reduce stranding of salmonids

Target(s):

1. Match tidal elevations and frequencies upstream and downstream of the culvert within 1 year of completion of construction.
2. Eliminate fish passage barrier at culvert within 1 year of completion of construction and maintain for lifetime of project.

Monitoring Protocol:

1. Install continuously logging pressure transducers at downstream end of culvert and approximately 100 feet upstream of the culvert for two years following construction. Data should be collected on an approximate 15 minute interval. Tidal elevations will be plotted to compare the two locations and identify differences in elevations and timing. This information will also be used to develop a depth/frequency curve for the culvert and lower tidal channel to compare to modeled output.
2. Install velocity meter in the culvert/low-flow channel to record velocities for one year following construction. Develop velocity/frequency curve for output.
3. Conduct channel cross-section and profile surveys in Years 1, 5, and 10 following construction. Document changes and identify frequency of connection based on elevation and velocity data. Identify causal factors for changes observed.

Adaptive Management Trigger(s):

1. If channel connection frequency and fish passage requirements are not met at least 95 percent of the time during design flows, then the Corps and non-Federal sponsor will review the data and causal factors to identify preferred management actions. Possible management actions could include installation of large wood or boulders to promote scour (i.e., if sediment deposition has occurred) or reduce channel velocities (via increased roughness); additional excavation if frequency targets are not met but no substantial channel deposition has occurred; or additional revegetation (to increase roughness or provide sediment trapping capacity).

Improve habitat for fish and wildlife species

Control non-native or pest populations

Maintain and improve quality of bird habitats

Target(s):

1. Achieve 80 percent cover of native vegetation species planted per design at designated representative monitoring plots within 5 years post-construction and sustain for lifetime of the project.
2. Reduce non-native vegetation species to less than 35 percent cover within 5 years post-construction and sustain for lifetime of the project.
3. Document changes in habitat suitability via the HGM model in Year 10 following construction. Compare scores to the baseline condition and predictions for Year 10 post-construction.

Monitoring Protocol:

- Establish minimum of five permanent vegetation plots to be representative of the plant communities and restored areas within the project site. Permanent plots shall be 33 foot diameter circular plots (center point of each plot will be documented via GPS coordinates to reoccupy in each of sampling). Percent cover will be visually assessed and documented for each stratum (herbs, shrubs, trees, woody vines) and each species with more than 5 percent cover. Sampling will occur in Years 1, 3, 5, and 10 following construction. Percent survival of planted stock should be a minimum of 80 percent during Years 1 and 3 otherwise supplemental plantings will be required to replace plants that have died. Percent cover of native species will be measured in the permanent plots and should

reach 30 percent in year 1, 50 percent in year 3, and 80 percent in years 5 and 10 (total percent cover in all strata).

- Map non-native vegetation species throughout restored areas on each site in Years 1, 3, 5, and 10 after construction and document percent cover in all locations with more than 100 square feet of presence. Document average percent cover by species across the site and estimate total area of infestation.
- Conduct habitat evaluation using HGM in Year 10 following construction at each site. Document changes from baseline.

Adaptive Management Trigger(s):

1. If native plant survival or percent cover does not meet targets in any year of monitoring then the non-Federal sponsor will undertake supplemental plantings to achieve the targets. The Corps and non-Federal sponsor will evaluate at the end of 10 years the overall quality of habitat in each restored plant community.
2. If average non-native invasive species cover exceeds 35 percent cover in any of the monitoring years then the non-Federal sponsor will undertake invasive species removal actions such as pulling, mowing, and spot application of herbicide.
3. Corps and non-Federal sponsor to evaluate habitat quality and determine if actual quality in Year 10 varies substantially from predictions. Identify causal factors and any appropriate adaptive management actions such as additional invasive species removal, fencing, or other measures.

SECTION 10. ANALYSIS OF PRACTICABLE ALTERNATIVES

The Integrated Feasibility Report/EA provides an analysis of practicable alternatives. As stated earlier, the purpose of the project is to restore a more natural tidal hydrologic connection between Oaks Bottom Wildlife Refuge and the Lower Willamette River, improve fish and wildlife habitats, reduce non-native species populations, and provide unhindered fish and wildlife passage into and out of Oaks Bottom. There are no alternatives that could achieve aquatic and hydrologic restoration without being in or adjacent to the water. The Corps and the local sponsor have determined that the proposed restoration plan is the most cost effective and feasible alternative to achieve the project purpose in a manner that is designed to avoid unacceptable adverse impacts to the aquatic ecosystem. Sections 10.1 through 10.6 summarize the findings per the CWA Section 404(b)(1) alternatives analysis criteria.

10.1 SITE AVAILABILITY

Pursuant to the CWA Section 404(b)(1) regulations, an alternative is practicable if it is available to meet and capable of meeting the project purpose, among other considerations. The regulations at 40 CFR 230.1(a)(2) state "an area not presently owned by the applicant, which could be reasonably obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity may be considered." The project area comprises the largest remaining tidal floodplain along the Lower Willamette River and restoring hydrology to the site cannot be accomplished at another location.

10.2 COST EFFECTIVENESS

Pursuant to the CWA Section 404(b)(1) regulations, a determination of practicability must consider if fill or disposal can be accomplished at a reasonable cost (§230.10(a)(2)). All alternatives evaluated in the feasibility study require excavation, fill, and grading work in and adjacent to the Lower Willamette River and within wetlands in Oaks Bottom. To determine cost effectiveness, a cost effectiveness and incremental cost analysis was conducted to compare the costs and habitat benefits for each alternative, as described generally in Section 1. The proposed restoration plan is the most cost effective alternative to achieve all of the project objectives in a manner that is designed to avoid unacceptable adverse impacts to the aquatic ecosystem. Avoidance of all effects (i.e., No Action Alternative) would result in no benefits to the ecosystem or species and would not accomplish the project purpose.

10.3 FEASIBILITY

The preferred alternative was determined to be the most practicable alternative considering cost, existing technology, and logistics in light of the overall project purpose and need.

10.3.1 Technical Feasibility

While all of the alternatives could be implemented, there would be potentially more difficulties and adverse effects on wetlands with a larger project and more complex construction methods. Under the No Action Alternative, no action would be taken to restore more natural tidal hydrology or provide fish passage and habitat enhancement, thus not achieving the project purpose and need. Because the proposed restoration plan achieves a significant amount of floodplain and aquatic habitat restoration on sites with willing partners and is within the cost-sharing capability of the local sponsor, the Corps believes that the proposed restoration plan is the most technically feasible alternative to achieve the project purpose in a manner that is designed to avoid unacceptable adverse impacts to the aquatic ecosystem.

10.3.2 Administrative Feasibility

Administrative feasibility refers to the requirements associated with coordinating with other offices and agencies, including statutory limits, waivers, and requirements for off-site actions. Overall, the administrative logistics increase as the project area and potential construction duration increases. The Corps believes that the proposed restoration plan is the most administratively feasible alternative to achieve the project purpose in a manner that is designed to avoid unacceptable adverse impacts to the aquatic ecosystem.

10.4 AQUATIC IMPACTS FROM DISPOSAL

Potential aquatic impacts are discussed in Section 4 of this analysis. The No Action Alternative would have no adverse effects, but would also have no beneficial effects on the ecosystem. The proposed restoration plan reasonably minimizes the discharge of dredged or fill material into Waters of the U.S. while achieving habitat reconnections and improvements. The Corps believes that the proposed restoration plan minimizes discharge to the maximum extent practicable and most effectively meets all of the project objectives.

10.5 CONSERVATION AND RECOVERY

Section 9 of this document provides a detailed set of potential avoidance and minimization measures as well as conservation measures that will reduce effects to any ESA-listed species and their critical habitat. Section 9 also includes a description of proposed monitoring actions that would be implemented post-construction.

10.6 LIMIT NUMBER OF SITES

The project area comprises the area that could be directly and physically affected by restoration activities. The size and location of sites selected for discharge of fill material included in the proposed restoration plan were determined in coordination with other resource agencies and stakeholders to assess a number of possible alternatives through the application of the cost, effectiveness, and implementability criteria. The proposed project results in a net removal of material from the floodplain and floodway and waters of the U.S.

SECTION 11. FACTUAL DETERMINATIONS

This section provides a summary of the determinations made for each component of the aquatic ecosystem evaluated in previous sections. The purpose of the project is to restore a more natural tidal hydrologic connection between Oaks Bottom and the Lower Willamette River, improve fish and wildlife habitats, reduce non-native species populations, and provide unhindered fish passage into and out of Oaks Bottom. The alternatives were developed consistent with the project purpose and need; however, the proposed restoration plan is the preferred alternative that has been selected by the Corps and the local sponsor, as the alternative that most satisfies the project purpose and need while minimizing costs and discharge to the maximum extent practicable.

11.1 PHYSICAL SUBSTRATE DETERMINATIONS

The physical and chemical substrate conditions are described in Section 2 and Section 4. Potential impacts to the physical and chemical properties of the substrate are discussed in Section 4.1.2.

The proposed restoration plan would result in temporary impacts to the existing substrate during construction but would result in long-term benefits by removing low-level contaminated sediments and installing new, clean material in the new excavated channels. BMPs would be implemented during construction to minimize disturbance to substrate as described in Section 9.

11.2 SUSPENDED PARTICULATES AND TURBIDITY DETERMINATIONS

Suspended particulates and turbidity existing conditions and potential impacts are described in Section 4.2.

The proposed restoration plan would result in minor temporary and localized increases in suspended particulates in the project area. BMPs would be implemented during construction to minimize suspended particulate materials and turbidity, as described in Section 9.

11.3 WATER QUALITY DETERMINATIONS

Water quality existing conditions are described in Sections 2 and 4. Potential impacts to water quality are described in Section 4.3.2.

The proposed restoration plan would result in minor increases in turbidity, construction stormwater run-off from upland areas, and potential spills/leaks from construction equipment. Long-term beneficial effects include improved water quality as a result of reduced heating in the reservoir and shading of spring-flow channels. There are no long-term adverse impacts identified. BMPs would be implemented during construction to minimize potential water quality impacts as described in Section 9.

11.4 CURRENT PATTERNS, WATER CIRCULATION, AND FLUCTUATION DETERMINATIONS

Current patterns, water circulation, and fluctuation existing conditions and potential impacts are described in Section 4.4.

The proposed restoration plan would have minor short-term effects on current patterns or water circulation in the project area due to coffer damming during culvert replacement and excavation of tidal slough channels. The effects of these actions are anticipated to be negligible because they would be insignificant localized and temporary impacts on the shoreline of the Lower Willamette River and in Oaks Bottom. The project will result in the reconnection of more natural tidal and riverine hydrologic conditions between Oaks Bottom and the Lower Willamette River. No changes in water surface elevation are anticipated to occur.

11.5 SALINITY DETERMINATIONS

N/A

11.6 AQUATIC ECOSYSTEM AND ORGANISM DETERMINATIONS

The aquatic ecosystem and organism existing conditions within the project area are described in Section 5. The proposed construction activities associated with the proposed restoration plan may have short-term in-water impacts on primary and secondary productivity, benthic and epibenthic organisms, from short-term increases in turbidity, excavation and disturbance, foraging disruption, and fish handling and removal. Short-term upland impacts on terrestrial mammals and birds may result from potential increased noise and grading, which may result in disruption of foraging. Long-term effects include improved connections and access between the Lower Willamette River and Oaks Bottom and improved habitat conditions. Impacts would be temporary and less than significant and improved habitat would represent a long-term benefit. BMPs would be implemented during construction to minimize impacts to the aquatic ecosystem and organisms as described in Section 9.

11.7 RECREATIONAL, AESTHETIC, AND ECONOMIC VALUES DETERMINATIONS

Recreational, aesthetic, and economic existing conditions and potential impacts are described in Section 7. Potential effects of the proposed restoration plan on human use characteristics would be negligible to minor but temporary effects are expected during construction. Impacts to historic and cultural resources are not likely. Recreation in the project area would be temporarily affected during construction via closure of the Springwater Trail. These impacts would be temporary and localized during construction. The completed project would not interfere with future recreation or navigation within the project area. Therefore, these impacts would be less than significant. BMPs would be implemented during construction to minimize construction-related impacts as described in Section 9. Bird-watching and viewing opportunities would be increased in the long-term.

11.8 DETERMINATION OF CUMULATIVE IMPACTS ON THE AQUATIC ECOSYSTEM

Substantial cumulative effects have occurred to the Lower Willamette River and its associated floodplain and riparian habitats since Euro-American settlement began in the early 1800s. Key actions have included urban development, timber harvesting, construction of dams and revetments/levees, discharges of water and sediment contaminants, filling or isolation of the floodplain, dredging of the river for navigation, and removal of wood from the rivers. These effects have altered the hydrology and geomorphology of the river disconnecting it from the few remaining floodplains areas As a result riparian and off-channel habitats have been greatly reduced resulting in substantial effects on fish and wildlife species. This proposed project will incrementally reverse some of the cumulative adverse effects that have occurred in the project area by restoring a more natural hydrologic connection between the Lower Willamette River and Oaks Bottom and enhancing wetland and floodplain habitats.

The project will restore floodplain and therefore fish and wildlife habitat in an area that has experienced negative cumulative impacts over the past 150 years. This project will incrementally reverse those cumulative impacts by restoring a more natural hydrologic connection to the Lower Willamette River, providing fish and wildlife passage to and from the refuge, reducing water temperatures, and providing much higher quality aquatic and riparian habitat than currently exists. Oaks Bottom represents the largest potential floodplain reconnection in the southern portion of the Lower Willamette River. Restoration and reconnection actions will restore a large area of off-channel and tidal floodplain habitat that is currently rare in the watershed.

Other reasonably foreseeable future actions are likely to occur in the broader Lower Willamette River watershed including the Lower Willamette Ecosystem Restoration General Investigation Study that is proposing shallow-water and alcove habitat restoration, the Portland Harbor Superfund clean-up and mitigation project will also include restoration actions such as downstream of Oaks Bottom to increase shallow-water habitat and instream habitat complexity (large wood, etc.). The Sellwood Bridge project is currently rebuilding the Sellwood Bridge and will include removal/control of invasive species on disturbed areas, plantings of native species along the river bank, and wetland mitigation at other sites along the Lower Willamette. Other development and redevelopment is likely to occur north of Oaks Bottom in the industrially zoned areas of the Lower Willamette River, but these future developments will be required to off-set any potential adverse effects on the river. Combined with these reasonably foreseeable future and on-going actions, this project will have a positive cumulative effect on the quality of habitat along the Lower Willamette River.

There could potentially be increased traffic congestion at Tacoma Street associated with construction traffic headed to/from Oaks Bottom interacting with the detour for the Sellwood Bridge construction. However, this is expected to be minor as there will only be limited traffic for the majority of the Oaks Bottom construction-typically fewer than 25 truck trips/day and not requiring truck traffic during all weeks of construction (primarily associated with mobilization/demobilization, delivery of materials, and haul of excavated materials). Overall, there should be no substantial cumulative effects associated with the Oaks Bottom project.

11.9 DETERMINATION OF SECONDARY IMPACTS ON THE AQUATIC ECOSYSTEM

Secondary effects (or impacts) are "effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material" (40 CFR 230.11(h)(1)). Under CWA, secondary impacts are generally interpreted as indirect impacts. Therefore, secondary effects are limited to other actions in the aquatic environment that are indirectly related to implementation of the action, such as erosion or downstream sedimentation, or compensatory mitigation.

Secondary indirect impacts of the project include the possible increased fishing opportunities due to an increase in fish populations as a result of restoration actions. Future recreation and environmental education enhancements may be implemented within the project area as an indirect result of successful habitat restoration.

SECTION 12. REVIEW OF CONDITIONS FOR COMPLIANCE

According to the guidance, "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (40 CFR 230.10 [a]).

The potential for significant adverse impacts on the aquatic ecosystems resulting from implementation of the preferred alternative would be mitigated to the extent possible through the application of avoidance and minimization measures and BMPs described in Section 9. The following subsections contain a review of conditions for compliance for the practicable alternatives assessed in this Alternatives Analysis.

12.1 AVAILABILITY OF PRACTICABLE ALTERNATIVES

Section 230.10 of Subpart B of the Section 404(b)(1) Guidelines further specifies four general conditions that must be met for compliance. These include consideration of practicability, compliance with the ESA, protections for water quality and human uses, and compliance with the avoidance, minimization, and compensatory mitigation requirements. The results of the analyses are summarized below.

12.1.1 Practicability (40 CFR Section 230.10(a))

A practicable alternative according to 40 CFR 230.10 is available and capable of being conducted after taking into consideration cost, existing technology, and logistics in light of the overall project purpose and needs. The alternatives are evaluated for compliance with the definition of practicability in the Integrated Feasibility Report/EA and were found to be practicable.

12.1.2 Compliance with Water Quality Standards, ESA, and Protection of Habitat (40 CFR Section 2301.10(b))

Based on the determination of impacts in Sections 4, 5, and 6 of this document, the alternatives have been assessed for their direct cause of or contribution to significant degradation of waters of the United States. Under 40 CFR 230.10(c), special emphasis on the persistence and permanence of the effects is considered in making the significant degradation determination. The potential impacts to the chemical and biological characteristics and special aquatic sites from the proposed restoration plan are generally low; the nature of the project is to provide a more natural hydrologic connection and unhindered fish and wildlife passage between the Lower Willamette River and Oaks Bottom. The potential to release pollutants arises from the excavation of low-level contaminated sediments. This Alternatives Analysis indicates that implementation of the proposed restoration plan would not result in substantial water quality exceedances, and therefore would not result in significant degradation. The project will result in a net removal of these low-level contaminated materials from the floodplain.

According to the Biological Opinion (NOAA 2012), the proposed restoration plan will not result in jeopardy to any listed species or result in the destruction or adverse modification of critical habitat. Further, no actions would affect any marine sanctuaries.

12.1.3 Protections for Water Quality, Special Aquatic Sites, and Human Uses (40 CFR Section 130.10(c))

This criteria involves prevention of significant degradation or significant adverse effects resulting from the discharge of pollutants on water supplies, fish and wildlife, aquatic organisms, and special aquatic sites; significant adverse effects on ecosystem diversity, productivity, or stability through the transfer of

pollutants outside of the disposal site; and/or significant adverse effects on human use values (40 CFR 230.10 (c)(1) – (4)).

Based on this analysis, the proposed restoration plan would meet all applicable state water quality standards within appropriate compliance distances and durations and are not expected to violate any toxic effluent standard or prohibition under CWA Section 307.

Wetlands and mudflats are located in the vicinity of the project, as described in Section 6. The purpose of the project is to enhance these habitats. Minor and short-term effects are expected, but would be minimized to the extent practicable. Long-term improvements to these resources are expected. Section 7 describes potential effects on human use characteristics. Negligible to minor temporary effects are expected to recreational fisheries, water-related recreation, navigation, aesthetics, and parks. Impacts to historic and cultural resources are not likely.

12.2 COMPLIANCE WITH PERTINENT LEGISLATION

All of the practicable alternatives are expected to comply with pertinent legislation and treaty rights as described below.

- ESA: Formal consultation has been completed under Section 7 of the ESA.
- Magnuson Stevens Fishery Conservation and Management Act: Essential Fish Habitat consultation with the National Marine Fisheries Service has been completed.
- Section 106 of the National Historic Preservation Act: Section 106 consultations with the Oregon State Historic Preservation Officer has been completed.
- Section 401 of the CWA: The State of Oregon has reviewed this project and provided a Water Quality Certification.

12.2.1 Treaty Rights

The proposed work would not affect treaty fishing rights and may have beneficial effects on overall fish populations.

12.3 POTENTIAL FOR SIGNIFICANT DEGRADATION OF WATERS OF THE UNITED STATES AS A RESULT OF THE DISCHARGE OF POLLUTED MATERIALS

As described in Section 8, any materials imported to the project area would have low or non-detectable levels of contaminants that are not expected to have significant adverse impacts on water quality or biota in the short or long term.

12.4 STEPS TO MINIMIZE POTENTIAL ADVERSE IMPACTS ON THE AQUATIC ECOSYSTEM

Finally, no discharge of fill shall be allowed unless all appropriate and practicable measures have been taken to minimize and avoid and then compensate for potential adverse impacts. Section 9 details the minimization measures, BMPs, and conservation measures that would be applied to the proposed restoration plan.

SECTION 13. FINDINGS

This section describes findings of compliance or non-compliance with the restrictions on discharge per 40 CFR Section 230.12. These findings are supported by the factual determinations and conditions for compliance as included in Sections 11 and 12.

13.1 ALTERNATIVES TEST

a. Based on the discussion above, are there available, practicable alternatives having less adverse impact on the aquatic ecosystem?

Yes ☐ No ☒ Not Applicable ☐

b. Based on the discussion above, if the project is in a special aquatic site and is not water-dependent, has the applicant clearly demonstrated that there are no practicable alternative sites available?

Yes ☐ No ☐ Not Applicable ☒

13.2 SPECIAL RESTRICTIONS

Would the project:

a. Violate state water quality standards?

Yes ☐ No ☒ Not Applicable ☐

b. Violate toxic effluent standards (under Section 307 of the CWA)?

Yes ☐ No ☒ Not Applicable ☐

c. Jeopardize endangered or threatened species or their critical habitat?

Yes ☐ No ☒ Not Applicable ☐

d. Violate standards set by the Department of Commerce to protect marine sanctuaries?

Yes ☐ No ☐ Not Applicable ☒

e. Evaluation of the information above indicates that the proposed discharge material meets testing exclusions criteria for the following reason(s):

☐ based on the above information, the material is not a carrier of contaminants

☐ the levels of contamination are substantially similar at the extraction and disposal sites and the discharge is not likely to result in degradation of the disposal site and pollutants would not be transported to less contaminated areas

☒ acceptable constraints are available and would be implemented to reduce contamination to acceptable levels within the disposal site and prevent contaminants from being transported beyond the boundaries of the disposal site

13.3 OTHER RESTRICTIONS

Would the discharge contribute to significant degradation of "waters of the U.S." through adverse impacts to:

a. Human health or welfare, through pollution of municipal water supplies, fish, shellfish, wildlife, and special aquatic sites?

Yes ☐ No ☒ Not Applicable ☐

b. Life stages of aquatic life and other wildlife?

Yes ☐ No ☒ Not Applicable ☐

c. Diversity, productivity, and stability of the aquatic ecosystem, such as the loss of fish or wildlife habitat, or loss of the capacity of wetland to assimilate nutrients, purify water or reduce wave energy?

Yes ☐ No ☒ Not Applicable ☐

d. Recreational, aesthetic, and economic values?

Yes ☐ No ☒ Not Applicable ☐

13.4 ACTIONS TO MINIMIZE POTENTIAL ADVERSE IMPACTS (MITIGATIONS)

Would all appropriate and practicable steps (40 CFR 23.70-77) be taken to minimize the potential adverse impacts of the discharge on the aquatic ecosystem?

Yes ☒ No ☐ Not Applicable ☐

Based upon this Section 404(b)(1) analysis, I have determined that the proposed action is in compliance with the Section 404(b)(1) Guidelines and would not have a significant adverse effects on Waters of the U.S.

Date: 20160129

Jose L. Aguilar
Colonel, Corps of Engineers
District Commander

SECTION 14. REFERENCES

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

Refer to NMFS No:
2012/02039

August 27, 2012

Kevin Moynahan
U.S. Army Corps of Engineers
Regulatory Branch
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 Consultation for the Oaks Bottom Wildlife Refuge Tidal Reconnection Project along the Willamette River (HUC 170900120302), Multnomah County, Oregon (Corps No.: NWP-2007-902)

Dear Mr. Moynahan:

The enclosed document contains a biological opinion (opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the effects of a proposal by the Portland District of the U.S. Army Corps of Engineers to authorize a tidal reconnection project at Oaks Bottom Wildlife Refuge under the authority of section 10 of the Rivers and Harbors Act and section 404 of the Clean Water Act. In this opinion, NMFS concluded 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 (critical habitat for LCR coho salmon has not yet been designated).

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 direct questions regarding this opinion to Genevieve Angle in the Willamette Basin/Lower Columbia Branch of the Oregon State Habitat Office, at 503.231.2223.

Sincerely,

for

William W. Stelle, Jr.
Regional Administrator

cc: Sean Bistoff, City of Portland, Bureau of Environmental Services

Endangered Species Act Biological Opinion
and
Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response
for the

Oaks Bottom Wildlife Refuge Tidal Reconnection Project
Willamette River (HUC 170900120302)
Multnomah County, Oregon
(Corps No.: NWP-2007-902)

NMFS Consultation Number: 2012/02039

Action Agency: U.S. Army Corps of Engineers

Affected Species and 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	NA
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, Northwest Region

Issued By:

William W. Stelle, Jr.
Regional Administrator

Date: August 27, 2012

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LIST OF ACRONYMS

BA	Biological Assessment
BMP	Best Management Practice
CFR	Code of Federal Regulations
CHART	Critical Habitat Analytical Review Team
DDT	Dichlorodiphenyltrichloroethane
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FR	Federal Register
HUC	Hydraulic Unit Code
LCR	Lower Columbia River
MSA	Magnuson Stevens Act
NMFS	National Marine Fisheries Service
PCE	Primary constituent element
RM	River Mile
RPM	Reasonable and prudent measure
TRT	Technical Review Team
U.S.C.	United States Code
UWR	Upper Willamette River
VSP	Viable Salmonid Population
WLC	Willamette-Lower Columbia

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, as amended (16 U.S.C. 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.

The opinion, incidental take statement, and EFH conservation recommendations are each in compliance with the Data Quality Act (44 U.S.C. 3504(d)(1) *et seq.*) and they underwent pre-dissemination review.

1.2 Consultation History

The NMFS received a letter from the U.S. Army Corps of Engineers (Corps) on February 10, 2011, requesting formal consultation on the effects of authorizing the City of Portland (City) to construct a tidal reconnection project at Oaks Bottom Wildlife Refuge, based on their authority under section 10 of the Rivers and Harbors Act and section 404 of the Clean Water Act. Oaks Bottom Wildlife Refuge is located along the east bank of the Willamette River at approximately river mile (RM) 16 in Multnomah County, Oregon. Along with the letter requesting formal consultation, we received a biological assessment for the proposed action, project drawings and photographs, an ecological risk assessment for the contaminants present in the action area, a sediment characterization report and a surface water characterization report (both addressing contaminants in the action area). After discussions with the Northwest Fisheries Science Center regarding concerns about salmonid exposure to contaminants (specifically DDT and its breakdown products) once access to the wildlife refuge is fully restored, we sent a letter on May 3, 2011, requesting additional information about the proposed action and the contaminant exposure scenarios for salmonids once construction of the proposed action is complete. Because responding to the additional information request required fish tissue sampling and other investigations that would take some time, the consultation request was withdrawn on March 27, 2012. We received a letter from the Corps requesting we restart the consultation on the proposed action on May 8, 2012, along with a detailed response to our additional information request and appendices for reference. We sent several follow-up questions via email on June 13, 2012, and received a response to our email on July 3, 2012. This consultation is based on the information provided in the documents described above.

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*), and UWR steelhead and their critical habitat. The Corps also determined that EFH for Chinook and coho salmon may be affected by the proposed action.

A complete record of this consultation is on file at the Oregon State Habitat Office in Portland, Oregon.

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. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. No interrelated or interdependent actions were identified for the proposed action.

The Corps proposes to authorize the construction of a tidal reconnection project at RM 16 along the Willamette River (east side). According to the BA, the proposed action consists of the following components:

1. A culvert under a railroad berm at the project site will be replaced with a new larger culvert to allow a significantly improved hydrologic connection and fish and wildlife passage. The existing 5-foot diameter and 80-foot length culvert with an upstream invert of 7.2 feet and a downstream invert of 7.0 feet will be replaced with a 16-foot span concrete arch culvert with a length of 90 feet and an upstream low-flow channel invert of 5.5 feet and a downstream invert of 5.3 feet. The new culvert will have a natural substrate bottom comprised of a sand/gravel/cobble mix and a wildlife bench along both sides at an elevation of 8.0 feet. The new culvert will be connected to the Lower Willamette River approximately 95% of the time at the daily mean water surface elevation. The existing culvert can have velocities of 6-8 feet per second (fps) during tidal changes. The proposed culvert will have velocities less than 2 fps 99% of the time during the rearing season for juvenile salmonids (November to June). During the summer/low flow season, the culvert is not connected nearly as frequently (the river elevation is below culvert invert), but velocities will still typically be below 2 fps. The primary period of interest for accessibility for salmonids is from November to June when juvenile salmonids are migrating out of the Willamette basin and utilizing floodplain and tidal slough habitats such as Oaks Bottom Wildlife Refuge.
2. The water control structure at the site will be removed and tidal slough channels will be excavated to connect the unregulated reservoir to the culvert for fish rearing and refuge and to reduce the potential for fish stranding. The existing channel to the reservoir will be excavated to start at the culvert at 5.5 feet in elevation and slope up to the reservoir outlet at 9.0 feet in elevation. The length of the channel will be increased by connecting to a remnant channel for a total length of 1,600 feet from the Willamette River, with a slope of 0.3% and 8 cobble riffles to maintain the gradient up to the reservoir (to prevent headcutting and the complete drainage of the reservoir). Additionally, the southern channel currently on the site will be connected to the new tidal channel and further

graded to allow positive drainage out, restore seasonal wetland habitat, and provide approximately 700 feet of additional tidal slough channel.

3. Invasive species will be removed and the area will be revegetated with native species within the construction footprint and around the reservoir. Associated with the grading of the channels, a 50-foot wide native plant buffer will be established on each bank of the channel. Reed canary grass will be stripped off and removed and the buffer will be mulched and seeded with a wetland seed mix and planted with willow cuttings (*Salix lucida, S. fluviatilis, S. sitchensis, S. hookeriana*), spirea (*Spirea douglasii*) and dogwood (*Cornus stolonifera*). On the upper 350 feet of the channel where there is concern that the channel could be flanked by receding flows after a storm event, the banks will be bioengineered with pre-vegetated mats (seeded with wetland seed mix) and willow cuttings to ensure quick establishment of vegetation and root mat. The City will also undertake a 5-year large-scale revegetation effort within and around the reservoir to restore a complex of native emergent wetland, Oregon ash seasonally flooded forest community, and Pacific willow temporarily flooded woodland community. This will provide significant shading benefits to the smaller reservoir area as well as the springflow channels that come from the bluffs and pass through the existing reservoir area.
4. Passive recreational enhancements associated with the Springwater Trail will be installed. Viewing platforms and interpretive signage will be installed at two locations on the Springwater Trail to provide educational opportunities as well as fish and wildlife viewing: (a) Near the new culvert; and (b) near the Oaks Park pedestrian ramp to the trail.

The likely sequence of construction will be:

a. Close Springwater Trail and provide detours, signage, fencing, *etc.*
b. Install staging area on south end, provide containment and fencing.
c. Install project limit fencing, mark trees for removal, salvage, or protection.
d. Remove rails and fencing for vehicular access.
e. Clear access ramp locations and install ramps and associated best management practices (BMPs).
f. Install coffer dams and diversion system; remove fish and wildlife from work area.
g. Clear and grub work area.
h. Install pilings and shoring for embankment excavation.
i. Excavate embankment and haul away unsuitable material for backfill; stockpile suitable material for reuse in embankment.
j. Demolish and remove existing culvert, water control structure, and abandoned gas line.
k. Excavate for culvert placement and install suitable subgrade and bedding.
l. Install footings and culvert.
m. Install streambed substrate mix through culvert.
n. Backfill around and above culvert and compact.
o. Move coffer dams and diversion system as appropriate to conduct channel excavation.
p. Place silt fencing and other turbidity control materials as appropriate for channel excavation.
q. Excavate channels and install riffles and large woody debris.
r. Remove contaminated sediments off-site to approved disposal location.
s. Remove coffer dams and diversion system.

t. Place pre-vegetated mats, mulching and seeding along channel and in buffer.
u. Install viewing platforms.
v. Remove ramps and any other temporary material.
w. Mulch and seed ramp areas and other disturbed areas.
x. Remove erosion control measures when ground is sufficiently covered to prevent runoff of turbid water.
y. Plant riparian and wetland plantings in October.
z. City continues plantings and maintenance over 5-year period.

The City of Portland has proposed the following reporting and conservation measures to minimize the effects of the proposed action:

1. All construction will occur during the designated ODFW fish window for the Lower Willamette River from July 1 through October 31.
2. The construction area will be isolated from both the Willamette River and the upstream wetlands/springs by installation of coffer dams and other measures. Fish and wildlife will be captured and removed from the work area. The spring outflow will be piped around the work area via a gravity system or pumping, if necessary. Any pumps used will be screened per ODFW requirements. The culvert area will need to be dewatered during the placement of the subgrade, bedding and footings for the culvert. Any groundwater present in the excavation area will be pumped and treated via infiltration or other methods (such as Baker tanks) prior to discharge back to either the river or wetlands.
3. All areas that will be cleared or graded will be contained with erosion control BMPs to prevent the runoff of sediment laden stormwater into the river or wetlands. Methods could include the installation of silt fencing, placement of straw bales, straw mulching, or other features.
4. The staging area(s) will be located within 150 feet of the river or the wetlands on the refuge, but will be fenced and contained to prevent the runoff of sediment or pollutant laden stormwater into the river or wetlands.
5. Ramps will be installed to allow vehicular and equipment access onto and off of the railroad embankment. Once construction activities are complete, these ramps will be removed in their entirety and the locations will be restored via mulching and hydroseeding and then planting of native shrub and tree species. Any fill placed in wetlands for temporary construction purposes will be removed and the area will be restored.
6. In areas of grading, removal of native trees and shrubs will be minimized to the extent practicable. If possible, shrubs will be salvaged for replanting on site. Suitable large wood from the removal of trees on site will be used in the channel or floodplain as large woody debris.
7. The tidal slough channel will be excavated to match the invert of the new culvert and provide a stable transition up to the reservoir. The surface sediments are contaminated above screening levels and these sediments will be removed. The tidal slough channel is the area that will be used most frequently by salmonids and other fish species because it will be wetted most frequently.
8. The City of Portland has developed a monitoring plan for the project that will include monitoring velocities and flows in the culvert, water temperatures, vegetation survival

and growth, periodic cross-section surveys to monitor channel changes, fish sampling, and bird and wildlife observations. Regular maintenance will occur to suppress reed canary grass and purple loosestrife and replace plantings as necessary until the native communities are established.

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

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). For this consultation, the action area is the Willamette River around RM 16 on the east side of the river as well as the tidal slough channels and surrounding wetland in Oaks Bottom Wildlife Refuge. The action area includes the Willamette River in the immediate area around the culvert outlet where a coffer dam will be installed to isolate the work area. The Willamette River around the culvert outlet may experience some turbidity or noise effects from construction in the 500 feet surrounding the culvert outlet. The action area also includes the tidal slough channels upstream of the culvert that will be excavated and the wetland area (75 acres) surrounding the channels and the reservoir that will be cleared of invasive species and planted with native vegetation.

The ESA-listed species listed in Table 1 use the action area for adult migration, and juvenile rearing and migration. The Willamette River is designated as critical habitat for all species in Table 1 except for LCR coho salmon. The action area is designated EFH for Chinook salmon and coho salmon (PFMC 1999), and is an area where environmental effects of the proposed action may adversely affect EFH of those species. The effects to EFH are analyzed in the MSA portion of the document.

Table 1. Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation. Listing status: "T" means listed as threatened under the ESA.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)			
Lower Columbia River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Coho salmon (*O. kisutch*)			
Lower Columbia River	T 8/15/11; 76 FR 50448	1/10/11; 76 FR 1392*	6/28/05; 70 FR 37160
Steelhead (*O. mykiss*)			
Lower Columbia River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160

*Advance notice of proposed rulemaking; request for information.

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. Section 7(a)(2) of the ESA requires Federal agencies to consult with the United States Fish and Wildlife Service, NMFS, or both, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Section 7(b)(3) requires that at the conclusion of consultation, the Service provide an opinion stating how the agencies' actions will affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires the consulting agency to provide an incidental take statement (ITS) that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts.

2.1 Approach to the Analysis

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts on the conservation value of designated critical habitat.

"To jeopardize the continued existence of a listed species" means 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).

This opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.[1]

We will use the following approach to determine whether the 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.* This section (2.2) describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. For listed salmon and steelhead, NMFS has developed specific guidance for analyzing the status of the listed species' component populations in a "viable salmonid populations" paper (VSP; McElhany et al. 2000). The VSP approach considers the abundance, productivity, spatial structure, and diversity of each population as part of the overall review of a species' status. For listed salmon and steelhead, the VSP criteria therefore

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

encompass the species' "reproduction, numbers, or distribution" (50 CFR 402.02). In describing the rangewide status of listed species, we rely on viability assessments and criteria in technical recovery team documents and recovery plans, where available, that describe how VSP criteria are applied to specific populations, major population groups, and species. We determine the rangewide status of critical habitat by examining the condition of its physical or biological features (also called "primary constituent elements" or PCEs in some designations) which were identified when the critical habitat was designated.

- *Describe the environmental baseline in the action area.* The environmental baseline (Section 2.3) includes the past and present impacts of Federal, state, or private actions and other human activities *in the action area.* It includes the anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation and the impacts of state or private actions that are contemporaneous with the consultation in process.
- *Analyze the effects of the proposed action on both species and their habitat.* In this step (Section 2.4), we consider how the proposed action would affect the species' reproduction, numbers, and distribution or, in the case of salmon and steelhead, their VSP parameters. We also evaluate the proposed action's effects on critical habitat features.
- *Describe any cumulative effects in the action area.* Cumulative effects (Section 2.5), as defined in our implementing regulations (50 CFR 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation.
- *Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.* In this step (Section 2.6), we add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5) to assess whether the action could reasonably be expected to: (1) reduce appreciably the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the conservation value of designated or proposed critical habitat. These assessments are made in full consideration of the status of the species and critical habitat (Section 2.2).
- *Reach jeopardy and adverse modification conclusions.* In this step (Section 2.7) we state our conclusions regarding jeopardy and the destruction or adverse modification of critical habitat. These conclusions flow from the logic and rationale presented in Section 2.6 (Integration and Synthesis).
- *If necessary, define a reasonable and prudent alternative to the proposed action.* If, in completing the last step in the analysis, we determine that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, we must identify a reasonable and prudent alternative (RPA) to the action in Section 2.8. The RPA must not be likely to jeopardize the continued existence of listed species nor adversely modify their designated critical habitat and it must meet other regulatory requirements.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be affected by the proposed action. The status is the level of risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section 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 physical and biological features that help to form that conservation value.

One factor affecting the status of salmonid fishes, 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. These changes will not be spatially homogeneous across the Pacific Northwest. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early spring will be less affected. Low-elevation areas are likely to be more affected.

During the last century, average regional air temperatures increased by 1.5°F, and increased up to 4°F in some areas (USGCRP 2009). Warming is likely to continue during the next century as average temperatures increase another 3 to 10°F (USGCRP 2009). 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 (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).

Higher winter stream flows increase the risk that winter floods in sensitive watersheds will damage spawning redds and wash away incubating eggs (USGCRP 2009). Earlier peak stream flows will also flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and the risk of predation (USGCRP 2009). Lower stream flows and warmer water temperatures during summer will degrade summer rearing conditions, in part by increasing the prevalence and virulence of fish diseases and parasites (USGCRP 2009). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, variation in quality and quantity of tributary rearing habitat, and increased competition and predation risk from warm-water, non-native species (ISAB 2007).

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 conditions adverse to salmon and steelhead may be more likely under a warming climate (Zabel *et al.* 2006).

2.2.1 Status of Listed Species

For Pacific salmon and steelhead, NMFS commonly uses four parameters to assess the viability of the populations that, together, constitute the species: spatial structure, diversity, abundance, and productivity (McElhany *et al.* 2000). These "viable salmonid population" (VSP) criteria therefore encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. When these parameters are collectively at appropriate levels, they maintain a population's capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment. These attributes are influenced by survival, behavior, and experiences throughout a species' entire life cycle, and these characteristics, in turn, are influenced by habitat and other environmental conditions.

"Spatial structure" refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. A population's spatial structure depends fundamentally on habitat quality and spatial configuration and the dynamics and dispersal characteristics of individuals in the population.

"Diversity" refers to the distribution of traits within and among populations. These range in scale from DNA sequence variation at single genes to complex life history traits (McElhany *et al.* 2000).

"Abundance" generally refers to the number of naturally-produced adults (*i.e.*, the progeny of naturally-spawning parents) in the natural environment (*e.g.*, on spawning grounds).

"Productivity," as applied to viability factors, refers to the entire life cycle; *i.e.*, the number of naturally-spawning adults produced per parent. When progeny replace or exceed the number of parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is declining. McElhany *et al.* (2000) use the terms "population growth rate" and "productivity" interchangeably when referring to production over the entire life cycle. They also refer to "trend in abundance," which is the manifestation of long-term population growth rate.

For species with multiple populations, once the biological status of a species' populations has been determined, NMFS assesses the status of the entire species using criteria for groups of populations, as described in recovery plans and guidance documents from technical recovery teams. Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as metapopulations (McElhany *et al.* 2000).

Status of *LCR Chinook Salmon*.

This species is listed as threatened under the ESA (8/15/11; 76 FR 50448).

Spatial Structure and Diversity. This species includes all naturally-spawned populations of Chinook salmon in the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River; the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River; and progeny of seventeen artificial propagation programs.[2] LCR Chinook populations exhibit three different life history types base on return timing and other features: fall-run (a.k.a. "tules"), late-fall-run (a.k.a. "brights"), and spring-run. The Willamette Lower Columbia Technical Recovery Team (WLC-TRT) identified 32 historical populations of LCR Chinook salmon— seven in the coastal subregion, six in the Columbia Gorge, and 19 in the Cascade Range (Table 2). Spatial structure has been substantially reduced in several populations. Low abundance, past broodstock transfers and other legacy hatchery effects, and ongoing hatchery straying may have reduced genetic diversity within and among LCR Chinook salmon populations. Hatchery-origin fish spawning naturally may also have reduced population productivity (Lower Columbia Fish Recovery Board 2010; ODFW 2010). Out of the 32 populations that make up this ESU, only the two late-fall runs—the North Fork Lewis and Sandy—are considered viable. Most populations (26 out of 32) have a very low probability of persistence over the next 100 years (and some are extirpated or nearly so) (Ford 2011; Lower Columbia Fish Recovery Board 2010; ODFW 2010). Five of the six strata fall significantly short of the WLC-TRT criteria for viability; one stratum, Cascade late-fall, meets the WLC-TRT criteria (NMFS 2012).

[2] In 2009, the Elochoman tule fall Chinook salmon program was discontinued and four new fall Chinook salmon programs have been initiated. In 2011, NMFS recommended removing the Elochoman program from the ESU and adding the new programs to the ESU (NMFS 2011).

Table 2. LCR Chinook salmon strata, ecological subregions, run timing, populations, and scores for the key elements (A&P, spatial structure, and diversity) used to determine overall net persistence probability of the population (NMFS 2012). Persistence probability ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Stratum		Spawning Population (Watershed)	A&P	Spatial Structure	Diversity	Overall Persistence Probability
Ecological Subregion	Run Timing					
Cascade Range	Spring	Upper Cowlitz River (WA)	VL	L	M	VL
		Cispus River (WA)	VL	L	M	VL
		Tilton River (WA)	VL	VL	VL	VL
		Toutle River (WA)	VL	H	L	VL
		Kalama River (WA)	VL	H	L	VL
		North Fork Lewis (WA)	VL	L	M	VL
		Sandy River (OR)	M	M	M	M
	Fall	Lower Cowlitz River (WA)	VL	H	M	VL
		Upper Cowlitz River (WA)	VL	VL	M	VL
		Toutle River (WA)	VL	H	M	VL
		Coweeman River (WA)	L	H	H	L
		Kalama River (WA)	VL	H	M	VL
		Lewis River (WA)	VL	H	H	VL
		Salmon Creek (WA)	VL	H	M	VL
		Clackamas River (OR)	VL	VH	L	VL
		Sandy River (OR)	VL	M	L	VL
		Washougal River (WA)	VL	H	M	VL
	Late Fall	North Fork Lewis (WA)	VH	H	H	VH
		Sandy River (OR)	VH	M	M	H
Columbia Gorge	Spring	White Salmon River (WA)	VL	VL	VL	VL
		Hood River (OR)	VL	VH	VL	VL
	Fall	Lower Gorge (WA & OR)	VL	M	L	VL
		Upper Gorge (WA & OR)	VL	M	L	VL
		White Salmon River (WA)	VL	L	L	VL
		Hood River (OR)	VL	VH	L	VL
Coast Range	Fall	Young Bay (OR)	L	VH	L	L
		Grays/Chinook rivers (WA)	VL	H	VL	VL
		Big Creek (OR)	VL	H	L	VL
		Elochoman/Skamokawa creeks (WA)	VL	H	L	VL
		Clatskanie River (OR)	VL	VH	L	VL
		Mill, Germany, and Abernathy creeks (WA)	VL	H	L	VL
		Scappoose River (OR)	L	H	L	L

Abundance and Productivity. A&P ratings for LCR Chinook salmon populations are currently "low" to "very low" for most populations, except for spring Chinook salmon in the Sandy River, which are "moderate" and late-fall Chinook salmon in North Fork Lewis River and Sandy River, which are "very high" (NMFS 2012). Low abundance of natural-origin spawners (100 fish or fewer) has increased genetic and demographic risks. Other LCR Chinook populations have higher total abundance, but several of these also have high proportions of hatchery-origin spawners. Particularly for tule fall Chinook salmon populations, poor data quality prevents precise quantification of population abundance and productivity; data quality has been poor because of inadequate spawning surveys and the presence of unmarked hatchery-origin spawners (Ford 2011).

Limiting Factors. These include (NMFS 2012; NOAA Fisheries 2011):

- Degraded estuarine and near-shore marine habitat resulting from cumulative impacts of land use and flow management by the Columbia River hydropower system
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Reduced access to spawning and rearing habitat mainly as a result of tributary hydropower projects
- Hatchery-related effects
- Harvest-related effects on fall Chinook salmon
- An altered flow regime and Columbia River plume has altered the temperature regime and estuarine food web, and has reduced ocean productivity
- 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 strandings that result from ship wakes
- Contaminants affecting fish health and reproduction

Status of *UWR Chinook Salmon*.

This species is listed as threatened under the ESA (8/15/11; 76 FR 50448).

Spatial Structure and Diversity. This species includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River; in the Willamette River and its tributaries above Willamette Falls, Oregon; and progeny of seven artificial propagation programs. All seven historical populations of UWR Chinook salmon identified by the WLC-TRT occur within the action area and are contained within a single ecological subregion, the western Cascade Range (Table 3). The McKenzie River population is currently characterized as at a "low" risk of extinction and the Clackamas population has a "moderate" risk. (Ford 2011). Consideration of data collected since the last status review in 2005 has confirmed the high fraction of hatchery origin fish in all of the populations of this species (even the Clackamas and McKenzie rivers have hatchery fractions above WLC-TRT viability thresholds). All of the UWR Chinook salmon populations have "moderate" or "high" risk ratings for diversity. Clackamas River Chinook salmon have a "low" risk rating for spatial structure (Ford 2011).

Table 3. Scores for the key elements (A&P, diversity, and spatial structure) used to determine current overall viability risk for UWR Chinook salmon (ODFW and NMFS 2011). All populations are in the Western Cascade Range ecological subregion. Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Population (Watershed)	A&P	Diversity	Spatial Structure	Overall Extinction Risk
Clackamas River	M	M	L	M
Molalla River	VH	H	H	VH
North Santiam River	VH	H	H	VH
South Santiam River	VH	M	M	VH
Calapooia River	VH	H	VH	VH
McKenzie River	VL	M	M	L
Middle Fork Willamette River	VH	H	H	VH

Abundance and Productivity. The Clackamas and McKenzie river populations currently have the best risk ratings for A&P, spatial structure, and diversity. Data collected since the BRT status update in 2005 highlighted the substantial risks associated with pre-spawning mortality. Although recovery plans are targeting key limiting factors for future actions, there have been no significant on-the-ground-actions since the last status review to resolve the lack of access to historical habitat above dams nor have there been substantial actions removing hatchery fish from the spawning grounds. Overall, the new information does not indicate a change in the biological risk category since the last status review (Ford 2011).

Limiting Factors. These include (NOAA Fisheries 2011; ODFW and NMFS 2011):

- Significantly reduced access to spawning and rearing habitat because of tributary dams
- Degraded freshwater habitat, especially floodplain connectivity and function, channel structure and complexity, and riparian areas and large wood recruitment as a result of cumulative impacts of agriculture, forestry, and development
- Degraded water quality and altered temperature as a result of both tributary dams and the cumulative impacts of agriculture, forestry, and urban development
- Hatchery-related effects
- Anthropogenic introductions of non-native species and out-of-ESU races of salmon or steelhead have increased predation on, and competition with, native UWR Chinook salmon
- Ocean harvest rates of approximately 30%

Status of *LCR Coho Salmon*.

This species is listed as threatened under the ESA (8/15/11; 76 FR 50448).

Spatial Structure and Diversity. This species includes all naturally-spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood rivers; in the Willamette River to Willamette Falls, Oregon; and progeny of 25 artificial propagation

programs.[3] Spatial diversity is rated "moderate" to "very high" for all the populations, except the North Fork Lewis River, which has a "low" rating for spatial structure.

Three evaluations of LCR coho salmon status, all based on WLC-TRT criteria, have been conducted since the last NMFS status review in 2005 (McElhany et al. 2007; NMFS 2012). Out of the 24 populations that make up this ESU (Table 4), 21 are considered to have a very low probability of persisting for the next 100 years, and none is considered viable (Ford 2011; Lower Columbia Fish Recovery Board 2010; NMFS 2012; ODFW 2010).

Table 4. LCR coho salmon strata, ecological subregions, run timing, populations, and scores for the key elements (A&P, spatial structure, and diversity) used to determine current overall net persistence probability of the population (NMFS 2012). Persistence probability ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Ecological Subregions	Population (Watershed)	A&P	Spatial Structure	Diversity	Overall Persistence Probability
Coast Range	Young's Bay (OR)	VL	VH	VL	VL
	Grays/Chinook rivers (WA)	VL	H	VL	VL
	Big Creek (OR)	VL	H	L	VL
	Elochoman/Skamokawa creeks (WA)	VL	H	VL	VL
	Clatskanie River (OR)	L	VH	M	L
	Mill, Germany, and Abernathy creeks (WA)	VL	H	L	VL
	Scappoose River (OR)	M	H	M	M
Cascade Range	Lower Cowlitz River (WA)	VL	M	M	VL
	Upper Cowlitz River (WA)	VL	M	L	VL
	Cispus River (WA)	VL	M	L	VL
	Tilton River (WA)	VL	M	L	VL
	South Fork Toutle River (WA)	VL	H	M	VL
	North Fork Toutle River (WA)	VL	M	L	VL
	Coweeman River (WA)	VL	H	M	VL
	Kalama River (WA)	VL	H	L	VL
	North Fork Lewis River (WA)	VL	L	L	VL
	East Fork Lewis River (WA)	VL	H	M	VL
	Salmon Creek (WA)	VL	M	VL	VL
	Clackamas River (OR)	M	VH	H	M
	Sandy River (OR)	VL	H	M	VL
	Washougal River (WA)	VL	H	L	VL
Columbia Gorge	Lower Gorge Tributaries (WA & OR)	VL	M	VL	VL
	Upper Gorge/White Salmon (WA)	VL	M	VL	VL
	Upper Gorge Tributaries/Hood (OR)	VL	VH	L	VL

[3] The Elochoman Hatchery Type-S and Type-N coho salmon programs were eliminated in 2008. The last adults from these two programs returned to the Elochoman in 2010. NMFS has recommended that these two programs be removed from the ESU (NMFS 2011).

Abundance and Productivity. In Oregon, the Clatskanie Creek and Clackamas River populations have "low" and "moderate" persistence probability ratings for A&P, while the rest are rated "very low." All of the Washington populations have "very low" A&P ratings. The persistence probability for diversity is "high" in the Clackamas population, "moderate" in the Clatskanie, Scappoose, Lower Cowlitz, South Fork Toutle, Coweeman, East Fork Lewis, and Sandy populations, and "low" to "very low" in the rest (NMFS 2012). Uncertainty is high because of a lack of adult spawner surveys. Smolt traps indicate some natural production in Washington populations, though given the high fraction of hatchery origin spawners suspected to occur in these populations it is not clear that any are self-sustaining. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford 2011; NMFS 2011; NMFS 2012).

Limiting Factors. These include (NMFS 2012; NOAA Fisheries 2011):

- Degraded estuarine and near-shore marine habitat resulting from cumulative impacts of land use and flow management by the Columbia River hydropower system
- Fish passage barriers that limit access to spawning and rearing habitats
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Hatchery-related effects
- Harvest-related effects
- An altered flow regime and Columbia River plume has altered the temperature regime and estuarine food web, and has reduced ocean productivity
- 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 strandings that result from ship wakes
- Contaminants affecting fish health and reproduction

Status of *LCR Steelhead*.

This species is listed as threatened under the ESA (8/15/11; 76 FR 50448).

Spatial Structure and Diversity. Four strata and 23 historical populations of LCR steelhead occur within the distinct population segment (DPS): 17 winter-run populations and six summer-run populations, within the Cascade and Gorge ecological subregions (Table 5).[4] The DPS also includes the progeny of ten artificial propagation programs.[5] Summer steelhead return

[4] The White Salmon and Little White Salmon steelhead populations are part of the Middle Columbia steelhead DPS and are addressed in a separate species-level recovery plan, the Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan (NMFS 2009).

[5] In 2007, the release of Cowlitz Hatchery winter steelhead into the Tilton River was discontinued; in 2009, the Hood River winter steelhead program was discontinued; and in 2010, the release of hatchery winter steelhead into the Upper Cowlitz and Cispus rivers was discontinued. In 2011, NMFS recommended removing these programs from the DPS. A Lewis River winter steelhead program was initiated in 2009, and in 2011, NMFS proposed that it be included in the DPS (NMFS 2011).

to freshwater long before spawning. Winter steelhead, in contrast, return from the ocean much closer to maturity and spawn within a few weeks. Summer steelhead spawning areas in the Lower Columbia River are found above waterfalls and other features that create seasonal barriers to migration. Where no temporal barriers exist, the winter-run life history dominates.

Table 5. LCR steelhead strata, ecological subregions, run timing, populations, and scores for the key elements (A&P, spatial structure, and diversity) used to determine current overall net persistence probability of the population (NMFS 2012). Persistence probability ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Stratum		Population (Watershed)	A&P	Spatial Structure	Diversity	Overall Persistence Probability
Ecological Subregion	Run Timing					
Cascade Range	Summer	Kalama River (WA)	H	VH	M	M
		North Fork Lewis River (WA)	VL	VL	VL	VL
		East Fork Lewis River (WA)	VL	VH	M	VL
		Washougal River (WA)	M	VH	M	M
	Winter	Lower Cowlitz River (WA)	L	M	M	L
		Upper Cowlitz River (WA)	VL	M	M	VL
		Cispus River (WA)	VL	M	M	VL
		Tilton river (WA)	VL	M	M	VL
		South Fork Toutle River (WA)	M	VH	H	M
		North Fork Toutle River (WA)	VL	H	H	VL
		Coweeman River (WA)	L	VH	VH	L
		Kalama River (WA)	L	VH	H	L
		North Fork Lewis River (WA)	VL	M	M	VL
		East Fork Lewis River (WA)	M	VH	M	M
		Salmon Creek (WA)	VL	H	M	VL
		Clackamas River (OR)	M	VH	M	M
		Sandy River (OR)	L	M	M	L
		Washougal River (WA)	L	VH	M	L
Columbia Gorge	Summer	Wind River (WA)	VH	VH	H	H
		Hood River (OR)	VL	VH	L	VL
	Winter	Lower Gorge (WA & OR)	L	VH	M	L
		Upper Gorge (OR & WA)	L	M	M	L
		Hood River (OR)	M	VH	M	M

It is likely that genetic and life history diversity has been reduced as a result of pervasive hatchery effects and population bottlenecks. Spatial structure remains relatively high for most populations Out of the 23 populations, 16 are considered to have a "low" or "very low" probability of persisting over the next 100 years, and six populations have a "moderate" probability of persistence (Ford 2011; Lower Columbia Fish Recovery Board 2010; NMFS 2012; ODFW 2010). All four strata in the DPS fall short of the WLC-TRT criteria for viability (NMFS 2012).

Baseline persistence probabilities were estimated to be "low" or "very low" for three out of the six summer steelhead populations that are part of the LCR DPS, moderate for two, and high for one—the Wind, which is considered viable (Lower Columbia Fish Recovery Board 2010; NMFS 2012; ODFW 2010). Thirteen of the 17 LCR winter steelhead populations have "low" or "very low" baseline probabilities of persistence, and the remaining four are at "moderate" probability of persistence (Table 5) (Lower Columbia Fish Recovery Board 2010; NMFS 2012; ODFW 2010).

Abundance and Productivity. The "low" to "very low" baseline persistence probabilities of most Lower Columbia River steelhead populations reflects low abundance and productivity (NMFS 2012). All of the populations increased in abundance during the early 2000s, generally peaking in 2004. Most populations have since declined back to levels within one standard deviation of the long term mean. Exceptions are the Washougal summer-run and North Fork Toutle winter-run, which are still higher than the long term average, and the Sandy, which is lower. In general, the populations do not show any sustained dramatic changes in abundance or fraction of hatchery origin spawners since the 2005 status review (Ford 2011). Although current LCR steelhead populations are depressed compared to historical levels and long-term trends show declines, many populations are substantially healthier than their salmon counterparts, typically because of better habitat conditions in core steelhead production areas (Lower Columbia Fish Recovery Board 2010; NMFS 2012).

Limiting Factors. These include (NMFS 2012; NOAA Fisheries 2011):

- Degraded estuarine and nearshore marine habitat resulting from cumulative impacts of land use and flow management by the Columbia River hydropower system
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and recruitment of large wood, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Reduced access to spawning and rearing habitat mainly as a result of tributary hydropower projects and lowland development
- Avian and marine mammal predation in the lower mainstem Columbia River and estuary
- Hatchery-related effects
- An altered flow regime and Columbia River plume has altered the temperature regime and estuarine food web, and has reduced ocean productivity
- 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 strandings that result from ship wakes
- Contaminants affecting fish health and reproduction

Status of *UWR Steelhead*.

This species is listed as threatened under the ESA (8/15/11; 76 FR 50448).

Spatial Structure and Diversity. This species includes all naturally-spawned steelhead populations below natural and manmade impassable barriers in the Willamette River, Oregon,

and its tributaries upstream from Willamette Falls to the Calapooia River. One stratum and four extant populations of UWR steelhead occur within the DPS (Table 6). Historical observations, hatchery records, and genetics suggest that the presence of UWR steelhead in many tributaries on the west side of the upper basin is the result of recent introductions. Nevertheless, the WLC-TRT recognized that although west side UWR steelhead does not represent a historical population, those tributaries may provide juvenile rearing habitat or may be temporarily (for one or more generations) colonized during periods of high abundance. Hatchery summer-run steelhead that are released in the subbasins are from an out-of-basin stock, not part of the DPS. Additionally, stocked summer steelhead that have become established in the McKenzie River were not considered in the identification of historical populations (ODFW and NMFS 2011).

Table 6. Scores for the key elements (A&P, diversity, and spatial structure) used to determine current overall viability risk for UWR steelhead (ODFW and NMFS 2011). All populations are in the Western Cascade Range ecological subregion. Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Population (Watershed)	A&P	Diversity	Spatial Structure	Overall Extinction Risk
Molalla River	VL	M	M	L
North Santiam River	VL	M	H	L
South Santiam River	VL	M	M	L
Calapooia River	M	M	VH	M

Abundance and Productivity. Since the last status review in 2005, UWR steelhead initially increased in abundance but subsequently declined and current abundance is at the levels observed in the mid-1990s when the DPS was first listed. The DPS appears to be at lower risk than the UWR Chinook salmon ESU, but continues to demonstrate the overall low abundance pattern that was of concern during the last status review. The elimination of winter-run hatchery release in the basin reduces hatchery threats, but non-native summer steelhead hatchery releases are still a concern for species diversity. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford 2011).

Limiting Factors. These include (NOAA Fisheries 2011; ODFW and NMFS 2011):

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, and stream flow have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Degraded water quality and altered temperature as a result of both tributary dams and the cumulative impacts of agriculture, forestry, and urban development
- Reduced access to spawning and rearing habitats mainly as a result of artificial barriers in spawning tributaries
- Hatchery-related effects: impacts from the non-native summer steelhead hatchery program
- Anthropogenic introductions of non-native species and out-of-ESU races of salmon or steelhead have increased predation and competition on native UWR steelhead

2.2.2 Status of Critical Habitat

We review the status of designated critical habitat affected by the proposed action by examining the condition and trends of essential physical and biological features throughout the designated area. These features are essential to the conservation of the 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 salmon and steelhead, NMFS 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 listed species they support,[6] the conservation rankings are high, medium, or low. To determine the conservation value of each watershed to species viability, NMFS' critical habitat analytical review teams (CHARTs; NOAA Fisheries 2005) evaluated the quantity and quality of habitat features (for example, spawning gravels, wood and water condition, side channels), 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. Thus, even a location that has poor quality habitat could be ranked with a high conservation value if it were essential due to factors such as limited availability (*e.g.*, one of a very few spawning areas), a unique contribution of the population it served (*e.g.*, a population at the extreme end of geographic distribution), or the fact that it serves another important role (*e.g.*, obligate area for migration to upstream spawning areas).

This section examines critical habitat condition for the salmonid species discussed in the status section above (critical habitat designated 9/02/05; 70 FR 52630), except LCR coho salmon, for which critical habitat has not been proposed or designated. The analysis is combined because of the similarity of essential physical and biological features for each species, and the overlapping critical habitat areas.

The action area was rated as having a "high" conservation value for each of the ESA-listed salmonids that have critical habitat designated in the action area. NMFS reviews the status of designated critical habitat affected by the proposed action by examining the condition and trends of the essential physical and biological features or primary constituent elements (PCEs) of the habitat throughout the designated area. These PCEs consist of site types and site attributes associated with life history events.

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[6] The conservation value of a site depends upon "(1) the importance of the populations associated with a site to the ESU [or DPS] conservation, and (2) the contribution of that site to the conservation of the population through demonstrated or potential productivity of the area" (NOAA Fisheries 2005).

Table 7. PCEs of critical habitats designated for ESA-listed salmon and steelhead species considered in the opinion and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site Type	**Site Attribute**	
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration

Climate change, as described in Section 2.2, is likely to reduce the conservation value of designated critical habitats in the Pacific Northwest. Other influences on the conservation value of critical habitats in this opinion are discussed below.

In the Willamette River mainstem and lower sub-basin mainstem reaches, high density urban development and widespread agricultural impacts have reduced aquatic and riparian habitat quality and complexity, and altered sediment and water quality and quantity, and watershed processes. The Willamette River, once a highly braided river system, has been dramatically simplified through channelization, dredging, and other activities that have reduced salmon and steelhead rearing habitat by as much as 75%. In addition, the construction of 37 dams in the basin blocked access to more than 435 miles of stream and river spawning habitat. The dams alter the temperature regime of the Willamette River and its tributaries, affecting the timing and development of naturally-spawned eggs and fry. Agriculture, urbanization, and gravel mining on the valley floor, and logging in the Cascade and Coast Ranges contribute to increased erosion and sediment loads throughout the basin.

The mainstem Willamette River has been channelized and stripped of large wood. Development began to encroach on the riparian forest beginning in the 1870s (Sedell and Froggatt 1984). Gregory *et al.* (2002a) calculated that the total mainstem Willamette River channel area decreased from 41,000 to 23,000 acres between 1895 and 1995. They noted that the lower reach, from the mouth of the river to Newberg (RM 50), is confined within a basaltic trench, and that due to this geomorphic constraint, less channel area has been lost than in upstream areas.

Gregory *et al.* (2002b) described the changes in riparian vegetation in river reaches from the mouth to Newberg, from Newberg to Albany, and from Albany to Eugene. They noted that the riparian forests were formerly a mosaic of brush, marsh, and ash tree openings maintained by annual flood inundation. Below the City of Newberg, the most noticeable change was that conifers were almost eliminated. Above Newberg, the formerly hardwood-dominated riparian forests along with mixed forest made up less than half of the riparian vegetation by 1990, while

agriculture dominated. This conversion has reduced river shading and the potential for recruitment of wood to the river, reducing channel complexity and the quality of rearing, migration and spawning habitats

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

Industrial harbor and port development are also significant influences on the Lower Willamette and Lower Columbia rivers (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2006, Lower Columbia Fish Recovery Board 2010). Since 1878, 100 miles of river channel within the mainstem Columbia River, its estuary, and Oregon's Willamette River have been dredged as a navigation channel by the Corps. In addition to loss of riparian habitat, and disruption of benthic habitat due to dredging, high levels of sediment chemicals, such as arsenic and polycyclic aromatic hydrocarbons (PAHs), have been identified the vicinity of the ports and associated industrial facilities.

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

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 Lower Willamette River 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 lower Willamette River 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 lower Willamette River 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 lower Willamette River has been deepened and narrowed through channelization, diking and filling, and much of the shallow-water habitat (important for rearing juveniles) 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). 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 Lower Willamette River 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. The large area of deltaic wetlands and riparian zone that historically occurred within and along the Lower Willamette River is almost non-existent today. The Oaks Bottom Wildlife Refuge is the largest remaining floodplain wetland habitat along the Lower Willamette River upstream of Sauvie Island. The Oaks Bottom Wildlife Refuge drains a small drainage basin of approximately 240 acres that includes the entire refuge and a small fringe of the bluff surrounding the site. The majority of the trees in the project area are medium to small in size and tend to be one of three species; black cottonwood *(Populus trichocarpa)*, willows (*Salix lasiandra* and others), and Oregon ash (*Fraxinus latifolia*). Red osier dogwood (*Cornus stolonifera*) is present along the edges of the wetlands. Reed canary grass (*Phalaris arundinacea*) and purple loosestrife (*Lythrum salicaria*) dominate the understory in the vast majority of the project area. Some native emergent vegetation is present including Columbia River sedge (*Carex aperta*) and smartweed (*Polygonum hydropiperoides*). Portland Parks and Recreation has undertaken a significant effort to reduce Himalayan blackberry (*Rubus procerus*) and other invasive plants along the bluff and the north fill area.

Water quality in the action area reach of the Willamette River reflects its urban location and disturbance history. The Lower Willamette River 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.

The results of the 2009 water quality sampling in Oaks Bottom Wildlife Refuge indicated that there were no contaminants of concern in water above published levels or screening criteria except for lead which was present at one site in the reservoir at levels of 2.97 µg/L, which is above the freshwater screening criteria of 2.5 µg/L (City of Portland 2010).

The sediment sampling conducted by the City of Portland in 2007 in the reservoir, channel and culvert area was intended to identify whether there were any contaminants of concern in the area proposed for excavation. The contaminants detected above screening levels were the pesticides, DDT, DDD, DDE, and chlordane. The DDT suite was detected in several samples. Sediment sampling was conducted again in 2009 and 2010 based on the Sampling and Analysis Plan developed for and reviewed by the Project Review Group. The areas of proposed excavation were sampled at the existing surface and at the proposed "new surface" after excavation. The

results of this sampling indicate that DDT, DDD, and DDE are present in both the channel and in the reservoir at the existing surface; additionally, zinc, chlordane and PCBs were detected above screening levels. The proposed "new surface" locations are clean, so areas proposed for excavation will reveal clean substrate.

Juvenile and adult Chinook salmon, coho salmon, and steelhead use the action area as a migratory corridor and as rearing habitat for juveniles (Friesen 2005). The results of the Friesen study demonstrate that juvenile salmon and steelhead are present in the Lower Willamette River 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 Lower Willamette River 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 from 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 Lower Willamette River.

Adult Chinook salmon and steelhead have been documented holding in the lower Willamette River for a period of time before moving upriver. Adults migrate upstream to spawn during early spring (spring Chinook), early fall (coho), and late fall through winter (steelhead), and spawn in early to mid-fall (Chinook and coho) 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.

The 2005 Friesen study's key finding is that the Lower Willamette River is no longer appropriately considered simply a migration corridor. The presence of naturally-spawned Chinook salmon from November through July, as well as significant evidence of fish growth, contradicts a longstanding assumption that spring Chinook salmon primarily reared in their natal streams over the winter and migrated out of the Willamette River during the spring. In this study, juvenile Chinook salmon were present in the Lower Willamette River in every month sampled from May, 2000 through July, 2003. Juvenile salmon were captured more frequently during winter and spring than during other seasons. Coho salmon and steelhead were generally present only 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 coho salmon and steelhead juveniles present as well.

2.4 Effects of the Action on Species and Designated Critical Habitat

"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 proposed action will affect the salmonid species considered in this opinion by causing physical, chemical, and biological changes to the environment, and through direct effects. These effects include a temporary reduction in water quality from increased suspended sediment, contaminants and noise, a temporary reduction in riparian vegetation, and harassment/displacement and possible injury from fish salvage and/or monitoring activities. There is also a small chance of an accidental contaminant release from construction equipment or activities, however any release would likely be small and quickly contained due to the implementation of a pollution control plan. In addition, beneficial effects from increased floodplain access and riparian plantings will occur.

Fish Salvage and Monitoring Effects. As part of the proposed action, portions of the channel leading into the wildlife refuge will be isolated and dewatered for a period of time so construction can occur in that area. Prior to dewatering an area, fish will be salvaged using backpack and boat-mounted electrofishers, as well as beach seines. Direct effects on ESA-listed salmonids from work area isolation and fish salvage in the culvert and channel area will include mechanical injury during capture, holding, or release, and potential horizontal transmission of disease and pathogens. Likely adverse effects include stress-related phenomena. Stress approaching or exceeding the physiological tolerance limits of individual fish can impair reproductive success, growth, resistance to infectious diseases, and general survival (Wedemeyer *et al.* 1990). When electrofishing is used to salvage fish, it will significantly increase stress loads. Harmful effects of electrofishing are detailed by Snyder (2003) and include internal and external hemorrhage, fractured spines, and death. Many factors influence the effects of electrofishing on fish. These include water conductivity and depth, substrate type, and fish size. Additionally, the amount of time taken to complete electrofishing, its frequency, the crew efficiency, and operator skill have been identified as factors influencing the magnitude of electrofishing effects. Stress or injury to the individuals captured and released, but not killed, may cause delayed migration or impair reproductive success, growth, or resistance to infectious diseases or predation. Any fish present in the isolated area will be salvaged and placed downstream. Additionally, following NMFS guidelines for electrofishing will minimize injuries.

Few, if any, ESA-listed salmonids are expected to be salvaged due to time of year (salvage will take place during the summer in-water work window) and existing barriers to salmonid migration into the channel (the existing culvert and water control structure). Handling of ESA-listed salmonids during subsequent monitoring events in the wildlife refuge will be subject to the

avoidance measures and best management practices laid out in the City of Portland's section 10 and 4(d) permits.

Contaminant Exposure Effects. The sediment that will be excavated from the channel and banks in the wildlife refuge is contaminated. This sediment will be removed and placed at an approved upland disposal site. Any contaminants mobilized during the excavation process will likely be effectively contained by the work area isolation methods. Since all fish will be salvaged from the isolated area, contaminant exposure to ESA-listed salmonids is not expected to be an issue during construction. Some of the sediments that remain in the wildlife refuge after removal of the contaminated sediments in the channel (i.e. the sediment in the reservoir) are contaminated, particularly with DDT and its breakdown products, which have shown up in samples from several areas. It is thought that this contamination is the result of aerial applications for mosquito control in this wetland area before DDT was banned in the United States. After construction, when salmonids begin to use the wildlife refuge in much greater numbers than is currently the case, exposure to these contaminants could occur.

DDT is a white crystalline pesticide once widely used to control agricultural pests and disease-carrying insects. Its use in the United States was banned in 1972 because of effects to wildlife. The effects of DDT have been widely documented in bald eagles and other top-level predators and are exacerbated due to its persistence in the environment. DDT binds strongly to soil and is slowly broken down to DDE and DDD by microorganisms. These pesticides are very persistent in the environment due to their low vapor pressure, high fat solubility, and resistance to degradation and photooxidation. Laboratory studies have shown that DDT and DDE accumulate in plants and fatty tissues of fish, birds, and other animals. For fish, the primary route of uptake is by ingesting prey items, but the pesticides can also be accumulated through the skin or gills upon exposure in water. Invertebrate species are generally more susceptible than fish species to effects associated with exposure to these pesticides in the water column (EPA 2000).

The presence of DDT and its metabolites could result in an increase in the level of these contaminants in benthic organisms, which provide some amount of forage for salmonids. Sublethal adverse effects are could result, including changes in behavior (*e.g.*, sheltering, feeding, migration) and reduced fitness of juvenile fish.

Due to concerns about the contaminants that will remain in the wildlife refuge post-construction, and exposure to the ESA-listed salmonids that will likely use the area, fish tissue sampling was conducted in the areas of the wildlife refuge where the sediments are known to be contaminated. After discussions with the Northwest Fisheries Science Center, we determined that three-spine stickleback tissue could be sampled and used as a surrogate for salmonid tissue since salmonids were unlikely to be in the area in its current condition. The stickleback tissue contaminant levels would then be compared to known levels from stickleback tissue collected in relatively clean areas of the Columbia River. The results of the sampling in the wildlife refuge indicate that DDT and its metabolites do not bioaccumulate in sticklebacks at concentration that would pose an unacceptable risk to the fish. Stickleback are resident fish in the wildlife refuge whereas ESA-listed salmonids would be there for relatively brief periods so it is likely that stickleback represent a conservative estimate of bioaccumulation relative to salmonids in the wildlife refuge. The average lipid-adjusted Total DDx (DDT and its metabolites) concentration in the stickleback

from the wildlife refuge was less than the average concentrations in stickleback obtained from the Columbia River sample locations, and tissue levels were below levels of concern.

Sedimentation, Turbidity and Noise Effects. Construction activities such as the channel excavation can result in the resuspension of sediment. In addition, a sheet pile coffer dam will be installed in the Willamette River immediately outside of the culvert in an estimated five feet of water depth. This coffer dam will be approximately 100 feet in length and will bracket the work area. A similar sheet piling coffer dam will be installed upstream of the culvert within the wildlife refuge to allow the culvert work area to be completely isolated and dewatered. Since all fish will be removed from the work area before excavation, turbidity and suspended sediment should not affect ESA-listed species except during the brief periods of installation and removal of the coffer dams, and these effects would be limited to the area immediately around the coffer dams.

The effects of suspended sediment and turbidity on fish range from beneficial to detrimental. Elevated total suspended solids (TSS) have been reported to enhance cover conditions, reduce piscivorous fish/bird predation rates, and improve survival, but elevated TSS have also been reported to cause physiological stress, reduce growth, and adversely affect survival. Although fish that remain in turbid waters experience a reduction in predation from piscivorous fish and birds (Gregory and Levings 1998), chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Lloyd *et al.* 1987; Redding *et al.* 1987; Servizi and Martens 1991). Of key importance in considering the detrimental effects of TSS on fish are the frequency and the duration of the exposure, as well as the TSS concentration. Juvenile Pacific salmonids tend to avoid streams that are chronically turbid, such as glacial streams or those disturbed by human activities, unless the fish traverse these streams along migration routes (Lloyd *et al.* 1987). Elevated TSS is likely to occur when the coffer dams are being installed or removed. Any suspended sediment should dissipate quickly following cessation of the activity.

Given the small area of river affected, the temporary duration (hours to days) of the coffer dam installation and removal, and the small number of ESA-listed salmonids likely to be in the area at the time, only a few ESA-listed fish are likely to be affected. Juvenile salmonids in the action area are primarily planktonic feeders in the summer, and therefore their ability to feed will decline in turbid waters. Depending on the concentrations of suspended solids, fish will either seek refuge in adjacent areas with less turbidity, or remain in the area, taking advantage of the additional cover. Death or injury to ESA-listed salmonids from increases in TSS is not likely during the summer in-water work window when densities of juvenile fish are low. Behavioral effects are likely to occur and would include decreased foraging behaviors, reducing juvenile growth and survival in a small number of fish.

During construction, steel pilings will be driven to support a temporary railroad bridge and to provide shoring for the cut through the railroad embankment for replacement of the culvert. It is estimated that a total of up to 10 steel pilings will be driven (estimated to be 14-inch H-piles). Additionally, up to 46 total sheet pile sections may be driven to provide shoring for the cut through the embankment. These pilings and sheet pile sections will be installed in the isolated work area or in uplands approximately 40-60 feet from waters that could contain ESA-listed

salmonids. The project may use both vibratory and impact hammers. Vibratory hammers would be used to drive the steel piles for most of their length. An impact hammer will likely be used for the last foot or so of the steel pile driving to determine if adequate bearing capacity has been reached. Because the piles will be driven on land primarily using a vibratory hammer, it is not likely that the hydroacoustic criteria for fish will be exceeded, but fish may still experience some noise effects that would cause them to avoid the area. The sheet pile coffer dams that will be used to isolate the work area will be installed in water without the use of an impact hammer. They will be either pushed into the sediment with excavation equipment or, if necessary based on subsurface conditions, a vibratory hammer will be used. The lack of impact hammer use in waters that could contain ESA-listed salmonids and the limited use of a vibratory hammer will limit noise disturbance to very brief periods in a small area.

Effects from Vegetation Removal and Planting. Vegetation, including approximately 50 trees, and invasive species, will be removed in order to construct the project. In areas of grading, removal of native trees and shrubs will be minimized to the extent practicable. If possible, shrubs will be salvaged for replanting on site. Suitable large wood from the removal of trees on site will be used in the channel or floodplain as large woody debris. Nevertheless, riparian vegetation will decrease in the project area temporarily, leading to reduced habitat for forage resources and for foraging, resting and cover for any ESA-listed salmonid in the area until the riparian area is replanted and re-established. An extensive re-vegetation program will take place after construction, which will increase the quantity and quality of the riparian vegetation in the wildlife refuge over the long-term.

Effects from Increased Habitat Access. The proposed action will greatly increase access to the floodplain habitat in the wildlife refuge for rearing and migrating ESA-listed salmonids once the culvert is replaced, the water control structure is removed and the channels excavated. Very little of this important type of habitat for ESA-listed salmonids exists anymore in the Lower Willamette River due to urbanization and industrialization. The proposed action will reopen the largest remaining off-channel, tidally influenced rearing and refuge habitat in the Lower Willamette River. While no salmonids have been documented at the site in its pre-construction state during numerous sampling events, several hundred to several thousand salmonids are expected to enter the wildlife refuge annually after construction depending on river flows. The fact that the channels into the refuge will be connected to the river during a greater portion of the year will also likely reduce fish strandings.

The post-construction condition will also have cooler water temperatures in the action area, due to the large diameter culvert and removal of the water control structure facilitating a greater volume of water exchange on a regular basis, and the free flow of spring and groundwater-fed flow through the channel. The excavation will drop the channel invert to an elevation that intersects the mean water table elevation, facilitating hyporheic exchange. Additionally, the excavation will allow fish greater access to the network of channels that emanate from the springs along the base of the bluff, which will provide added areas of high water quality and optimal temperature for salmonid rearing and refuge.

Summary of Effects on Listed Species. 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 8. The applicant proposes to complete all in-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 Lower Willamette River 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. Therefore, the potential for direct interaction with salmon and steelhead during the project will be significantly lower during the summer in-water work window than during the rest of the year because salmon presence is low.

Table 8. The presence/absence of ESA-listed salmonids in the Lower Willamette River 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-

However, NMFS does expect some fish to be present in the area during construction Most of the fish present will incur short-term stress due to noise and reduced water quality during construction. Few, if any, ESA-listed salmonids are expected to be salvaged as part of work area isolation due to time of year and the barrier the current culvert and water control structure pose to fish passage. Any salmonids handled for wildlife monitoring purposes in the refuge in the future will be subject to the avoidance measures and best management practices laid out in the City of Portland's section 10 and 4(d) permits. Any non-lethal stress experienced by individual fish is likely to be brief (minutes to days). A few fish may be injured or killed from the effects of handling or by the culmination of joint causes, such as a previous wound inflicted by the environmental baseline and genetic weakness.

Considering the low abundance and short residence time of juvenile ESA-listed salmonids in the action area during the in-water work window, any effects to the growth, survival, and distribution of ESA-listed salmonids in the action area will be small and isolated. These effects are unlikely to be significant at either the local or population scale.

The number of individual ESA-listed salmonids that will be adversely affected by the effects of the proposed action cannot be quantified. 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 within the action area cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action.

In addition to the adverse effects described above, ESA-listed salmonids will benefit from increased access to shallow water, off-channel habitat once the culvert is replaced, the water control structure is removed and the new channels are excavated. This floodplain habitat will be able to serve as refuge habitat for rearing and migrating salmonids. The plantings will also improve habitat quality by providing forage and cover.

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 (PCEs) 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. The water quality, forage, natural cover and passage effects described will be short-term during and immediately following construction. The long-term effects on critical habitat will be beneficial (increased floodplain connectivity, forage, water quality and natural cover and removal of artificial obstructions).

Freshwater rearing

Floodplain connectivity – The new culvert and removal of the water control structure will increase floodplain connectivity by allowing the wildlife refuge to be connected to the Lower Willamette River approximately 95% of the time at the daily mean water surface elevation.

Forage – While forage may decrease in the short term due to channel excavation and removal of riparian vegetation, over the long term forage should increase due to the planting of native vegetation in the wildlife refuge and increased access to shallow water off-channel habitat for ESA-listed salmonids.

Natural cover – There will be a temporary decrease in natural cover due to the removal of riparian vegetation for construction purposes; but a long-term increase in natural cover due to extensive plantings of native species.

Water quality – There will be an increase in noise, suspended sediment and concentrations of contaminants during and for a short period following construction. Over the long term, water quality will improve due to the removal of contaminants and lower water temperature.

Water quantity – No effect.

Freshwater migration

Free of artificial obstruction – The work area will be isolated during construction so the channel that sometimes exists through the culvert into the wildlife refuge will be blocked during one in-water work window, but the Lower Willamette River will remain free of artificial obstruction. The current culvert and water control structure act as an artificial obstruction to fish passage into

the wildlife refuge for most of the year and these will be removed.

Natural cover – There will be a temporary decrease in natural cover due to the removal of riparian vegetation for construction purposes; but a long-term increase in natural cover due to extensive plantings of native species.

Water quality – There will be an increase in noise, suspended sediment and concentrations of contaminants during and for a short period following construction. Over the long term, water quality will improve due to the removal of contaminants and lower water temperature.

Water quantity – No effect.

The proposed action is likely to cause minor, localized and temporary degradation of critical habitat PCEs for water quality, forage, natural cover and free passage. None of the effects are likely to reduce the quality and function of the PCEs within the action area. The critical habitat in the action area will retain 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 NMFS assumes that future private and state actions will continue near the action area, increasing as population density rises. As the human population near the action area continues to grow, the demand for agricultural, commercial, and residential development is also likely to grow and increase in intensity. However, the NMFS is not aware of any specific future non-Federal activities within the action area that would cause greater impacts to listed species than presently occur.

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 will add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5) 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 or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 2.2).

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.

The current extinction risk for UWR Chinook salmon is very high and the recovery goal for the extinction risk is very low. The current extinction risk for UWR steelhead is low and the recovery goal for the extinction risk is very low. The current extinction risk for the Clackamas River population of LCR Chinook salmon is very high and the recovery goal for the extinction risk is medium. The current extinction risk for the Clackamas River population of LCR coho salmon is medium and the recovery goal for the extinction risk is very low. The current extinction risk for the Clackamas River population of LCR steelhead is medium and the recovery goal for the extinction risk is low. The Clackamas River population is identified as a "core" population. In order 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 effects of the proposed action on the factors limiting recovery for the ESA-listed salmonids considered in this opinion include a temporary reduction in water quality in the action area from the increase in suspended sediment, contaminants and noise during construction. The reduction in water quality will be short term (approximately 3 months) during construction. Some vegetation removal will also take place in order to reconstruct channels and remove invasive species. Fish salvage will occur to remove species from the excavation area, but few, if any, ESA-listed salmonids are expected to be salvaged. Because these effects are relatively brief and/or small in scale, survival and recovery of ESA-listed salmonids will not be affected. The proposed action also includes the positive effects from the new connection to the floodplain that will be established so that ESA-listed salmonids will have access to this potential off-channel, refuge habitat. Also, the native vegetation that will be planted will provide benefits such as large wood recruitment over the long-term. No cumulative effects were described in the BA and NMFS did not identify any during the consultation, so none were added to this evaluation.

The few adults and juveniles that are likely to be injured or killed due to the action are too few to cause a measurable effect on the long-term abundance or productivity of any affected population

or to appreciably reduce the likelihood of survival and recovery of any listed species. The proposed action will have no effect on population diversity or spatial structure. Therefore, the proposed action will not reduce the productivity or survival of the affected populations of LCR Chinook salmon, UWR Chinook salmon, LCR steelhead, UWR steelhead or LCR coho salmon, even when combined with a degraded environmental baseline and additional pressure from cumulative effects and climate change.

The value of critical habitat for these species in the Lower Willamette River is limited by poor water quality, altered hydrology, lack of floodplain connectivity and shallow-water habitat, and lack of complex habitat to provide forage and cover. The action area is in an urban area where the habitat has been degraded due to past land use practices including stormwater runoff and industrial and urban development. Despite this, the critical habitat in the action area has a high conservation value for LCR Chinook salmon, LCR steelhead, UWR Chinook salmon, and UWR steelhead.

The same effects of the proposed action that will have an effect on ESA-listed salmon and steelhead will also have an effect on critical habitat PCEs for salmon and steelhead. The proposed action is likely to result in the short-term (months) reduction in the quality and function of critical habitat PCEs in the action area during construction due to suspended sediment, contaminant exposure, noise and vegetation removal. The project will improve floodplain connectivity and riparian vegetation conditions over the long term.

The effects of this action will not lower the value of the necessary habitat attributes in the action area over the long term. At the watershed scale, the proposed action will not increase the extent of degraded habitat within the basin, add to the degradation of water quality, or further decrease limited rearing areas or limit access to rearing habitat. Even when cumulative effects and climate change are included, the proposed action will not negatively influence the function or conservation role of critical habitat at the watershed scale. Critical habitat for LCR Chinook salmon, LCR steelhead, UWR Chinook salmon, and UWR steelhead will remain functional, or retain the current ability for the PCEs to become functionally established, to serve the intended conservation role for the species (in this case, to provide freshwater rearing sites and migration corridors).

For all the reasons described in the preceding paragraphs of this section, the proposed action will not appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction or distribution nor will the proposed action reduce the value of designated critical habitat for the conservation of the species.

2.7 Conclusion

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent actions, 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. No critical habitat has been designated or proposed for LCR coho salmon; therefore, none will be affected.

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 results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. For this consultation, we interpret "harass" to mean an intentional or negligent action that has the potential to injure an animal or disrupt its normal behaviors to a point where such behaviors are abandoned or significantly altered.[7] 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

Activities necessary to complete the proposed tidal reconnection project will take place within the active channel of the Willamette River when individual Chinook salmon, coho salmon, and steelhead considered in this opinion are likely to be present. Adverse effects of the proposed action will include harassment from fish salvage activities, an increase in turbidity, contaminants and noise during one in-water work window, and the temporary removal of riparian vegetation. These effects are reasonably certain to result in incidental take/harassment of adults and juveniles, and harm of juveniles (avoidance behaviors, impaired feeding, reduced growth) that will likely lead to injury or death of a few individuals.

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 within the action area cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action. In such circumstances, NMFS cannot provide an amount of take that would be caused by the proposed action.

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[7] NMFS has not adopted a regulatory definition of harassment under the ESA. The World English Dictionary defines harass as "to trouble, torment, or confuse by continual persistent attacks, questions, etc." The U.S. Fish and Wildlife Service defines "harass" in its regulations as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). The interpretation we adopt in this consultation is consistent with our understanding of the dictionary definition of harass and is consistent with the Service's interpretation of the term.

The best available indicators for the extent of take are the number of ESA-listed salmonids that will be salvaged, the number of strikes with an impact hammer in waters that could contain ESA-listed salmonids, the success of replanted riparian vegetation, and the extent of suspended sediment plumes. These features best integrate the likely take pathways associated with this action, are proportional to the anticipated amount of take, and are the most practical and feasible indicators to measure. Thus, the extent of take indicators that will be used as reinitiation triggers for this consultation are: (1) 10 ESA-listed salmonids handled as part of fish salvage efforts during the proposed action, (2) no pile strikes with an impact hammer in waters that could contain ESA-listed salmonids, (3) 100% survival of riparian plantings after the first year and 80% survival thereafter, and (4) increased suspended sediment from construction activities with suspended sediment plumes 100 feet from the boundary of construction activities at 10% over the background level. Suspended sediment is an appropriate extent of take indicator for contaminant exposure as well due to the direct relationship between suspended sediment and contaminant concentrations.

The number of ESA-listed salmonids salvaged, the number of impact hammer pile strikes in water, riparian planting survival, and increase in suspended sediment are thresholds for reinitiating consultation. Exceeding these indicators for extent of take will trigger the reinitiation provisions of this opinion.

2.8.2 Effect of the Take

In Section 2.7, NMFS determined that the level of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02).

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

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.
    b. Notice to Contractors. Before beginning work, all contractors working on site shall be provided with a complete list of Corps permit special conditions, reasonable and prudent measures, and terms and conditions intended to minimize the amount and extent of take resulting from in-water work.
    c. Minimize Impact Area. The applicant will confine construction impacts to the minimum area necessary to complete the project.
    d. Fish Capture and Removal. Whenever work isolation is required and ESA-listed fish are likely to be present, the applicant must attempt to capture and remove the fish as follows:
        i. A fishery biologist experienced with work area isolation and competent to ensure the safe capture, handling and release of all fish will supervise this part of the action.
        ii. Any fish trapped within the isolated work area must be captured and released using a trap, seine, electrofishing, or other methods as prudent to minimize the risk of injury, then released at a safe release site.
        iii. If electrofishing is used to capture fish, that work must consistent with NMFS' electrofishing guidelines.
    e. Pile Driving. No impact hammer will be used to drive piles in any water that could contain ESA-listed salmonids.
    f. 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 during any activity that could generate turbidity approximately 100 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.

g. Pollution Control Plan. The applicant will implement a pollution control plan (PCP) to prevent pollution caused by construction activities from entering the river. The PCP must have the following components:

i. The name and address of the party responsible for accomplishment of the PCP.

ii. Practices to prevent contaminant releases associated with equipment and material storage sites and fueling staging areas.

iii. A description of any regulated or hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring.

iv. A spill containment and control plan with notification procedures, specific cleanup and disposal instructions for different products, quick response containment and cleanup measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment.

v. Practices to prevent debris from dropping into any stream or waterbody, and to remove any material that does drop with a minimum disturbance to the streambed and water quality.

vi. During construction activities, monitoring will be done as often as necessary to ensure the controls discussed above are working properly. If monitoring or inspection shows that the controls are ineffective, work crews will be mobilized immediately to make repairs, install replacements, or install additional controls as necessary.

h. The applicant will maintain an absorptive boom during all in-water activities to capture contaminants that may be floating on the water surface as a consequence of construction activities.

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

a. Reporting. The applicant reports all monitoring items, including number of ESA-listed salmonids salvaged, any impact hammer use, riparian planting survival

rates, and turbidity observations, to NMFS within 60 days of the close of any work window that had in-water work within it, or within 60 days of any monitoring activities. 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.

b. The applicant will submit monitoring reports to:

National Marine Fisheries Service
Oregon State Habitat Office
Attn: 2012/02039
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232-2778

c. The applicant posts the following notice prominently at the work site:

NOTICE: If a sick, injured or dead specimen of a threatened or endangered species is found in the project area, the finder must notify NMFS through the contact person identified in the transmittal letter for this opinion, or through the NMFS Office of Law Enforcement at 1-800-853-1964, and follow any instructions. If the proposed action may worsen the fish's condition before NMFS can be contacted, the finder should attempt to move the fish to a suitable location near the capture site while keeping the fish in the water and reducing its stress as much as possible. Do not disturb the fish after it has been moved. If the fish is dead, or dies while being captured or moved, report the following information: (1) NMFS consultation number; (2) the date, time, and location of discovery; (3) a brief description of circumstances and any information that may show the cause of death; and (4) photographs of the fish and where it was found. The NMFS also suggests that the finder coordinate with local biologists to recover any tags or other relevant research information. If the specimen is not needed by local biologists for tag recovery or by NMFS for analysis, the specimen should be returned to the water in which it was found, or otherwise discarded.

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 restoration activities:

Identify and implement habitat enhancement or restoration activities in the Lower Willamette River that:

- Increase the amount of shallow-water habitat in the reach to benefit ESA-listed salmonids

- Restore or create off-channel habitat or access to off-channel habitat, side channels, alcoves, wetlands, and floodplains
- Remove old docks and pilings that are no longer in use
- Protect and restore riparian areas to improve water quality, provide long-term supply of large wood to streams, and reduce impacts that alter other natural processes
- Improve or regrade/revegetate streambanks
- Restore instream habitat complexity, including large wood placement
- Remove invasive plants and plant native species

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

As provided in 50 CFR 402.16, 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 take 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

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effects occur when EFH quality or quantity is reduced by a direct or indirect physical, chemical, or biological alteration of the waters or substrate, or by the loss of (or injury to) benthic organisms, prey species and their habitat, or other ecosystem components. 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 (PFMC 1999) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) 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 (PFMC 1999).

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. These effects include impacts from handling fish during fish salvage operations and monitoring activities, contaminant exposure, a temporary reduction in water quality from sediment disturbance during construction, noise from installing pilings and cofferdams and other construction activities, and temporary vegetation removal.

3.3 Essential Fish Habitat Conservation Recommendations

1. In-water Work: The Corps should follow terms and conditions 1(a) – 1(h) as presented in the ESA portion of this document.
2. Monitoring and Reporting: The Corps should follow term and condition 2(a) and 2(b) as presented in the ESA portion of this document.
3. The Corps should identify and implement habitat enhancement or restoration activities in the Lower Willamette River (or encourage applicants to do so) that:
    - Increases the amount of shallow-water habitat in the reach to benefit ESA-listed salmonids
    - Restores or creates off-channel habitat or access to off-channel habitat, side channels, alcoves, wetlands, and floodplains
    - Removes old docks and pilings that are no longer in use
    - Protects and restores riparian areas to improve water quality, provide long-term supply of large wood to streams, and reduce impacts that alter other natural processes
    - Improves or regrades/revegetates streambanks
    - Restores instream habitat complexity, including large wood placement
    - Removes invasive plants and plants native species

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 75 acres 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

Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency 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 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 user of this opinion is the U.S. Army Corps of Engineers. Other interested users could include the City of Portland, citizens living around Oaks Bottom Wildlife Refuge, or others interested in the conservation of the affected ESUs/DPS. Individual copies of this opinion were provided to the Corps and the City of Portland. This opinion will be posted on the NMFS Northwest Region web site (http://www.nwr.noaa.gov). 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/EFH consultation contain more background on information sources and quality.

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

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

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Water Quality Certification

Oregon
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Attn: Kevin Moynahan, Portland District Regulatory Branch Chief
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Subject: 401 Water Quality Certification for 2012 Nationwide Permit Program

1.0 Background: On July 18, 2007, the Oregon Department of Environmental Quality issued a 401 Water Quality Certification for the five year duration of the US Army Corps of Engineers 2007 Nationwide Permit (NWP) package.

On February 16, 2011, the USACE published a notice in the Federal Register (Vol 76, No 32, 9174-9207) proposing reissuance of 48 of the existing NWP categories, issuance of two new NWP categories, general conditions, and definitions, all with some modifications. Additionally, on June 20, 2011, the Portland District USACE issued a special public notice to solicit comments on the proposed regional conditions for the 2012 NWPs. Prior to this notice, DEQ participated in an interagency workgroup with representatives from USACE, US Environmental Protection Agency, National Marine Fisheries Service, US Fish and Wildlife Service, Oregon Department of Land Conservation and Development, Oregon Department of Fish and Wildlife, and Oregon Department of State Lands to amend the 2007 USACE Portland District NWP regional conditions.

2.0 Public Notice: On January 10, 2012 DEQ requested public comments on a draft 401 Water Quality Certification evaluation and decision. DEQ considered all comments relevant to water quality before finalizing the decision.

3.0 Applicable Water Quality Regulations and DEQ Evaluations: DEQ is the agency of the State of Oregon designated to carry out the certification functions prescribed by Section 401 of the Clean Water Act. In the Section 401 certification process, the state acts under the authority of the federal law. However, the state must also comply with state law. In Oregon, statutory authority for Section 401 certification is contained in ORS chapter 468B. Administrative rules (OAR chapter 340, Division 48) prescribe the procedures for Section 401 certifications. Oregon's water quality regulations are contained in Oregon Administrative Rules (OAR) Chapter 340, Divisions 40 through 56 and 71. Division 40 contains the state's groundwater standards. Division 41 entitled "Water Quality Standards: Beneficial Uses, Policies, and Criteria for Oregon" contains the surface water standards, and is the most significant with respect to Section 401 certification evaluation of a proposed project. The requirements and standards set forth in Division 41 were adopted to comply with the surface water quality protection provisions of both state and federal law. The water quality standards in Division 41 are composed of three elements: beneficial uses, water quality criteria (both narrative and numeric), and the antidegradation policy.

DEQ has determined that 2012 NWP categories authorized under both Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act may result in a discharge to waters of the state and are therefore subject to this 401 Water Quality Certification. However, actions that USACE determines, with input from DEQ, will not result in a discharge to waters of the state, are not subject to the terms of this 401 Water Quality Certification.

4.0 Federally Authorized Actions Description: On February 21, 2012, USACE published a notice in the Federal Register announcing the reissuance of all existing NWPs, general conditions, and definitions with some modifications. As noted in the Federal Register, activities authorized by NWPs must be similar in nature, cause only minimal adverse environmental effects when performed separately, and cause only minimal cumulative adverse effect on the aquatic environment. As such, categories have impact threshold limitations and specific activity prohibitions. Impacts are further limited by Nationwide General Conditions, Regional General Conditions and Category Specific Conditions.

5.0 Status of Affected Waters: As a nationwide, general permit program, activities proposed could affect any water of the state, defined in ORS 468B.005 as lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon, and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface or underground waters) that are located wholly or partially within or bordering the state or within its jurisdiction.

DEQ has not designated any Outstanding Waters in Oregon. High Quality Waters include the Clackamas River, the North Santiam River, and the McKenzie River (above river mile 15), as described in DEQ's Three Basin Rule (OAR 340-041-0350) and all waterbodies that are *not* listed for any parameters per the Clean Water Act Section 303(d) list of impaired waterbodies. Water Quality Limited Waters include all waterbodies listed as impaired, including those for which a Total Maximum Daily Load (TMDL) has been developed to address impairments, in DEQ's most current Water Quality Assessment Integrated Report (available at: http://www.deq.state.or.us/wq/assessment/rpt0406/search.asp).

6.0 Beneficial Uses: Both Oregon Law and the federal Clean Water Act are structured to require that water quality be protected and maintained so that existing designated and potential beneficial uses of public waters are not impaired or precluded by degraded water quality. Designated beneficial uses of Oregon's waters are available at: http://www.deq.state.or.us/wq/standards/uses.htm. In general, it is assumed that achieving a water quality standard that fully protects the most sensitive beneficial use, then all beneficial uses are fully protected.

7.0 Potential Modification of Waters of the State and Antidegradation Evaluation: In consideration of the activities proposed for authorization under the USACE 2012 NWP package, DEQ has determined that impacts to waters of the state could be reasonably expected to occur.

For activities that DEQ has determined would result in more than minimal potential water quality and beneficial use impacts, DEQ has not evaluated these categories for certification under this

"programmatic" 401 decision, but rather, will evaluate each individually in order to provide conditions or denial of certification protective of water quality.

The majority of the proposed activities will be limited in duration and magnitude of impact. This is because these activities are short-term and are limited in scope by the language of the permitted categories, definitions, and general conditions. The Portland District Regional Conditions further limit the location, scope, timing, and methodology of permitted activities, as well as providing additional protective measures and assurances for implementation of contingency and compensatory mitigation measures.

In consideration of the potential for exceedance of the Turbidity standard and long-term impacts, such as generation of polluted stormwater runoff from new and existing impervious surfaces made contiguous as a result of project activities, DEQ has included additional general water quality conditions to limit the magnitude and duration of allowable short-term exceedances and avoidance of long-term exceedances. Implementation of these conditions will address the majority of potential impacts to the water quality criteria of Bacteria, Biocriteria, Dissolved Oxygen, Narrative Criteria, Nuisance Phytoplankton Growth, pH, Temperature, Total Dissolved Gas, Total Dissolved Solids, Toxic Substances, Turbidity, and Basin-Specific Criteria.

In addition, DEQ has identified 14 categories of activities (as noted in Tables 10.1 and 10.2 below) that require additional category specific water quality conditions to further limit activities or provide additional control measures to protect water quality and beneficial uses that could be impaired as a result of these activities.

As such, DEQ is reasonably assured that no significant lowering of water quality will occur as a result of the actions proposed for certification or partial certification, and these actions will be in compliance with DEQ's Antidegradation Policy, provided all permit limitations, national general conditions regional general and category specific conditions and water quality general and category specific conditions are included in the federal permit and strictly adhered to by the permittee and their contractors.

8.0 Evaluation of Other Water Quality Related Requirements of State Law: In consideration of state statutes and rules promulgated pursuant to statutes with explicit references to water quality, factors necessary for maintenance of, or evaluation of water quality, or reasonably expected impacts to water quality that could be applicable to the actions authorized by the various categories of the USACE 2012 NWP permit, DEQ has identified the following potential water quality related requirements of state law:

TABLE 8.0:
OTHER POTENTIAL WATER QUALITY RELATED REQUIREMENTS OF STATE LAW

STATUTE (ORS) OR RULE (OAR)	SUMMARY
ORS 196.795 to 196.990	Requires that permits be obtained from DSL prior to any fill and removal of material from the bed or banks of any stream. Such permits, when issued, may be expected to contain conditions to assure protection of water quality so as to protect fish and aquatic habitat.
ORS 496.012	Sets wildlife policy for prevention of depletion of indigenous species and toward wildlife resource decisions to be made in the best social, economical and recreational interests of all user groups.
ORS 496.164	Provides for cooperation and technical assistance to other agencies with regard to wildlife resource management.

ORS 496.170 to 496.192	Requires collection and analysis of scientific data to determine and inventory biological status of species, develop conservation strategies, and provide recommendations to other agencies regarding actions affecting threatened or endangered species.
OAR 635-007-0502 et. seq.	Native fish conservation policy – protection of natural ecological communities and habitats tailored to individual watersheds and situations.
OAR 635-059-0000 et. seq.	Aquatic invasive species control.
OAR 635-100-0150	Requires consultation with ODFW on affects to endangered species.
OAR 635-410-0000	Natural resource losses.
OAR 635-412-0005 et. seq.	Addresses fish passage.
OAR 635-413-0000 et. seq.	Fish habitat mitigation policy.
OAR 635-500-0002 et. seq.	Addresses fish management plans.
ORS 468B.155	Prevention of groundwater contamination.
ORS 468B.160 (5)	Triggers action to prevent groundwater contamination or restore acceptable levels.
OAR 340-040-0030	Permitted operation (5) action requirements and (6) remedial action requirements.
OAR 340-041-0350	Prohibits new or increased wastewater discharge in the McKenzie, Clackamas and North Santiam rivers.
OAR 340-045	Pertaining to NPDES and WPCF permits.
ORS 466.635 to 466.645	Requirements for reporting and cleanup of spills of petroleum products and hazardous materials.
ORS 197.180	State agencies are required to make decisions in programs affecting land use that comply with Statewide Goals and that are compatible with those local land use plans and regulations that have been determined to comply with the Goals. Plans and regulations that comply with the Goals are referred to as "acknowledged."
ORS 541-351 et. seq.	Oregon Plan for Salmon and Watersheds.
OAR 690-009	Groundwater interference with surface water.
OAR 690-010	Appropriation and use of groundwater.
OAR 690- 012	Out-of-basin diversion.
OAR 690-020	Dam safety.
OAR 690-28	Surface water registrations.
OAR 690-033	Standards for new appropriations.
OAR 690-051	Standards for appropriation and use of water for hydroelectric projects.
OAR 690-077	In-stream water rights.
OAR 690-086	Water management and conservation plans.

In compliance with 33 USC 1341(d) and OAR 340-048-0025, DEQ has included conditions in the 401 Water Quality Certification that are consistent with these other requirements of state law. However, issuance of a 401 Water Quality Certification does not obviate the need for any applicable permits, licenses, or other permissions required by local, state, or federal laws as interpreted by the agency charged with implementing the laws.

9.0 Evaluation of Compliance with Clean Water Act Sections 301, 302, 303, 306, and 307: Sections 301, 302, 306, and 307 of the federal Clean Water Act establish effluent limitations, water quality related effluent limitations, national standards of performance for new sources, and toxic and pretreatment standards, respectively. These requirements relate to point source discharges and are the foundation for conditions to be incorporated in National Pollutant Discharge Elimination System permits issued to the point sources. Activities authorized under USACE NWP categories, and certified by DEQ under the 2012 NWP 401 Water Quality Certification must also apply for, obtain, and implement all required NPDES permits.

Section 303 of the Act relates to Water Quality Standards and Implementation Plans. The EPA has adopted regulations to implement Section 303 of the Act. Oregon's Environmental Quality Commission has adopted water quality standards consistent with the requirements of Section 303 and the applicable EPA rules. The EQC standards are codified in Oregon Administrative Rules Chapter 340, Division 41. The EPA has approved the Oregon standards pursuant to the

requirements of Section 303 of the Act. Therefore, activities authorized under USACE's 2012 NWPs must comply with Oregon Water Quality Standards and Total Maximum Daily Loads to qualify for certification. In section 7.0 Potential Modification of Waters of the State and Antidegradation Evaluation, DEQ considered potential impacts within each category of activity and detailed conditions necessary for DEQ to include in the 401 Water Quality Certification decision in order to ensure compliance with water quality standards, TMDLs, and other policies.

10.0 Certification Decision: A list of DEQ water quality certification conditions, both general and activity specific, is attached to and made a part of this 401 WQC. Each activity considered for authorization under the 2012 Nationwide Permit Program in Oregon must comply with the applicable conditions and criteria. DEQ reserves the right to modify these conditions as necessary to ensure compliance with water quality standards and programs of any permit, license, or project where necessary on a case-by-case basis.

Based on DEQ's evaluation of the 2012 NWPs and analysis of authorizations in Oregon by category over the duration of the previous 2007 NWP package, DEQ is reasonably assured that authorizations issued under the 2012 NWP package will be consistent with applicable provisions of Sections 301, 302, 303, 306, and 307 of the federal Clean Water Act, state water quality standards set forth in OAR Chapter 340 Division 41, and other appropriate requirements of state law, provided the conditions in the Appendix are made part of the USACE permits and are strictly adhered to by permittees and their contractors.

10.1 Certified NWP Categories

Table 10.1 lists the NWP categories that are water quality certified subject to all applicable NWP general conditions, USACE Portland District regional conditions and general and category specific water quality conditions are contained in the Appendix to this 401 certification.

TABLE 10.1: CERTIFIED 2012 NWP CATEGORIES

#	CERTIFIED CATEGORY	NOTES
1	Aids to Navigation	Section 10 with minimal, if any, discharge
2	Structures in Artificial Canals	Section 10 with minimal, if any, discharge
3	Maintenance	General conditions appropriate
4	Fish and Wildlife Harvesting, Enhancement, and Attraction Devices and Activities	Minimal impact
5	Scientific Measurement Devices	Minimal impact
6	Survey Activities	Minimal impact
9	Structures in Fleeting and Anchorage Areas	Section 10 with minimal, if any, discharge
10	Mooring Buoys	Section 10 with minimal, if any, discharge
11	Temporary Recreation	Section 10 with minimal, if any, discharge
12	Utility Line Activities	Specific conditions needed
14	Linear Transportation Projects	Specific conditions needed
15	US Coast Guard Bridges	General conditions appropriate
18	Minor Discharges	General conditions appropriate
19	Minor Dredging	General conditions appropriate

20	Response Operations for Oil and Hazardous Substances	Specific conditions needed
22	Removal of Vessels	Specific conditions needed
23	Approved Categorical Exclusions	General conditions appropriate
25	Structural Discharges	Minimal impact
27	Aquatic Habitat Restoration, Establishment, & Enhancement Activities	General conditions appropriate
28	Modifications of Existing Marinas	Section 10 with minimal, if any, discharge
29	Residential Developments	General conditions appropriate
30	Moist Soil Management for Wildlife	Minimal impact
32	Completed Enforcement Actions	General conditions appropriate
33	Temporary Construction, Access and Dewatering	General conditions appropriate
35	Maintenance Dredging of Existing Basins	Section 10 with minimal, if any, discharge
36	Boat Ramps	General conditions appropriate
37	Emergency Watershed Protection and Rehabilitation	Minimal impact
38	Cleanup of Hazardous and Toxic Waste	Specific conditions needed
39	Commercial & Institutional Developments	General conditions appropriate
41	Reshaping Existing Drainage Ditches	Specific conditions needed
42	Recreational Facilities	Specific conditions needed
45	Repair of Uplands Damaged by Discrete Events	General conditions appropriate
48	Existing Commercial Shellfish Aquaculture Activities	General conditions appropriate
51	Land-Based Renewable Energy Generation Facilities	Specific conditions needed

10.2 Partially Certified Nationwide Permits

The specified sections of the following NWP categories are denied certification and must undergo individual review and evaluation for 401 Water Quality Certification. Applications which do not include the prohibited sections are certified, subject to all applicable NWP general conditions, USACE Portland District regional conditions and general and category specific water quality conditions contained in the Appendix to this 401 certification.

TABLE 10.2:
PARTIALLY CERTIFIED 2012 NWP CATEGORIES

#	PARTIALLY CERTIFIED CATEGORY	ACTIVITES DENIED 401 CERTIFICATION
7	Outfall Structures & Associated Intake Structures	Discharge outfalls: 1) Not subject to an NPDES permit; or 2) That do not demonstrate pollutant removal to meet water quality standards prior to discharge to waters of the state are denied certification.
13	Bank Stabilization	Projects that: 1) Do *not* include bioengineering (unless a registered professional engineer identifies non-bioengineered solutions as the *only* way to protect an *existing* transportation related structure); or 2) That proposes permanent fill in adjacent wetlands are denied certification.
16	Return Water from Contained Upland Disposal Areas	Return water exceeding chronic water quality criteria for toxics is denied certification.

31	Maintenance of Existing Flood Control Facilities	Projects in streams with Temperature TMDLs that propose vegetation removal are denied certification.
43	Stormwater Management Facilities	1) In-stream stormwater facilities, 2) Discharge outfalls not subject to and NPDES permit, and 3) Proposals that do not demonstrate pollutant removal to meet water quality standards prior to discharge to waters of the state are denied certification.
44	Mining Activities	Projects that do *not* obtain an NPDES 700-PM or Individual permit are denied certification.

10.3 Nationwide Permits Denied Certification

The following NWP categories are denied water quality certification in their entirety. Each category was reviewed and it was determined that: potential water quality and beneficial use impacts would be beyond that considered minimal; the activity was not likely to occur in Oregon; inadequate data was available for DEQ to fully evaluate potential water quality and beneficial use impacts; or the category was empty (reserved). Permittees wishing to pursue NWPs for projects in these categories must submit complete project information and water quality impacts analysis directly to DEQ in order to undergo individual 401 Water Quality Certification evaluation and fulfill public participation requirements. 401 Water Quality Certification application and process information is available at: http://www.deq.state.or.us/wq/sec401cert/removalfill.htm.

TABLE 10.3:
2012 NWP DENIED CATEGORIES

#	DENIED CATEGORY
8	Oil & Gas Structures on the Outer Continental Shelf
17	Hydropower Projects
21	Surface Coal Mining Activities
24	Indian Tribe or State Administered Section 404 Program
26	[Reserved]
34	Cranberry Production Activities
40	Agricultural Activities
46	Discharges in Ditches
47	[Reserved]
49	Coal Re-mining Activities
50	Underground Coal Mining
52	Water-Based Renewable Energy Generation Pilot Projects

11.0 Duration of Certification: This 401 Water Quality Certification decision will be in effect from the date of signature, April 9, 2012, until expiration of the USACE 2012 NWP package.

12.0 Opportunity to Appeal: If USACE is dissatisfied with the conditions contained in this certification, a contested case hearing may be requested, in accordance with OAR 340-048-0045. Such request must be made in writing to DEQ's Office of Compliance and Enforcement at 811SW 6th Avenue, Portland Oregon 97204, within 20 days of the mailing of this certification.

Please direct any questions about this 2012 NWP 401 WQC to the DEQ 401 Water Quality Certification Coordinator at (503) 229-6030, or by email at anderson.peter@deq.state.or.us. Thank you for your continued cooperation in protecting Oregon's water quality and natural resources.

Sincerely,

Steve Mrazik,
Water Quality Manager
Northwest Region

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cc: Juna Hickner, DLCD
Marc Liverman, NMFS
Yvonne Vallette, EPA
Joe Zisa, USFWS
Jon Germond, ODFW
Bill Ryan, DSL

Appendix

General Conditions

In addition to all USACE national and regional permit conditions, the following 401 Water Quality Certification conditions apply to all NWP categories certified or partially certified. Additional 401 Water Quality Certification category specific conditions follow, which must also be complied with as applicable.

1) **Turbidity:** All Permittees must implement all reasonably availably technological controls and management practices to meet the standard in rule of no more than a 10% increase in project caused turbidity above background levels. However, if all reasonably available controls and practices are implemented by a permittee, turbidity exceedances of more than 10% above background are allowed for limited times depending on the severity of the increase, as specified in this condition.

   a. **Monitoring and Compliance Requirements:** Permittees must monitor and record in a daily log stream turbidity levels during work below ordinary high water, compare turbidity caused by authorized actions to background levels, and adapt activities to minimize project-caused turbidity. Required monitoring steps include:

      i. Identify two monitoring locations:

         A. Background location: A relatively undisturbed location, approximately 100 feet upcurrent from the disturbing activity; and,

         B. Compliance location: A location downcurrent from the disturbing activity, at approximately mid-depth, within any visible plume, and at the distance that corresponds to the size of the waterbody where work is taking place as listed in the table below:

WETTED STREAM WIDTH	COMPLIANCE DISTANCE
Up to 30 feet	50 feet
>30 feet to 100 feet	100 feet
>100 feet to 200	200 feet
>200 feet	300 feet
LAKE, POND, RESERVOIR	Lesser of 100 feet or maximum surface dimension

      ii. Determine Compliance:

         A. At the start of work, measure turbidity at both locations and record in the daily log date, time, location, tidal stage (if waterbody is tidally influenced), and turbidity levels at each point and

comparison. Permittee must also record in the daily log all controls and practices implemented at start of work.

B. During work, measure turbidity at both locations at the frequency directed in the tables below and record in the daily log date, time, location, tidal stage (if waterbody is tidally influenced), and turbidity measurements.

C. Turbidity measurements must be representative of stream turbidity when the activity is being conducted. Measurements can not be taken during a cessation of activity.

D. If project caused turbidity is elevated above background, Permittee must implement additional controls and practices and monitor both points again as described below for either monitoring method. A description of the additional controls and the date, time and location where they are implemented must be recorded in the daily log:

MONITORING WITH A TURBIDIMETER		
ALLOWABLE EXCEEDANCE TURBIDITY LEVEL	ACTION REQUIRED AT 1ST MONITORING INTERVAL	ACTION REQUIRED AT 2ND MONITORING INTERVAL
0 to 5 NTU above background	Continue to monitor every 4 hours	Continue to monitor every 4 hours
5 to 29 NTU above background	Modify controls & continue to monitor every 4 hours	Stop work after 8 hours at 5-29 NTU above background
30 to 49 NTU above background	Modify controls & continue to monitor every 2 hours	Stop work after 2 confirmed hours at 30-49 NTU above background
50 NTU or more above background	Stop work	Stop work

VISUAL MONITORING*		
No plume observed	Continue to monitor every 4 hours	Continue to monitor every 4 hours
Plume observed within compliance distance	Modify controls & continue to monitor every 4 hours	Stop work after 8 hours with an observed plume within compliance distance
Plume observed beyond compliance distance	Stop work	Stop work
**Note: Monitoring visually may require stopping work as soon as the visual plume exceeds the waterbody specific compliance distance. However, using a turbidimeter can allow work to continue based on a more precise determination of the severity of turbidity increase over time.*		

iii. Work must **stop immediately for the remainder of that 24-hour period** if:

A. A visible turbidity plume extends beyond the compliance distance; or,

B. Turbidity is measured at the compliance point at:

I. 50 NTU or more over background at any time;

II. 30 NTU over background for 2 hours; or

III. 5-29 NTU over background for 8 hours.

iv. Work may continue if no visible plume is observed, turbidity measured at the compliance point is no more than 0-5 NTU above background, or additional control measures can be applied to keep the visible plume within the compliance distance, measured turbidity ranges, and durations listed in the tables above.

b. **Turbidity Control Measures** - The permittee must implement all reasonably available controls and practices to minimize turbidity during in-water work, which may include, but are not limited to:

i. Schedule, sequence or phase work activities so as to minimize in-water disturbance and duration of activities below ordinary high water;

ii. Install and maintain containment measures to prevent erosion of upland material to waterways and wetlands, isolate work areas from flowing waters, and prevent suspension of in-stream sediments to the maximum extent practicable;

iii. Apply control measures for all in-stream digging, including but not limited to: employing an experienced equipment operator; not dumping partial or full buckets of material back into the wetted stream; adjusting the volume, speed, or both of loads or hydraulic suction equipment; or by using a closed-lipped environmental bucket;

iv. Limit the number and location of stream crossing events. If equipment must cross a waterway, establish temporary crossing sites at an area with stable banks, where the least vegetation disturbance will occur, shortest distance across water, oriented perpendicular to the stream, and supplement with clean gravel or other temporary methods as appropriate;

v. Place excavated, disturbed, and stockpiled material so that it is isolated from the edge of waterways and wetlands and not allowed to enter waters of the state uncontrolled; and,

vi. Apply other effective turbidity control techniques, such as those in Appendix D and throughout DEQ's *Oregon Sediment and Erosion Control Manual*, April 2005, http://www.deq.state.or.us/wq/stormwater/docs/escmanual/appxd.pdf.

c. **Reporting:** Copies of daily logs for turbidity monitoring must be made available to DEQ and other regulatory agencies upon request. The log must include:

i. Background NTUs or observation, compliance point NTUs or observation, comparison of the points in NTUs or narrative, and location, time, date, and tidal stage (if applicable) for each reading or observation.

ii. A narrative discussing all exceedances, controls applied and their effectiveness, subsequent monitoring, work stoppages, and any other actions taken.

2) **Stormwater Discharge Pollution Prevention:** All projects that involve land disturbance or impervious surfaces must implement prevention or control measures to avoid discharge of pollutants in stormwater runoff to waters of the state.

a. For land disturbances during construction, the permittee must obtain and implement permits where required (see: http://www.deq.state.or.us/wq/stormwater/construction.htm) and follow DEQ's *Oregon Sediment and Erosion Control Manual*, April 2005 (or most current version), http://www.deq.state.or.us/wq/stormwater/docs/escmanual/appxd.pdf.

b. Following construction, prevention or treatment of on-going stormwater runoff from impervious surfaces must be provided (including but not limited to NWP categories 3, 12, 14, 15, 28, 29, 31, 32, 36, 39, 42, 43, and 51). DEQ encourages prevention of discharge by managing stormwater on site through Low Impact Development principles and other prevention techniques. Assistance in developing an approvable stormwater management plan is available in DEQ's *Stormwater Management Plan Submission Guidelines for Removal/Fill Permit Applications Which Involve Impervious Surfaces*, January 2012 (or most current version), available at: http://www.deq.state.or.us/wq/sec401cert/docs/stormwaterGuidlines.pdf.

c. In lieu of a complete stormwater management plan, the applicant may submit:

i. Documentation of acceptance of the stormwater into a DEQ permitted National Pollutant Discharge Elimination Strategy (NPDES) Phase I or II Municipal Separate Storm Sewer System (MS4); or

ii. Reference to implementation of a programmatic process developed to achieve these expectations, and acknowledged by DEQ as adequately addressing pollution control or reduction through basin-wide post-construction storrmwater management practices.

3) **Vegetation Protection and Restoration:** Riparian, wetland, and in-water vegetation in the authorized project area must be protected from unnecessary disturbance to the maximum extent practicable through methods including:

a. Minimization of project and impact footprint;

b. Designation of staging areas and access points in open, upland areas;

c. Fencing or other barriers demarking construction areas;

d. Use of alternative equipment (e.g., spider hoe or crane); and,

e. Replacement - If authorized work results in unavoidable vegetative disturbance that has not been accounted for in planned mitigation actions; riparian, wetland and in-water vegetation must be successfully reestablished to a degree that it functions (for water quality purposes) at least as well as it did before the disturbance. The vegetation must be reestablished by the completion of authorized work.

4) **Land Use Compatibility Statement:** In accordance with OAR 340-048-0020(2) (i), each permittee must submit findings prepared by the local land use jurisdiction that demonstrates the activity's compliance with the local comprehensive plan. Such findings can be submitted using Block 7 of the USACE & DSL Joint Permit Application, signed by the appropriate local official and indicating:

a. "This project is consistent with the comprehensive plan and land use regulations;" or,

b. "This project will be consistent with the comprehensive plan and land use regulations when the following local approvals are obtained," accompanied by the obtained local approvals.

c. Rarely, such as for federal projects on federal land, "this project is not regulated by the comprehensive plan" will be acceptable.

5) A copy of all applicable 401 WQC conditions must be kept on the job site and readily available for reference by the permittee, their contractors, DEQ, USACE, NMFS, USFWS, DSL, ODFW, and other appropriate state and local government inspectors.

6) DEQ may modify or revoke these 401 WQC conditions, in accordance with OAR 340-048-0050, in the event that project activities are having a significant adverse impact on state water quality or beneficial uses.

Category Specific Conditions

In addition to all national and regional conditions of the USACE permit and the 401 Water Quality Certification general conditions above, the following conditions apply to the noted specific categories of authorized activities.

NWP 7 – Outfall Structures and Associated Intake Structures:

7.1) The following actions are denied certification:

a. Discharge outfalls that are not subject to an NPDES permit; and,

b. Outfalls that discharge stormwater without pollutant removal demonstrated to meet water quality standards prior to discharge to waters of the state.

7.2) If a permittee cannot obtain an NPDES permit or submit an approvable stormwater management plan per DEQ's Guidelines (at: http://www.deq.state.or.us/wq/sec401cert/docs/stormwaterGuidlines.pdf), the permittee must submit complete project information and water quality impacts analysis directly to DEQ in order to undergo individual 401 WQC evaluation and fulfill public participation requirements.

NWP 12 – Utility Lines:

12.1) For proposals that include directionally-bored stream or wetland crossings:

a. All drilling equipment, drill recovery and recycling pits, and any waste or spoil produced, must be completely isolated, recovered, then recycled or disposed of to prevent entry into waters of the state. Recycling using a tank instead of drill recovery/recycling pits is preferable;

b. In the event that drilling fluids enter a water of the state, the equipment operator must stop work, immediately initiate containment measures and report the spill to the Oregon Emergency Response System (OERS) at 800-452-0311.

c. Prior to cleaning up drilling fluids spilled into waters of the state, cleanup plans must be submitted and approved by the regulatory agencies; and

d. An adequate supply of materials needed to control erosion and to contain drilling fluids must be maintained at the project construction site and deployed as necessary.

NWP 13 – Bank Stabilization:

13.1) Projects that do not include bioengineering are denied certification, unless a registered professional engineer provides a written statement that non-bioengineered solutions are the only means to protect an existing transportation-related structure.

13.2) To apply for certification for a project without bioengineering, the permittee must submit complete project information and water quality impacts analysis directly to DEQ in order to undergo individual 401 WQC evaluation and fulfill public participation requirements.

NWP 14 – Linear Transportation:

14.1) For projects that include bank stabilization, bioengineering must be a component of the project, unless a registered professional engineer provides a written statement that non-bioengineered solutions are the only means to protect an existing transportation related structure.

14.2) To apply for certification for a project without bioengineering, the permittee must submit complete project information and water quality impacts analysis directly to DEQ in order to undergo individual 401 WQC evaluation and fulfill public participation requirements.

NWP 16 - Return Water from Contained Upland Disposal Areas: Water quality criteria and guidance values for toxics, per OAR 340-041-0033, are available in Tables 20, 33A, 33B, and 33C at: http://www.deq.state.or.us/wq/standards/toxics.htm#Cur.

16.1) Return to waters of the state of water removed with contaminated dredged material that exceeds a chronic or acute toxicity water quality standard is denied certification.

16.2) Water removed with contaminated dredged material that could or does exceed chronic water quality criteria must be contained and disposed of at an appropriately sized and sealed upland facility by evaporation or infiltration.

16.3) If a Modified Elutriate Test (MET) is performed for the known contaminants of concern (CoCs) and CoC concentrations are below DEQ chronic water quality criteria, return water discharge is not limited.

a. The MET must be performed before dredging.

b. DEQ must approve the list of CoCs and analytical method prior to the permittee performing the MET.

c. DEQ must review the results and provide approval of discharge from return water, in writing, prior to dredging.

NWP 20 – Response Operations for Oil and Hazardous Waste:

20.1) Coordination with DEQ's Emergency Response program is required. See: http://www.deq.state.or.us/lq/cu/emergency/index.htm.

NWP 22 – Removal of Vessels:

22.1) Coordination with DEQ's Emergency Response program is required. See: http://www.deq.state.or.us/lq/cu/emergency/index.htm.

NWP 31 – Maintenance of Existing Flood Control Facilities:

31.1) Projects at existing facilities in streams with Temperature TMDLs and that propose net permanent, riparian vegetation removal are denied certification.

31.2) To apply for certification for projects where riparian vegetation removal is unavoidable and vegetation cannot be re-established, the permittee must submit complete project information and water quality impacts analysis directly to DEQ in order to undergo individual 401 WQC evaluation and fulfill public participation requirements.

NWP 38 – Cleanup of Hazardous and Toxic Waste:

38.1) For removal of contaminated material from waters, dredging method is limited to diver assisted hydraulic suction, hydraulic suction, closed-lipped environmental bucket, or excavation in the dry.

a. For in-water isolation measures, the permittee is referred to Appendix D of DEQ's *Oregon Erosion and Sediment Control Manual*, April 2005 (or most current version), at: http://www.deq.state.or.us/wq/stormwater/docs/escmanual/appxd.pdf.

38.2) Discharge to waters resulting from dewatering during dredging or release of return water from an upland facility is prohibited except as provided below.

a. All water removed with sediment must be contained and disposed of at an appropriately sized and sealed upland facility by evaporation or infiltration; or,

b. A Modified Elutriate Test (MET) may be performed for the known CoCs and if CoC concentrations are below DEQ chronic water quality criteria, return water discharge is not limited.

i. The MET must be performed before dredging.

ii. DEQ must approve the list of CoCs and analytical method prior to the

permittee performing the MET.

iii. DEQ must review the results and provide approval of discharge from dewatering and return water in writing prior to dredging.

38.3) Dredged material must be disposed of in compliance with DEQ Rules governing Hazardous Waste (see: http://www.deq.state.or.us/lq/hw/hwmanagement.htm) or Solid Waste (see: http://www.deq.state.or.us/lq/sw/index.htm).

38.4) The new in-water surface must be managed to prevent exposure or mobilization of contaminants.

NWP 41 - Reshaping Existing Drainage Ditches:

41.1) To the extent practicable, permittees must work from only one bank in order to minimize disturbance to existing vegetation, preferably the bank with the least existing vegetation;

41.2) Following authorized work, permittee must establish in-stream and riparian vegetation on reshaped channels and side-channels using native plant species wherever practicable. Plantings must be targeted to address water quality improvement (e.g., provide shade to water to reduce temperature or provide bank stability through root systems to limit sediment inputs). Planting options may include clustering or vegetating only one side of a channel, preferably the side which provides maximum shade.

NWP 42 – Recreational Facilities:

42.1) For facilities that include turf maintenance actions, the permittee must develop and implement an Integrated Pest Management Plan (IPM) that describes pest prevention, monitoring and control techniques with a focus on prevention of chemical and nutrient inputs to waters of the state, including maintenance of adequate buffers for pesticide application near salmonid streams, or coverage under an NPDES permit, if required (information is available at: http://www.deq.state.or.us/wq/wqpermit/pesticides.htm).

NWP 43 – Stormwater Management Facilities:

43.1) Projects that propose the following elements are denied certification:

a. In-stream stormwater facilities;

b. Discharge outfalls not subject to an NPDES permit; and,

c. Proposals that do not demonstrate pollutant removal to meet water quality standards prior to discharge to waters of the state.

43.2) To apply for certification for a project with in-stream stormwater facilities, without an NPDES permit, or without submittal of an approvable stormwater management plan per DEQ's Guidelines (at: http://www.deq.state.or.us/wq/sec401cert/docs/stormwaterGuidlines.pdf), the permittee must submit complete project information and water quality impacts analysis directly to DEQ in order to undergo individual 401 WQC evaluation and fulfill public participation requirements.

NWP 44 – Mining Activities:

44.1) Projects that do not obtain an NPDES 700-PM or Individual permit are denied certification.

44.2) To apply for certification for a project without an NPDES permit, the permittee must submit complete project information and water quality impacts analysis directly to DEQ in order to undergo individual 401 WQC evaluation and fulfill public participation requirements.

NWP 51 – Land-Based Renewable Energy Generation Facilities:

51.1) For associated utility lines with directionally-bored stream or wetland crossings proposed, condition 12.1) must be applied.

Fill/Removal General Authorization

Oregon
Theodore R. Kulongoski, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us.

State Land Board

Theodore R. Kulongoski
Governor

Kate Brown
Secretary of State

Ted Wheeler
State Treasurer

RECEIVED
DEC 2 2010
ENVIRONMENTAL SERVICES

December 1, 2010

mmc600/600
CITY OF PORTLAND
BUREAU OF ENVIRONMENTAL SERVICES
ATTN SEAN BISTOFF
1120 SW 5TH AVENUE ROOM 1000
PORTLAND OR 97212

RE: General Authorization for Fish Habitat Enhancement
DSL Application Number 45925-GA: Oaks Bottom
T. 1S, R. 1E, Section 14 & 23, Portland, Multnomah County

Dear Mr. Bistoff:

On October 22, 2010 we received your complete application to conduct removal or filling in a wetland adjacent to the Willamette River for fish habitat enhancement purposes. Based on our review of your application, and comments provided by interested resource agencies, we hereby authorize the project, subject to the conditions outlined in OAR 141-089-0120 (enclosed) and to the following additional conditions:

1. Fill and removal activities in Willamette River (below the OHWL) shall be conducted between July 1 and October 31, unless otherwise coordinated with ODFW and approved in writing by ODSL.

Upon completion of the project, an Oregon Watershed Restoration Inventory (OWRI) Reporting Form must be completed and copies sent to the Oregon Watershed Enhancement Board and the Department of State Lands. Forms can be downloaded or filled out online at http://www.oregon.gov/OWEB/MONITOR/OWRI.shtml. Please make sure the above DSL Application Number is on the form. Attach photographs of the restoration/enhancement area to the Department's copy or email them with the completed online PDF to an email account.

This authorization expires when the work identified in the application is completed. The work must be completed by January 1, 2012. Please be aware that this authorization is not a land use approval. You must also receive authorization, when required, from the local planning department and the U.S. Army Corps of Engineers before beginning construction. If you have any questions regarding this authorization, please contact me at 503.986.5255.

Sincerely,

Michael V. McCabe

Michael V. McCabe
Senior Resource Coordinator
Wetlands and Waterways Conservation Division

Enclosure

c: James Holm, Corps of Engineers (Portland)
Elizabeth Ruther, ODFW (Sauvie Island)

Department of State Lands

Division 141-089

GENERAL AUTHORIZATIONS

Effective: March 1, 2009

General Authorization for Fish Habitat Enhancement

141-089-0100
Purpose and Applicability
(1) This rule sets forth conditions under which an applicant may, without an individual removal-fill permit from the Department, place or remove material within waters of this state (including Essential Salmon Habitat as designated in OAR 141-102) for the purposes of fish habitat enhancement (OAR 141-085).
(2) A letter of authorization from the Department is required prior to any person commencing an activity authorized by this general authorization. The term and conditions of issuance shall be stated in the letter of authorization. The term shall not exceed the expiration date of this general authorization. A letter of authorization is transferable to another person in accordance with OAR 141-085.
(3) This general authorization is made pursuant to ORS 196.850 and is based upon the determination that the authorized activities are similar in nature and when conducted in accordance with this general authorization will not result in long-term harm to water resources of the state, and will cause only minimal individual and cumulative environmental effects.
(4) This general authorization does not apply to activities or waters exempt from the removal-fill law as described in OAR 141-085.
(5) Unless specified, the terms used in this general authorization (GA) are defined in OAR 141-085.
(6) Other structures, uses or activities included in any application for this general authorization that are subject to another general authorization under OAR 141-089 or individual permit under OAR 141-085 will not be authorized or covered by this general authorization. An application encompassing multiple activities must be processed as an individual removal-fill permit under OAR 141-085 except a single application, for activities eligible for General Authorizations for Fish Enhancement and Wetland Restoration and Enhancement may be used in combination to authorize the same project.
(7) Activities and/or projects, which qualify for this general authorization, are exempt from removal-fill permit fees as described in OAR 141-085.
(8) In the event a dispute arises as to the applicability of this general authorization to any project application, the Department shall make the final determination. The Department shall rely upon the applicant's project application and supporting documentation for its decision.
Stat. Auth.: ORS 196.850
Stats. Implemented: ORS 196.800 - 196.990

141-089-0105
Eligibility Requirements; Ineligible Projects
(1) In order to issue a letter of authorization the Department shall determine that the project is eligible and meets the applicable mandatory requirements as described in this rule. To be eligible a project must:
(a) Be constructed for the primary purpose of improving aquatic habitat;
(b) Consist of fill or removal of material such as:
(A) Randomly placed rock
(B) Deflectors
(C) Rock and log weirs
(D) Gravel placement
(E) Pool and pond construction
(F) Back/side channel construction
(G) Channel reconstruction
(H) Barrier removal and placement of fish passage ways
(I) Woody material
(2) A project is not eligible for this general authorization if:
(a) The project fails to meet any eligibility or mandatory requirements;
(b) The project is not for the primary purpose of improving aquatic habitat; or
(c) The project application includes any structure, use or activity subject to another general authorization under OAR 141-089 or individual permit under OAR 141-085; except as provided for in 141-089-0205 Wetland Restoration and Enhancement.
Stat. Auth.: ORS 196.850
Stats. Implemented: ORS 196.800 - 196.990

141-089-0110
Mandatory Requirements
The Department shall review each application to ensure that a project complies with the following mandatory requirements:
(1) Be consistent with the Oregon Aquatic Habitat Restoration and Enhancement Guide.
(2) Demonstrate consistency with the Oregon Department of Fish and Wildlife's requirements under ORS 509.580 to 509.645 for upstream and downstream fish passage.
(3) Fills shall be of a size appropriate to the stream, and not exceed 150 cubic yards per site unless otherwise recommended by the Oregon Department of Fish and Wildlife for purposes of providing or improving fish passage (e.g., a simulated stream bottom or reconstructed channel). For purposes of this general authorization, a site can be a single location of the entire project or a component of a project with multiple elements and geographic locations.
(4) Channel reconstruction projects shall restore pre-channelized morphology to channelized streams by providing for sinuosity and width/depth ratios that emulate the natural stream channel, as practicable.
(5) In order to stabilize deflectors, log weirs and other similar structures, the bed and the bank may be stabilized with nonstructural methods or riprap not more than 15 feet

upstream and downstream of the structure. Rock fill shall not exceed 50 cubic yards at each site.
(6) Rock and log weirs and full-spanning boulder weirs may be placed within the bed and banks only if they promote fish passage, prevent streambed degradation and/or recruit spawning gravel and do not require annual reconstruction. Weirs must incorporate a keystone rock or rocks that allow for juvenile fish passage at all flows.
(7) Deflectors may be placed only if they add stream structure and increase habitat complexity.
(8) Clean, river-run gravel used for enhancing or improving spawning areas must come from within the same river system as the placement site and not exceed 100 cubic yards per site.
(9) Pools and ponds shall be designed to allow fish to escape during low water periods. Bed material may be removed to create instream pools and hydrologically connected off-channel ponds, so long as pool depth does not exceed the depth of adjacent pools.
(10) Gravel and bed materials may be removed to create or clear side or back channels.
(11) Artificial barriers to fish passage including but not limited to culverts, tidegates and road crossings (not exempt from the removal-fill law under OAR 141-085) may be removed and fish passage structures may be placed within the bed and banks of waters of this state.
(12) The project may convert wetlands to other waters if the project approximates or restores fish habitat lost by past land use activities. The project shall have only minimal adverse effects to wetlands.
(13) If the project is within a State Scenic Waterway, a scenic waterway removal-fill permit must have been obtained from the Department (unless exempt) in accordance with OAR 141-100.
(14) When necessary to protect and conserve the water resources of the state, the Department may waive and/or modify any conflicting guidelines, mandatory requirements or conditions in either the Fish Habitat Enhancement or Wetland Restoration and Enhancement General Authorizations.
Stat. Auth.: ORS 196.850
Stats. Implemented: ORS 196.800 - 196.990

141-089-0115
Application Requirements; Public Notice Review Process
(1) An application for general authorization under this rule shall be submitted on an application form available from the Department. A complete application is one that contains all the information required in the application packet provided by the Department.
(2) The Department shall notify the applicant within fifteen (15) calendar days of receipt of the application if the application is incomplete or ineligible; otherwise the application will be considered complete. If the application is deemed incomplete, the Department shall notify the applicant and identify the missing, inaccurate or insufficient information. The Department will not continue to process an incomplete application. To re-initiate the application review process the applicant may submit an amended application at any time within twelve (12) months of the original application date. The applicant must resubmit an entire amended application for reconsideration, unless instructed by the

Department to do otherwise. Submission of an amended application commences a new review period.
(3) Once the application is deemed complete, the Department shall provide notice of the application to the adjacent property owners, the local planning department, the local Soil and Water Conservation District, the Oregon Department of Fish and Wildlife, the Oregon Department of Environmental Quality, the Oregon Department of Land Conservation and Development, affected Tribal government, the State Historic Preservation Office, the Oregon Water Resources Department, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service and National Marine Fisheries Service. Diking and drainage districts shall also be notified as applicable. If the project is on a federally designated Wild and Scenic River, the Department shall provide notice to the appropriate U.S. Forest Service or Bureau of Land Management office.
(4) The Department shall consider comments received with fifteen (15) calendar days of the notice date. In the event a party fails to comment within the (15) calendar day period, the Department shall assume the party has no objection to the application.
(5) The Department may waive or shorten the comment period described in (4) above upon a showing by the applicant in the application that the interested parties listed in (3) have previously reviewed and approved the project.
(6) Following the comment period and not more than forty (40) calendar days from the receipt of an application, the Department will determine if the project meets the eligibility and mandatory requirements set out in this general authorization and do one of the following:
(a) Approve the application and issue a letter of authorization to the applicant;
(b) Approve the application and issue a letter of authorization, with project specific conditions, to the applicant; or
(c) Deny the application and notify the applicant. If the Department determines that the proposed project is ineligible or otherwise does not qualify for the general authorization the applicant may submit the project for processing and review as an application for an individual removal-fill permit, as provided in OAR 141-085.
(7) The applicant may request additional time to respond to comments or to satisfy other requirements. The applicant and the Department will agree on a new decision date before the expiration of the 40-day period. If no agreement is reached, the Department will make a final decision within the original 40-day time period
(8) The Department may require an individual removal-fill permit for a project that would otherwise be authorized by this general authorization, if the Department determines that the activity might cause more than minimal individual or cumulative environmental effects or might result in long-term harm to the water resources of the state. The Department may also require an individual removal-fill permit if requested to do so by the Oregon Department of Fish and Wildlife, the Oregon Department of Environmental Quality or the affected local land use planning department.
Stat. Auth.: ORS 196.850
Stats. Implemented: ORS 196.800 - 196.990

141-089-0120
Conditions of Issuance of General Authorization
All holders of a letter of authorization (authorization holder) shall adhere to the conditions of the general authorization.
(1) The authorization holder shall conduct all work in compliance with the comprehensive plan, zoning requirements or other local, state, or federal regulations pertaining to the project. Local land use planning department approval shall be obtained if the project is located within a Federal Emergency Management Agency designated floodway. All other necessary approvals and permits shall be obtained before commencing with the authorized project. All necessary approvals and permits shall be obtained before commencing the project under this general authorization.
(2) The authorization holder shall obtain all necessary access permits or rights-of-way prior to entering lands owned by another for the purposes of completing a project authorized under this general authorization.
(3) The authorization holder shall conduct the activity during the time period recommended by the Oregon Department of Fish and Wildlife, unless after consultation with ODFW, a waiver is granted by Department for a longer or alternative time period.
(4) The authorization holder shall demonstrate that the activity will not interfere with fish passage, as required by the Oregon Department of Fish and Wildlife.
(5) When listed species are present, the authorization holder shall comply with the state and Federal Endangered Species Acts. If previously unknown listed species are encountered during the project, the authorization holder shall contact the Department as soon as possible.
(6) The authorization holder shall not disturb or destroy known archeological sites unless authorized under a permit issued by the State Historic Preservation Office. When previously unknown occurrences of archeological sites are discovered during construction, the authorization holder shall immediately cease work at the discovery site and contact the Department.
(7) The authorization holder shall ensure that the authorized work does not unreasonably interfere with or create a hazard to recreational navigation.
(8) The authorization holder shall ensure that woody vegetation removal is limited to the minimum amount needed to complete the project including construction access and keying in of structures.
(9) The authorization holder shall ensure that areas disturbed in the course of completing the authorized work are revegetated with the same mix of native herbs, shrubs and/or trees in approximately the same numeric proportion as were removed from the site, unless otherwise approved by the Department, except that grass seed mixes of exotics certified free of noxious weeds that will hold the soil and not persist are permitted.
(10) The authorization holder shall ensure that no petroleum products, chemicals or deleterious materials are allowed to enter the waters of this state.
(11) The authorization holder shall adhere to all applicable Department of Environmental Quality (DEQ) water quality requirements. If a 401 Water Quality Certification (WQC) is issued by DEQ in conjunction with a US Army Corps of Engineers 404 permit for the same project, the water quality conditions in the 401 WQC

will govern water quality requirements pertaining to the authorized removal-fill activity. In this event, a copy of the 401 Water Quality Certification shall be retained on site.
(12) The authorization holder shall obtain a water right or reservoir permit, if needed, from the Oregon Department of Water Resources if the project involves a water diversion or impoundment.
(13) The authorization holder may use streambed gravels from the trench excavation for a filter blanket.
(14) Upon completion of the project the authorization holder shall report to the Oregon Watershed Enhancement Board on Restoration Inventory Report forms provided by the Department.
(15) The authorization holder shall keep a copy of the letter of authorization available at the work site whenever the activity is being conducted.
(16) Employees of the Department and all duly authorized representatives shall be permitted access to the project area at all reasonable times for the purpose of inspecting work performed under this authorization.
(17) The Department makes no representation regarding the quality or adequacy of the project design, materials, construction, or maintenance, except to approve the project's design and materials as satisfying the resource protection, scenic, safety, recreation, and public access requirements of ORS Chapters 196 and related administrative rules.
(18) The State of Oregon, and its officers, agents, and employees shall be held harmless from any claim, suit, or action for property damage or personal injury or death arising out of the design, material, construction, or maintenance of the permitted improvements.
(19) The Department may add other project-specific conditions to the letter of authorization as necessary to meet the requirements of the general authorization. Such additional conditions may be needed to ensure that the project will cause only minimal individual and cumulative environmental effects and will not result in long-term harm to water resources of the state.
(20) The Department may, at any time, by notice to affected authorization holders revoke or modify any letter of authorization granted under this general authorization if it determines the conditions of the general authorization are insufficient to minimize individual or cumulative environmental effects.
(21) The authorization holder is responsible for the activities of all contractors or other operators involved in project work covered by the letter of authorization.
Stat. Auth.: ORS 196.850
Stats. Implemented: ORS 196.800 - 196.990

141-089-0125
Violation of General Authorization; Enforcement
Violations of the terms and conditions of this general authorization are subject to administrative and/or legal action, which may result in revocation of the authorization. The authorization holder is responsible for the activities of all contractors or other operators involved in work done at the site or under the authorization.
Stat. Auth.: ORS 196.850
Stats. Implemented: ORS 196.800 - 196.990 & 390.805 - 390.925

141-089-0130
Expiration; Review of General Authorization
(1) This general authorization shall be reviewed by the Department on or before January 1, 2011, at which time it shall be modified, reissued or rescinded. The review will include public notice and opportunity for public hearing. An approval issued prior to expiration of this General Authorization shall remain in effect until January 1, 2012.
(2) Any activities authorized by a letter of authorization issued prior to January 1, 2006 are authorized until the activity is completed or until January 1, 2012, whichever comes first. All conditions of issuance continue to be in force. Activities authorized by this General Authorization that are not completed by January 1, 2012, shall require the submittal of a new application in order to complete the proposed activities. However, a one time 90-day extension will be allowed by the Department, if the applicant provides the Department with a written notice that states that the activities authorized by this General Authorization will be completed within 90 days of January 1, 2012. The Department shall acknowledge and approve in writing the one time 90-day extension.
Stat. Auth.: ORS 196.850
Stats. Implemented: ORS 196.800 - 196.990

Fish Passage Approval

Oregon
Theodore R. Kulongoski, Governor

Department of Fish and Wildlife
Fish Division
3406 Cherry Avenue NE
Salem, OR 97303
503-947-6228
503-947-6256
Fax: 503-947-6202
TTY: 503-947-6339
greg.d.apke@state.or.us
ken.j.loffink@state.or.us

November 18th, 2010

Sean Bistoff
City of Portland Environmental Services
1120 SW 5th Avenue, Room 1000
Portland, OR 97212

Zari Santner
City of Portland Bureau of Parks and Recreation
1120 SW 5th Avenue, Room 1300
Portland, OR 97212

Re: ODFW Fish Passage Approval for the Oaks Bottom Tidal Restoration Project; PA-02-0028

Mr. Bistoff and Ms. Santner,

The Oregon Department of Fish and Wildlife (ODFW) approves, as required by Oregon Revised Statutes (ORS 509.585), the fish passage designs for the Oaks Bottom Tidal Restoration Project located in Multnomah County. The project will improve fish passage in the Oaks Bottom Wildlife Refuge by improving connectivity between Oaks Bottom Spring and the Willamette River. Oaks Bottom Wildlife Refuge is a large tidal wetland that flows into the Willamette River (Oaks Bottom Spring) and relies on the tidal action of the Willamette River for the ingress and egress of fresh water into and out of the wildlife area.

Currently the culvert connecting the tidal wetland with the Willamette River has become perched at low flows and inhibits fish passage as well as the overall functionality of the system. The Oaks Bottom Tidal Restoration Project will replace this culvert with a culvert that meets stream simulation requirements as stated in OAR 635-412-0035 (3). The project will also remove an artificial barrier and re-grade the stream with a series of riffles that will enhance the tidal connection with the Willamette River.

ODFW Fish Passage program staff reviewed the design plans for the Oaks Bottom Tidal Restoration Project, which were received on 10/19/2010, and find the plans meet Oregon Fish Passage design criteria (OAR 635-412-0035 (1)(2(C))(3)(8)). ODFW fish passage

approval for the Oaks Bottom Tidal Restoration Project is contingent on specific items which include:

1. All in-water work for these projects shall occur during the ODFW in-water work window, unless otherwise approved by the Department.
2. The Applicant shall be responsible for all monitoring and maintenance required such that the finished project elements provide adequate passage for native migratory fish as described in the application materials. Monitoring shall entail visual observations during site visits paying special attention to head-cutting and scour as they relate to each constructed riffle and the stream simulation culvert. If monitoring by the Applicant or Department indicates that fish passage is not being provided as described, the Applicant in consultation with the Department shall determine the cause and, during a work period approved by the Department, shall modify the passage structure(s) to adequately provide passage to native migratory fish. Maintenance activities shall include periodic debris removal from the inlet and outlet of the culvert as well as seasonal inspection of the culvert interior to ensure no obstructions form.
3. The Department shall be allowed to inspect the project site at reasonable times for the duration of this approval. Unless prompted by emergency or other exigent circumstances, inspection shall be limited to regular and usual business hours, including weekends.
4. The applicant and contractor shall take special precautions and direction from the ODFW Northwest Watershed District Habitat Biologist to minimize the impacts of construction on native wildlife within the wetland. Specifically, channel re-grade activities shall not disturb American Otter den sites to the extent possible and areas being excluded from re-grade to preserve denning habitat will be clearly marked and fenced for avoidance. Any foreseen impacts shall be discussed and approved by the ODFW habitat biologist (Liz Ruther).

Please retain this email correspondence for your records, as this documents ODFW's approval of fish passage at this site. Please distribute to all project entities as you deem fit. Again, please note that it is your responsibility as the owner operator to maintain the fish passage site as approved (ORS 509.610).

Thank you for cooperation as we worked through the fish passage issues at this site. If you have any questions, please contact me.

Ken Loffink
ODFW – Statewide Assistant Fish Passage Program Coordinator

cc Greg Apke, Statewide Fish Passage Program Coordinator
Alan Ritchey, Fish Screens and Passage Program Manager
Liz Ruther, Northwest Watershed District Habitat Biologist
Fish Passage Project File: PA-02-0028

Communications with State Historic Preservation Office and Tribes

Martz, Merri

From:	Holm, James A NWP <James.A.Holm@usace.army.mil>
Sent:	Wednesday, February 02, 2011 11:51 AM
To:	'Eirik.Thorsgard@grandronde.org'; 'Michael.karnosh@grandronde.org'; 'don.day@grandronde.org'; 'Sally Bird'; 'rkentta@ctsi.nsn.us'
Cc:	'Dennis Griffin'
Subject:	Oaks Bottom Wildlife Refuge Restoration, Corp No. NWP-2007-902, City of Portland-BES, Willamette River, Portland, Multnomah County, OR ; SHPO # 10-2565 (UNCLASSIFIED)
Attachments:	NWP-2007-902 JPA.pdf

Classification: UNCLASSIFIED
Caveats: NONE

Good morning,

The attached City of Portland's Bureau of Environmental Services (BES) project description, maps, and drawings are provided for your review.

The project is within the City of Portland's Oaks Bottom Wildlife Refuge on the east bank of the Willamette River (river mile 15) in SE Portland, Multnomah County, Oregon (Sections 14 and 23, Township 1 South and Range 1 East).

The purpose of the proposed project is to improve overall habitats and to provide fish passage into and out of the refuge through the existing culvert under the railroad tracks/Springwater Trail.

Proposed work in the river, refuge channel, and refuge wetlands includes the following:

Replace the existing 60-inch culvert under the railroad/trail with a 16-ft by 10-ft arch culvert. Remove the existing water-control structure. Excavate contaminated sediments from the refuge channel and reconnect/re-contour the channel to improve habitat complexity. Install riffles, large woody debris, natural substrates, bio-engineered channel banks and native vegetation. Temporary work area isolation in the river and channel, as well as a temporary access point from the Springwater Trail. In total, approximately two acres of wetlands, refuge channel, and culvert area will be disturbed, with ~0.3 acres of jurisdictional fill materials. No work is proposed in the southern reservoir area.

All work will be conducted during the in-water work window for the Willamette River (July 1 to October 31). Site access will use the Springwater Trail. The City will implement standard erosion controls at their work areas and staging area. All temporary ramps in wetlands will be removed and restored with native plants.

The Corps will initiate formal consultation with NMFS for compliance with Endangered Species Act and MSA.

The SHPO previously reviewed this project area for the DSL removal fill program (SHPO # 10-2565) in November 2010. At that time, the SHPO did not know of any previous surveys in the project area, but stated the project is in a high probability area given its position in the landscape.

Preliminarily, the Corps believes this project will have "no effect" to historic properties or cultural resources based upon our review of available information and determination that no known sites are located in the permit area. We reviewed nearby Branch permit files, the latest published version(s) of the National Register, lists of properties determined eligible, and other appropriate sources of information in making our determination.

We respectfully request that you advise us whether treaty fishing access sites, usual and accustomed areas, traditional cultural properties, or other resources important to the Tribes might be affected by the proposed action.

Please respond to the Corps' effects determination at your earliest convenience. If we have not heard back from you within 30 days from date of this notification, we will assume you have no comments or concerns and/or concur with our effects determination regarding this action.

Thank you for taking time out of your busy and hectic schedules to review this project.

Have a great day,
James

James A. Holm
Project Manager/Team Lead, Regulatory Branch U.S. Army Corps of Engineers - Portland District
333 S.W. First Avenue
Portland, OR 97204
Tel: 503-808-4385 | Fax: 503-808-4375 james.a.holm@usace.army.mil I would appreciate your feedback on how I am performing my duties. Our automated Customer Service Survey is located at: http://per2.nwp.usace.army.mil/survey.html. Thank you for taking the time to visit the site and complete the survey. Have a great day!

Sharing Science Websites: http://www.globalchange.gov/ - federal research on global climate change (USGCRP)

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Martz, Merri

From: Holm, James A NWP <James.A.Holm@usace.army.mil>
Sent: Monday, February 07, 2011 4:48 PM
To: 'Eirik Thorsgard'
Subject: RE: Oaks Bottom Wildlife Refuge Restoration, Corp No. NWP-2007-902, City of Portland-BES, Willamette River, Portland, Multnomah County, OR ; SHPO # 10-2565 (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Thanks Eirik,
I will require the City to have an archeological monitor onsite during ground-disturbing work, if we issue this permit.
James

James A. Holm
Project Manager/Team Lead, Regulatory Branch U.S. Army Corps of Engineers - Portland District
Tel: 503-808-4385 | james.a.holm@usace.army.mil

-----Original Message-----
From: Eirik Thorsgard [mailto:Eirik.Thorsgard@grandronde.org]
Sent: Monday, February 07, 2011 4:46 PM
To: Holm, James A NWP
Subject: Re: Oaks Bottom Wildlife Refuge Restoration, Corp No. NWP-2007-902, City of Portland-BES, Willamette River, Portland, Multnomah County, OR ; SHPO # 10-2565 (UNCLASSIFIED)

The Tribe is recommending that an archaeological monitor due to the high potential for previously unrecorded archaeological sites in the area.

Eirik Thorsgard MAIS
Cultural Protection Coordinator

Interim Tribal Historic Preservation Officer

Confederated Tribes of the Grand Ronde Community of Oregon

PhD Candidate Flinders University Adelaide, Australia

Office 1-503-879-1630
Cell. 1-971-241-2696
Email. Eirik.thorsgard@grandronde.org

----- Original Message -----
From: Holm, James A NWP [mailto:James.A.Holm@usace.army.mil]
Sent: Monday, February 07, 2011 04:42 PM
To: Eirik Thorsgard; Michael Karnosh; Don Day

Subject: RE: Oaks Bottom Wildlife Refuge Restoration, Corp No. NWP-2007-902, City of Portland-BES, Willamette River, Portland, Multnomah County, OR ; SHPO # 10-2565 (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Thanks Eirik for your quick response. Can you provide generic rationale for requesting a monitor that I can reference in our permit decision document?
Such as known sites in the vicinity or proximity to tribal use areas. Thank you for considering my request for rationale and I hope it is not offensive to you.

Best regards,
James

James A. Holm
Project Manager/Team Lead, Regulatory Branch U.S. Army Corps of Engineers - Portland District
Tel: 503-808-4385 | james.a.holm@usace.army.mil

-----Original Message-----
From: Eirik Thorsgard [mailto:Eirik.Thorsgard@grandronde.org]
Sent: Monday, February 07, 2011 1:19 PM
To: Holm, James A NWP; Michael Karnosh; Don Day; Sally Bird; rkentta@ctsi.nsn.us
Cc: Dennis Griffin
Subject: RE: Oaks Bottom Wildlife Refuge Restoration, Corp No. NWP-2007-902, City of Portland-BES, Willamette River, Portland, Multnomah County, OR ; SHPO # 10-2565 (UNCLASSIFIED)

Hello James,

The Confederated Tribes of the Grand Ronde Community of Oregon Cultural Resources Department has reviewed this permit application and is recommending that the project proponent have an archaeological monitor on hand for the ground disturbing portions of the project. If you or the applicant have any questions please feel free to contact me.

-----Original Message-----
From: Holm, James A NWP [mailto:James.A.Holm@usace.army.mil]
Sent: Wednesday, February 02, 2011 11:51 AM
To: Eirik Thorsgard; Michael Karnosh; Don Day; Sally Bird; rkentta@ctsi.nsn.us
Cc: Dennis Griffin
Subject: Oaks Bottom Wildlife Refuge Restoration, Corp No. NWP-2007-902, City of Portland-BES, Willamette River, Portland, Multnomah County, OR ; SHPO #
10-2565 (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

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version(s) of the National Register, lists of properties determined eligible, and other appropriate sources of information in making our determination.

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Thank you for taking time out of your busy and hectic schedules to review this project.

Have a great day,
James

James A. Holm
Project Manager/Team Lead, Regulatory Branch U.S. Army Corps of Engineers - Portland District
333 S.W. First Avenue
Portland, OR 97204
Tel: 503-808-4385 | Fax: 503-808-4375 james.a.holm@usace.army.mil I would appreciate your feedback on how I am performing my duties. Our automated Customer Service Survey is located at:
http://per2.nwp.usace.army.mil/survey.html. Thank you for taking the time to visit the site and complete the survey.
Have a great day!

Sharing Science Websites: http://www.globalchange.gov/ - federal research on global climate change (USGCRP)

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Oregon
John A. Kitzhaber, MD, Governor

Parks and Recreation Department
State Historic Preservation Office
725 Summer St NE, Ste C
Salem, OR 97301-1266
(503) 986-0671
Fax (503) 986-0793
www.oregonheritage.org

RECEIVED
By

February 4, 2011

Mr. James Holm
USACOE PDX
PO Box 2946
Portland, OR 97208-2946

RE: SHPO Case No. 10-2565
APP0045925 and NWP-2007-902
FOE/wetland enhancement, removal-fill - Oak Bottom Wildlife Refuge
DSL/COE/City of Portland P&R
1S 1E 14C, Portland, Multnomah County

Dear Mr. Holm:

Our office recently received a request to review the proposal for the project referenced above. In checking our statewide cultural resource database, I find that there have been no previous cultural resource surveys completed near the proposed project area. However, the project area lies within an area generally perceived to have a high probability for possessing archaeological sites and/or buried human remains.

While not having sufficient knowledge to predict the likelihood of cultural resources being within your project area, extreme caution is recommended during future ground disturbing activities. ORS 358.905 and ORS 97.740 protect archaeological sites and objects and human remains on state public and private lands in Oregon. If any cultural material is discovered during construction activities, all work should cease immediately until a professional archaeologist can assess the discovery. If your project has a federal nexus (i.e., federal funding, permitting, or oversight) please coordinate with your federal agency representative to ensure that you are in compliance with Section 106 of the NHPA.

If you have any questions about my comments or would like additional information, please feel free to contact our office at your convenience. In order to help us track your project accurately, please be sure to reference the SHPO case number above in all correspondence.

Sincerely,

Dennis Griffin

Dennis Griffin, Ph.D., RPA
State Archaeologist
(503) 986-0674
dennis.griffin@state.or.us

Oregon
Theodore R. Kulongoski, Governor

Parks and Recreation Department
State Historic Preservation Office
725 Summer St NE, Ste C
Salem, OR 97301-1266
(503) 986-0671
Fax (503) 986-0793
www.oregonheritage.org

RECEIVED
By

November 09, 2010

Mr. Mike McCabe
DSL
775 Summer St NE No 100
Salem, OR 97301

RE: SHPO Case No. 10-2565
APP0045925
FOE/wetland enhancement, removal-fill - Oak Bottom Wildlife
DSL/COE/City of Portland P&R
1S 1E 14C, Portland, Multnomah County

Dear Mr. McCabe:

Our office recently received a request to review the proposal for the project referenced above. In checking our statewide cultural resource database, I find that there have been no previous cultural resource surveys completed near the proposed project area. However, the project area lies within an area generally perceived to have a high probability for possessing archaeological sites and/or buried human remains.

While not having sufficient knowledge to predict the likelihood of cultural resources being within your project area, extreme caution is recommended during future ground disturbing activities. ORS 358.905 and ORS 97.740 protect archaeological sites and objects and human remains on state public and private lands in Oregon. If any cultural material is discovered during construction activities, all work should cease immediately until a professional archaeologist can assess the discovery. If your project has a federal nexus (i.e., federal funding, permitting, or oversight) please coordinate with your federal agency representative to ensure that you are in compliance with Section 106 of the NHPA.

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Dennis Griffin

Dennis Griffin, Ph.D., RPA
State Archaeologist
(503) 986-0674
dennis.griffin@state.or.us

HERITAGE
• RESEARCH •
ASSOCIATES, INC
ARCHAEOLOGY & HISTORY

TO: Sean Bistoff, Design Manager
City of Portland, Bureau of Environmental Services
1120 SW 5th Avenue, Room 1000
Portland, OR 97204-1912

From: Robert R. Musil, PhD, RPA
Heritage Research Associates, Inc.
1997 Garden Avenue
Eugene, Oregon 97403

Date: June 3, 2010

HRA Letter Report 10-19: Archaeological Survey of the Oak Bottoms Wildlife Refuge Enhancement Project, City of Portland, Multnomah County, Oregon

This letter presents the results of an archaeological survey of the Oak Bottoms Wildlife Enhancement Project in Portland, Oregon. The City of Portland is implementing a large scale (75 acres) wetland habitat enhancement project to benefit wildlife and people along this section of the Willamette River. The Bureau of Environmental Services (BES) contracted with Heritage Research Associates, Inc. of Eugene to provide archaeological services for this project. The archaeological survey was undertaken to identify any prehistoric or early historical archaeological resources that might be impacted by the planned project. The archaeological survey was undertaken on May 12, 2010 by Robert R. Musil of Heritage Research Associates, Inc., after an onsite consultation with Sean Bistoff of BES.

Project Setting

The Oak Bottoms Wildlife Refuge Enhancement project area is located along the Willamette River just north of the Sellwood Bridge. Specifically, the project area is situated in the E½ SW¼ SW¼ and the E½ SE¼ SW¼ of Section 14, T1S, R1E, W.M., and lies at an elevation of 6-12 feet above mean sea level (Figure 1).

The project area is located in the Portland Basin along the east bank of the Willamette River in the Portland/Vancouver Basin Ecoregion. The Oak Bottoms Wildlife Refuge encompasses a small remnant of the Cottonwood/Willow riparian vegetation zone that used to line much of the river prior to urban development (Loy et al. 2001). Riparian bottomland environments are dominated by black cottonwood (*Populus trichocarpa*), which is often found in association with black

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Eugene, Oregon 97403
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FAX 541/485-1364

hawthorne (*Crataegus douglasii*) and Oregon ash (*Fraxinus latifolia*). Native vegetation in the vicinity of the project area would have likely consisted of riparian woodlands along the edge of sloughs, ponds, and the river, with prairie settings and woodlands on the higher terraces above the river. The project's location places it within an area that would have been highly susceptible to annual flooding. The original riparian bottomlands would have supported a variety of wetland plants that were important to native subsistence. A diverse array of mammals, fish, shellfish, and birds would have also been available to the native inhabitants who exploited the resources along floodplain.

The Oaks Bottom Wildlife Refuge was created in 1988, and is Portland's first wildlife refuge. The refuge is the largest remaining natural area on the lower Willamette River floodplain and provides habitat for fish and wildlife including a number of threatened and special status species.

The enhancement project calls for replacing an existing culvert under the Springwater Trail and railroad tracks to enhance fish passage and to improve the flow of river water in and out of the refuge. The project will also include excavating and enhancing slough channels, removal of invasive plant species, and revegetation of disturbed areas with native species to improve wildlife habitat (Figure 2).

Historical Context

The Lower Columbia Valley was occupied at the time of Euro-American contact by Chinookan peoples. The Chinookans inhabited an area that encompassed both banks of the Columbia River from the Pacific Coast upriver to The Dalles (Silverstein 1990). Historic accounts indicate that independent Chinookan groups occupied riverside villages or clusters of villages that were united by political and economic ties (Hajda 1984; Silverstein 1990). Because of a favorable environmental setting, the region was estimated to have had one of the highest pre-contact native population densities in North America (Kroeber 1939:136-155). However, because Chinookan territory centered on the Columbia River, the main route of contact-period exploration, travel, and commerce in the region, the Chinookan peoples were affected early and often by introduced diseases, to which they had almost no immunity. By the mid-1800s the Chinookan population had been devastated by these epidemics, and most of the villages that had been occupied prior to contact were abandoned (Boyd 1985:250; Silverstein 1990).

Chinookan peoples spoke languages of the Chinookan branch, thought to be an independent branch of the Penutium phylum of languages. The Chinookan language family consisted of two distinct languages: Lower Chinookan and Upper Chinookan. Lower Chinookan speakers resided at the mouth of the Columbia River, with the Upper Chinookan speakers occupying territory upstream (Spier 1936). Upper Chinookan consisted of a chain of dialect clusters

including Cathlamet (or Kathlamet), Multnomah, and Kiksht. Cathlamet was spoken from Tongue Point on the lower Columbia River upstream to the mouth of the Kalama River. Multnomah was spoken by Chinookan groups who occupied the Portland Basin from the mouth of the Lewis River to Government Island. Kiksht was spoken by the Clackamas who occupied the areas along the lower Willamette River, near the falls, and along the Clackamas River. Kiksht was also spoken by Chinookan groups living upstream in the Columbia Gorge to The Dalles (Silverstein 1990:532-534; Thompson and Kinkade 1990:41). The location of the project area falls at the boundary between the ethnographically defined territories occupied by the Clackamas and the Multnomah.

Evidence derived from archaeological research in the Portland Basin indicates that Native American peoples have inhabited the region for at least the last 9,000-10,000 years. The earliest evidence of human occupation in the Portland Basin is best represented at a handful of sites located in settings away from the major rivers. These sites are undated, but the most common artifacts recovered are large leaf-shaped, broad stemmed, and corner-notched projectile points, unifacially flaked cobbles, foliate bifaces, and bola stones. These types of stone tools all suggest occupations prior to 3000 years ago (Pettigrew 1990:521-522).

The archaeological record for the Portland Basin is on firmer footing during the last 3000 years, as all of the archaeological sites for which radiocarbon dates are available fall within this period. The local cultural sequence, developed during the 1970s, is based for the most part on archaeological testing at sites in the Scappoose-Sauvie Island area on the Oregon side of the river downstream from Portland (Pettigrew 1981, 1990). This cultural sequence begins with the Merrybell Phase (2550-1750 BP), which is characterized by broad-necked projectile points, followed by the Multnomah Phase (1750-100 BP), characterized by narrow-necked points and, after historic contact, by the introduction of materials of Euro-American manufacture (Multnomah 3 subphase) (Pettigrew 1981). This cultural sequence was interpreted to reflect a strong pattern of cultural continuity, and it was suggested that the way of life practiced by the Chinookan peoples inhabiting the area at the time of historic contact had been followed in the Portland Basin for at least the last 2600 years (Pettigrew 1981:137).

Euro-American exploration of the Pacific Northwest began in the eighteenth century, with numerous voyages of discovery by explorers and fur traders from various European nations and the fledgling Unites States in quests for wealth and empire. In 1792, George Vancouver dispatched Robert Broughton in the *Chatham* up the Columbia River to the Portland Basin, and in 1805-06 the Lewis and Clark Expedition passed through the area on their journey of discovery. Following the Lewis and Clark expedition, the Columbia River became a major avenue for exploration and the fur trade. In 1824, Dr. John McLoughlin established Fort Vancouver for the Hudson's Bay Company on the north side of the river, and also established a trading post on the Willamette River at the falls in 1829, before founding the town of Oregon City in 1842 (Dodds 1986).

Around that same time, William Overton acquired a land claim that was located in what is now downtown Portland. Overton sold the two halfs of his claim to L.A. Lovejoy and Francis W. Pettygrove, who in 1844 built the first structure in Portland at the current location of First and Washington streets. The two gentlemen named their city Portland (based on the outcome of a coin toss) after Portland, Maine in honor of Pettigrove's hometown. Portland was incorporated in 1851, and by 1855 Pettygrove and Lovejoy had platted 16 blocks and four streets. The city grew rapidly after 1855, and by 1872 the population had reached upwards of 12,000 citizens. Urban growth in the latter part of the nineteenth century also encompassed the east side of the Willamette River. With the completion of two bridges across the river by 1891, small communities east of the river were consolidated with Portland to form a city of around 88,000 people (MacColl 1988; Snyder 1970). The village of Sellwood was developed in 1883 and was incorporated in 1887 by the Sellwood Real Estate Co. Many communities, including Sellwood, developed along a railroad line that provided rail service by 1903. The rail line was known variously as the Springwater Division Line, the Portland Traction Company Line, the Cazadero Line, and the Bellrose Line as the line changed hands over the years. The nearby Oaks Amusement Park was developed as destination park by the rail corporation to encourage ridership on weekends. Thus, the embankment on which the rail line is situated has been in place since the early 1900s.

During the first decade of the twentieth century, Portland expanded to almost 50 square miles and population increased to over 200,000 citizens. During the rest of the century the city spread out into the suburbs, with an urban growth boundary that now encompasses many surrounding communities. Today a population of over a half million people reside within the boundaries of the City of Portland (Loy et al. 2001).

Early maps of the area indicate that what is now the Oak Bottoms Wildlife Refuge consisted of an interconnected network of sloughs, marshes, and ponds, with a large lake and the northern drainage channel (Ives 1852). The project area was part of the 640-acre Alfred Llewellyn Donation Land Claim (Claim 49), and the 1852 plat of survey shows the house and field of Alfred Llewelyn (General Land Office 1860) on the upper terrace east of the project area (Figure 3).

The 1914 U.S. Geological Survey (USGS) 15' Oregon City quadrangle shows the presence of an expansive lake and two other ponds in the project area, with higher ground separating the ponds in the area of the present drainage channel (Figure 4). The surrounding floodplain to the north is shown as a large marsh. The railroad tracks are shown bordering the lake on the west on the 1914 USGS map and the railroad tracks, lake, smaller pond, and drainage channel are all shown on the 1967 U.S. Coast and Geodetic Survey maps (Figure 5). Early maps of the area indicate that the drainage channel and the lake have been relatively stable natural features on the floodplain for at least the last 150 years. This evidence suggests that

the banks along the drainage channel are stable landforms that have the potential to contain intact cultural deposits.

Records Search

A review of the archaeological site records on file at the State Historic Preservation Office (SHPO) in Salem indicates that no prehistoric or early historical sites have been recorded in the vicinity of the project area. The nearest recorded sites are located on the opposite bank of the Willamette River. Cultural resource surveys in the vicinity have been conducted along SE Tacoma Street and a section of the rail corridor south of the Sellwood Bridge (Musil 2001; Wilt 2010). However, a number of prehistoric sites have been reported on terraces along the Willamette River south of the project area. Cultural materials collected from many of these sites are known from collections of private individuals and local museums. This evidence suggests, although much of it is unsubstantiated, that a number of prehistoric sites were located along the banks of both the Willamette and Clackamas rivers between Ross Island and Willamette Falls (Woodward 1974).

Field Methods and Results

The archaeological survey of the project area was conducted by a single surveyor walking along both sides of the existing drainage channel and around a circular channel. The survey also included an area where an abandoned portion of the slough channel will be reexcavated and the river bank at the culvert outlet (Figure 6). The survey area was covered by dense vegetation, except along the banks of the slough (Figure 7) and on the mud flats at the south end of the channel (Figure 8). The survey consisted of walking along the eroded cutbank on both sides of the drainage channel, and then walking roughly parallel transects at approximately two meter intervals on the top of the banks where vegetation allowed.

The circular channel in the northern portion of the project area is an artificial channel that appears to have been excavated to create small islands. Vegetation was very dense around this channel and ground visibility was almost completely obscured in that area. The ground surface in the area encompassing the abandoned slough channel and along the southern and northern bank of the drainage channel was covered by a dense carpet of reed canary grass intermingled with clumps of blackberry brambles. The only areas of bare ground observed on top of the banks were restricted to a few rodent burrow backdirt piles and nutria tunnels.

Ground visibility was much better on the mud flats to the south and along the eroded cutbanks of the drainage channel, and although a few items of recent discard, such as beer cans and other refuse, were observed, no evidence of prehistoric or early historical artifacts or deposits were noted in the cutbanks along the drainage channel.

At the west end of the drainage channel an abandoned water control structure (Figure 9), the existing culvert, and an abandoned pipeline (Figure 10) remain in place. The plans call for demolishing these structures and replacing the culvert. The culvert will be removed by excavating into the railroad embankment, and will require erecting a temporary bridge over the excavation while construction is in progress. The culvert was probably installed when the railroad embankment was constructed and is most likely over one hundred years old. The water control structure may be that old as well.

Summary and Recommendations

An archaeological survey was conducted by Heritage Research Associates, Inc. of the Oak Bottoms Wildlife Refuge Enhancement Project on May 12, 2010. Ground visibility within the project area was restricted by dense vegetation, except along the eroded banks of the drainage channel and on the mudflats to the south. No evidence of prehistoric or early historical archaeological materials or deposits was observed during the survey. However, because of the poor ground visibility and the presence of higher elevations bordering the drainage that have been stable landforms for at least the last 150 years, there remains a possibility that buried cultural deposits may be present in the project area. Therefore, based on these considerations, it is recommended that subsurface probing be conducted prior to construction activities on the higher landforms along both the existing drainage channel and along the abandoned portion of the channel to determine if cultural deposits are present.

In addition, the existing culvert and water control structure appear to be at least one hundred years old and it is recommended that an historic preservation specialist visit the project area to assess these structures and document them before they are demolished.

Also, due to the fact that ground visibility was obscured in most places, there remains the possibility that ground disturbance during construction may expose buried prehistoric or historical cultural material or deposits that were not detected. If buried materials are encountered, Oregon State law (ORS 97.740 to 97.760, 358.905 to 358.955, and 390.235), as well as various federal laws and regulations that may be applicable to this project, require that work in the vicinity of any such discoveries be suspended immediately. The State Historic Preservation Office (SHPO) should be notified, and a qualified archaeologist should be called in to evaluate the find and recommend subsequent courses of action in consultation with the tribes and SHPO.

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Wilt, Julia
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Woodward, John A.
1974 *Salmon, Slaves, and Grizzly Bears: The Prehistoric Antecedents of Clackamas Indian Culture.* Unpublished PhD Dissertation, Department of Anthropology, University of Oregon, Eugene.

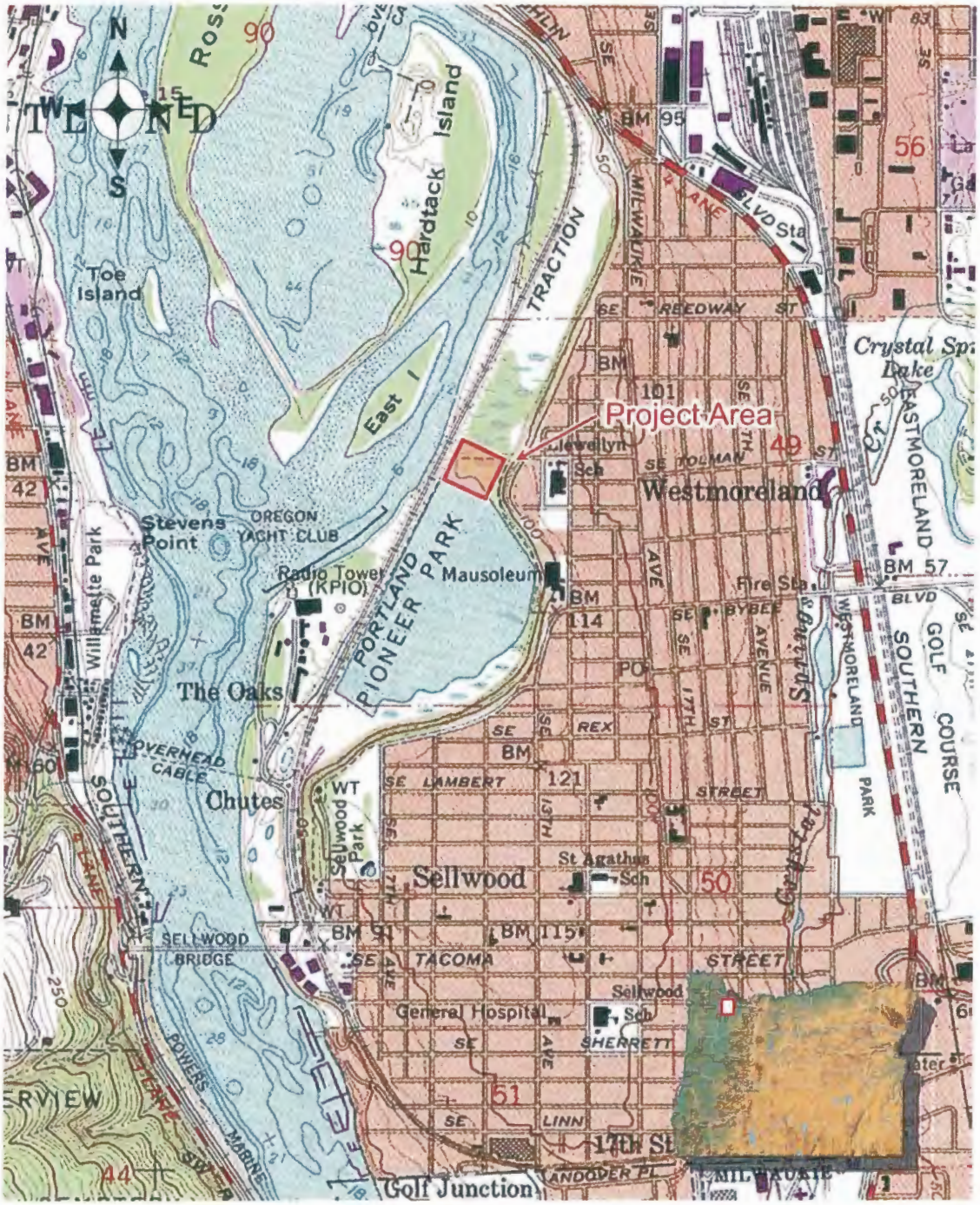
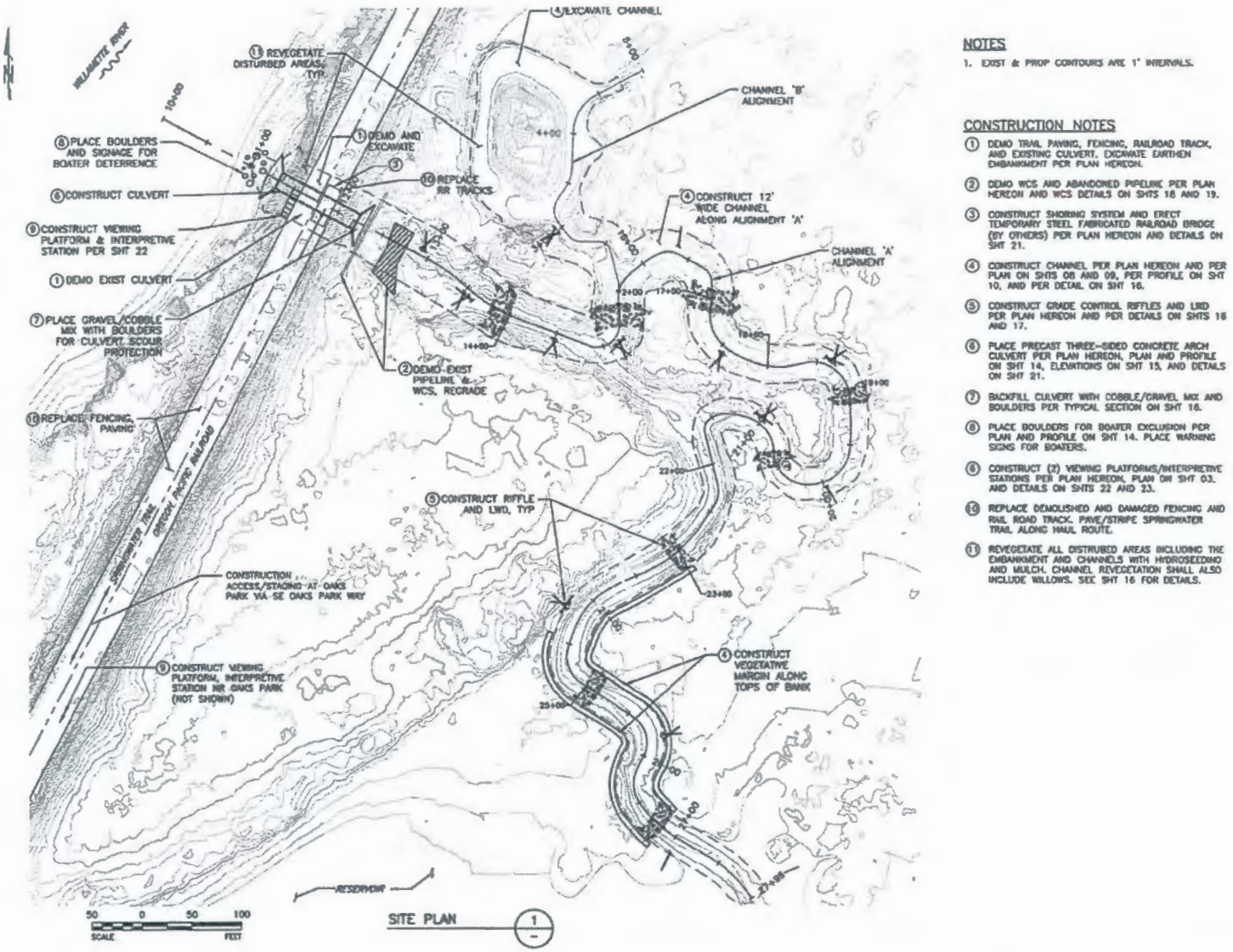


Figure 1. Location of the Oak Bottoms Wildlife Refuge Enhancement project area along the Willamette River (USGS Lake Oswego, Oregon 7.5' quadrangle, 1961, photorevised 1984).



NOTES

1. EXIST & PROP CONTOURS ARE 1' INTERVALS.

CONSTRUCTION NOTES

① DEMO TRAIL PAVING, FENCING, RAILROAD TRACK, AND EXISTING CULVERT. EXCAVATE EARTHEN EMBANKMENT PER PLAN HEREON.

② DEMO WCS AND ABANDONED PIPELINE PER PLAN HEREON AND WCS DETAILS ON SHTS 18 AND 19.

③ CONSTRUCT SHORING SYSTEM AND ERECT TEMPORARY STEEL FABRICATED RAILROAD BRIDGE (BY OTHERS) PER PLAN HEREON AND DETAILS ON SHT 21.

④ CONSTRUCT CHANNEL PER PLAN HEREON AND PER PLAN ON SHTS 08 AND 09, PER PROFILE ON SHT 10, AND PER DETAIL ON SHT 16.

⑤ CONSTRUCT GRADE CONTROL RIFFLES AND LWD PER PLAN HEREON AND PER DETAILS ON SHTS 18 AND 17.

⑥ PLACE PRECAST THREE-SIDED CONCRETE ARCH CULVERT PER PLAN HEREON, PLAN AND PROFILE ON SHT 14, ELEVATIONS ON SHT 15, AND DETAILS ON SHT 21.

⑦ BACKFILL CULVERT WITH COBBLE/GRAVEL MIX AND BOULDERS PER TYPICAL SECTION ON SHT 16.

⑧ PLACE BOULDERS FOR BOATER EXCLUSION PER PLAN AND PROFILE ON SHT 14. PLACE WARNING SIGNS FOR BOATERS.

⑨ CONSTRUCT (2) VIEWING PLATFORMS/INTERPRETIVE STATIONS PER PLAN HEREON, PLAN ON SHT 03, AND DETAILS ON SHTS 22 AND 23.

⑩ REPLACE DEMOLISHED AND DAMAGED FENCING AND RAIL ROAD TRACK. PAVE/STRIPE SPRINGWATER TRAIL ALONG HAUL ROUTE.

⑪ REVEGETATE ALL DISTRUBED AREAS INCLUDING THE EMBANKMENT AND CHANNELS WITH HYDROSEEDING AND MULCH. CHANNEL REVEGETATION SHALL ALSO INCLUDE WILLOWS. SEE SHT 16 FOR DETAILS.

Figure 2. Oak Bottoms Wildlife Refuge Phase 1 Design site plan (plan provided by Bureau of Environmental Services).

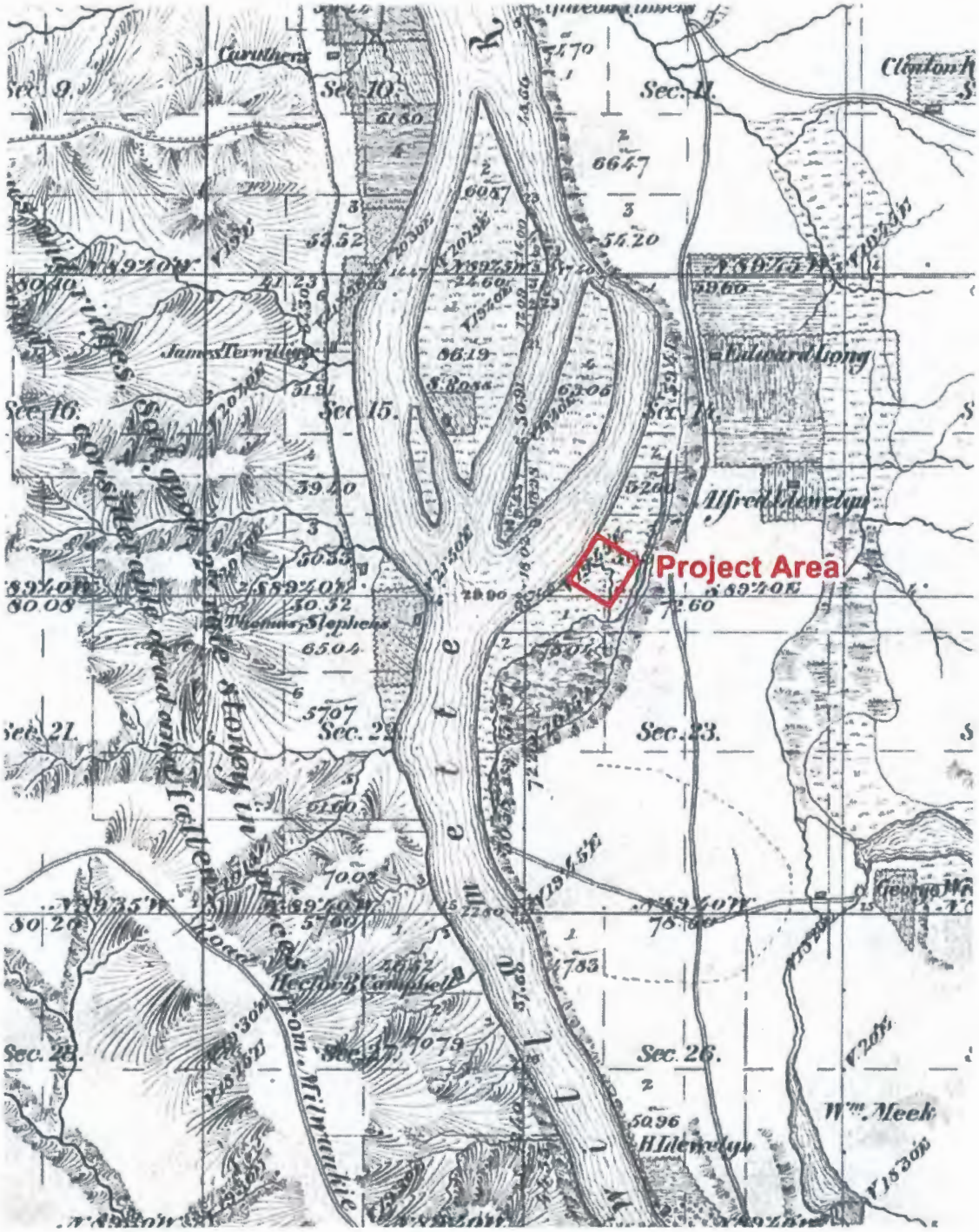


Figure 3. Location of the Oak Bottoms Wildlife Refuge Enhancement Project on the 1852 plat of survey for T1S, R1E (adapted from Ives 1852).

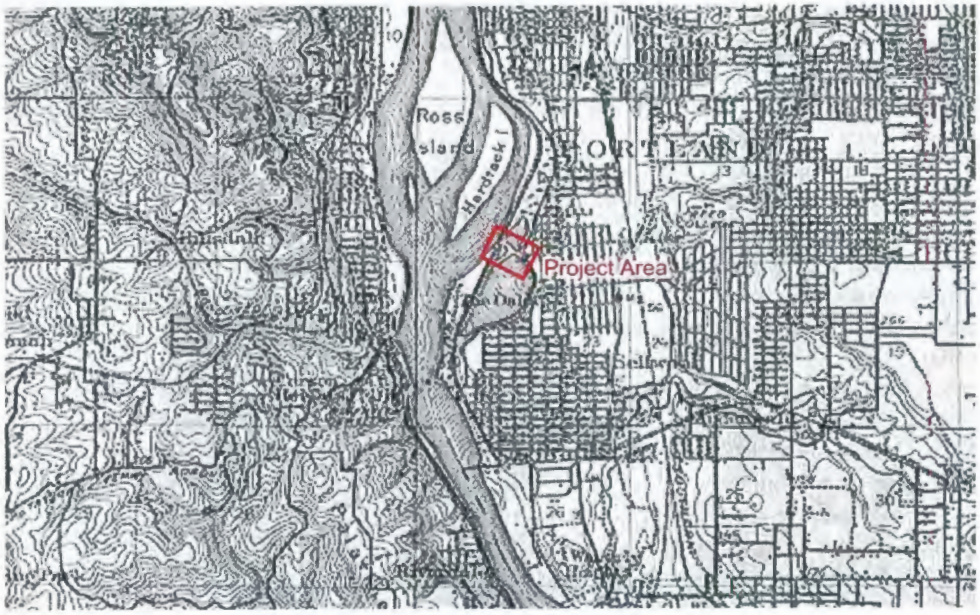


Figure 4. Location of the Oak Bottom Wildlife Refuge Enhancement project area on the 1914 USGS Oregon City, Oregon 15' quadrangle.

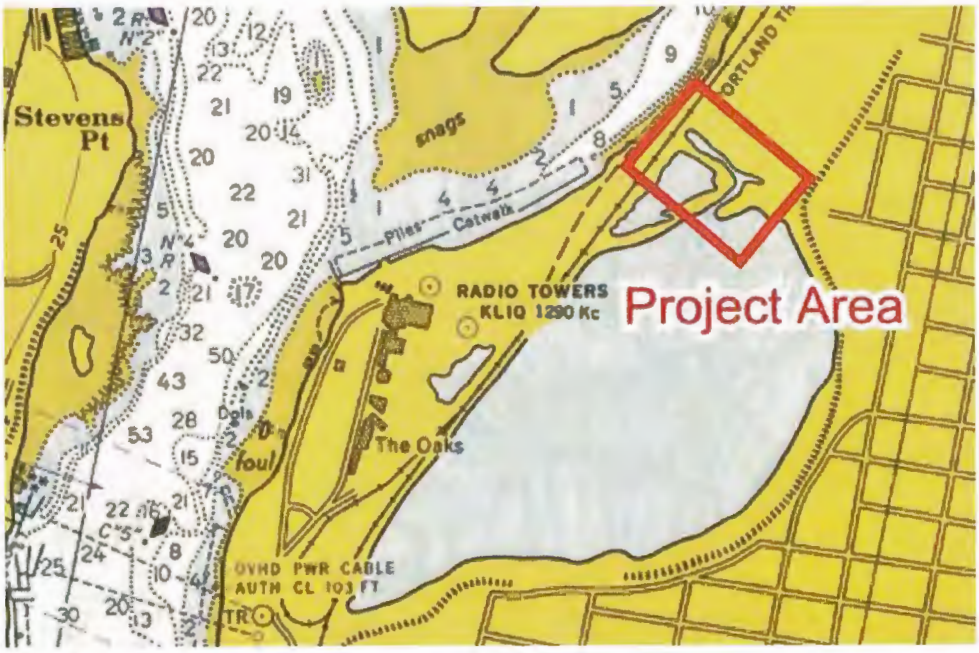


Figure 5. Location of the Oak Bottom Wildlife Refuge Enhancement project area on the 1967 Willamette River, Portland to Walnut Eddy U.S. Coast and Geodetic Survey map (scale = 1:15,000).

Figure 6. Location of the area surveyed in the Oak Bottoms Wildlife Enhancement project area (USGS aerial photograph May 8, 2002).

Figure 7. View to the northwest along the drainage channel.

Figure 8. View to the north at the south end of the drainage channel.

Figure 9. View to the west of the existing water control structure.

Figure 10. View to the southwest of the exiting culvert and abandoned pipeline under the Oregon Pacific Railroad and Springwater Trail embankment.

SHPO Reporting Data

Findings:	(-) negative
County:	Multnomah
Legal:	E½ SW¼ SW¼ and the W½ SE¼ SW¼ of Section 14, T1S, R1E, W.M.,
USGS Quad:	Lake Oswego, Oregon.5', 1961, photorevised 1984
Project Acres:	4 acres
Project Type:	Pedestrian Survey
Field Notes Location:	Heritage Research Associates, Inc.
Project Title:	*Archaeological Survey of the Oak Bottoms Wildlife Refuge Enhancement Project, City of Portland, Multnomah County, Oregon.* Heritage Research Associates Letter Report 10-19.
Author:	Robert R. Musil, PhD, RPA
Contractor:	Heritage Research Associates, Inc., Eugene, Oregon
Client:	Bureau of Environmental Services, City of Portland

SHPO Letters & Concurrence

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, PORTLAND DISTRICT
PO BOX 2946
PORTLAND OR 97208-2946

OCT 27 2015

Planning, Programs and Project
Management Division

Mr. John Pouley, M.A., RPA
Assistant State Archaeologist
State Historic Preservation Office
725 Summer St. NE, Suite C
Salem, OR 97301-0707

SUBJECT: Oaks Bottom Wildlife Refuge Tidal Restoration Project, Multnomah County, Oregon

Dear Mr. Pouley:

The U.S. Army Corps of Engineers, Portland District (Corps), is continuing consultation with the Oregon State Historic Preservation Officer (SHPO) regarding the Oaks Bottom Wildlife Refuge Tidal Restoration Project (the "undertaking). This project is proposed at Oaks Bottom Wildlife Refuge Tidal Restoration Project and its associated facilities, Multnomah County, Oregon, SHPO Case No. 10-2565. The Corps has obtained concurrence on "*No Historic Properties Affected*" for the proposed undertaking (pursuant to §800.4[d](1)) from the SHPO for the main portion of the project (letter dated September 25, 2015).

The intent of this letter is to notify you that the Corps will be requiring the applicant (City of Portland) to obtain the services of an archeological monitor for portions of the project associated with the railroad embankment/trestle. During construction the applicant will be doing an open cut down through the embankment and trestle to install the culvert. After construction it will all get backfilled to its current elevation. The railroad and culvert are older than 50 years in age, but it is the Corps findings that no new information will be found that will contribute to the understanding of the railroad use or the placement of the existing pipe to facilitate draining of the wetland.

Enclosed you will find the following materials in support of our present consultation effort:

Enclosure 1: Map of the APE

To ensure the proper handling and treatment of any unexpected or inadvertently discovered cultural resources which may be uncovered during the proposed ground disturbing work, the Corps will request the City of Portland to prepare and implement an

Inadvertent Discovery Plan (IDP) that conforms to Corps Regulations ER 1130-2-540, Corps Guidance EP 1130-2-540, NHPA and its implementing regulations 36 CFR 800.

Likewise, we will also request that a professional archaeological monitoring report be submitted for review and approval upon completion of the construction associated with the railroad trellis and pipe. The Corps will provide a copy of the submitted monitoring report for your review and records.

The Corps has determined that the construction associated with the railroad embankment/trellis will have "*No Adverse Effect*" to the historic and cultural resources in the area per 36 C.F.R 800.5 (d)(1). In compliance with Section 106 of the NHPA of 1966 as amended, please provide us with your concurrence or comments on our determination of No Adverse Effect. We request your comments and concurrence on the following items:

1. the appropriateness of the APE for the proposed undertaking (pursuant to §800.4[a][1]);

2. the adequacy of historic property identification efforts (pursuant to §800.4[b]); and

3. the finding of "*No Adverse Effect*" for the proposed undertaking (pursuant to §800.5[b][1]).

Concurrent consultation letters and accompanying enclosures are being sent to Ms. Roberta Kirk, Confederated Tribes of Warm Springs, P.O. Box 460 Warm Springs, Oregon 97761; Mr. Jordan Mercier, The Confederated Tribes of the Grand Ronde Community of Oregon, 9615 Grand Ronde Road, Grand Ronde, Oregon 97347; and Mr. Robert Kentta, Confederated Tribes of Siletz Indians, P.O. Box 549, Siletz, Oregon 97380.

If you have any questions or require additional information, please contact Corps District Archeologist, Eirik Thorsgard, at eirik.e.thorsgard@usace.army.mil or (503) 808-4688. Thank you for your assistance with this undertaking.

Sincerely,

Joyce E. Casey

Joyce E. Casey
Chief, Environmental Resources Branch

Enclosures

US Army Corps of Engineers
Portland District
October 2015

Oaks Bottom Wildlife Refuge Restoration

Topographic Map of Monitoring Area of Potential Effect

T1S, R1E, Sect 14. Multnomah County, Oregon
Lake Oswego, Oregon 5', 1961,
Map created by V. van der Borg

N

1:24,000

Culvert/Railroad Monitoring APE

Previously Consulted APE

0 0.25 0.5 1 Kilometers

0 0.25 0.5 1 Miles

ENCL 1

US Army Corps of Engineers
Portland District
October 2015

Oaks Bottom Wildlife Refuge Restoration

Aerial Map of Monitoring Area of Potential Effect

T1S, R1E, Sect 14. Multnomah County, Oregon
Lake Oswego, Oregon 5', 1961,
Map created by V. van der Borg

N

1:3,000

Culvert/Railroad Monitoring APE

Previously Consulted APE

0 50 100 200 Meters

0 100 200 400 Feet

ENCL 7

Oregon
Kate Brown, Governor

Parks and Recreation Department
State Historic Preservation Office
725 Summer St NE Ste C
Salem, OR 97301-1266
Phone (503) 986-0690
Fax (503) 986-0793
www.oregonheritage.org

September 29, 2015

Ms. Joyce Casey
USACE
PO Box 2946
Portland, OR 97208-2946

RE: SHPO Case No. 10-2565
NWP-2007-902, APP0045925, Oaks Bottom Wildlife Refuge Tidal Restoration Project
FOE/wetland enhancement, removal-fill -
1S 1E 14C, Portland, Multnomah County

Dear Ms. Casey:

Our office recently received an Area of Potential Effects (APE) request for concurrence for the the undertaking referenced above. Two reports were additionally submitted (SHPO Report#s 25821 and 27604) in support of a No Effect determination. After review, Oregon SHPO concurs with the APE, that a good faith effort has been implemented, and with the No Effect determination. In the unlikely event an archaeological object or site (i.e., historic or prehistoric) is encountered during project implementation, all ground disturbance at the location should cease immediately until a professional archaeologist can be contacted to evaluate the discovery. Under state law (ORS 358.905-955 & ORS 97.740) archaeological sites, objects and human remains are protected on both public and private land in Oregon. If you have not already done so, be sure to consult with all appropriate Indian tribes regarding your proposed project. If you have any questions regarding any future discovery or this letter, feel free to contact me at your convenience.

Sincerely,

John D. Pouley

John Pouley, M.A., RPA
Assistant State Archaeologist
(503) 986-0675
john.pouley@oregon.gov

cc: Eirik Thorsgard, USACE Army Corps

Oregon
Kate Brown, Governor

Parks and Recreation Department
State Historic Preservation Office
725 Summer St NE Ste C
Salem, OR 97301-1266
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November 4, 2015

Ms. Joyce Casey
USACE
PO Box 2946
Portland, OR 97208-2946

RE: SHPO Case No. 10-2565
NWP-2007-902, APP0045925, Oaks Bottom Wildlife Refuge Tidal Restoration Project
FOE/wetland enhancement, removal-fill -
1S 1E 14C, Portland, Multnomah County

Dear Ms. Casey:

Our office recently received your letter for the project referenced above. After review, Oregon SHPO concurs with the proposed APE and adequacy of historic property identification efforts. In addition, Oregon SHPO agrees that the project activities, as described in your report, will likely have no adverse effect to the historic railroad embankment and trestle or any other known archaeological sites, provided a professional archaeologist is on hand to monitor project related ground disturbance. In the unlikely event archaeological features or additional sites (i.e., historic or prehistoric) are encountered, all activities should cease immediately and a professional archaeologist should be contacted to evaluate the discovery. Under state law (ORS 358.905-955 & ORS 97.740) archaeological sites, objects and human remains are protected on both public and private land in Oregon. If project impacts and the degree/type of required ground disturbance changes from that outlined in your report, further consultation with our office will be required before proceeding with the proposed activity. If you have any questions regarding any future discovery, or this letter, feel free to contact our office. We look forward to receiving a copy of the monitoring report once completed.

Sincerely,

John D. Pouley

John Pouley, M.A., RPA
Assistant State Archaeologist
(503) 986-0675
john.pouley@oregon.gov

cc: Eirik Thorsgard, USACE Army Corps

U.S. Fish and Wildlife Service FWCA Letter and Attachment

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oregon Fish and Wildlife Office
2600 SE 98th Avenue, Suite 100
Portland, Oregon 97266
Phone: (503) 231-6179 FAX: (503) 231-6195

Reply To: 7363.0052
File Name: OaksBottom206_FWCA2.doc
TS Number: 15-831
TAILS: 01EOFW00-2015-CPA-0058
Doc Type: F

SEP 25 2015

Joyce E. Casey
Chief, Environmental Resources Branch
Corps of Engineers, Portland District
P.O. Box 2946
Portland, Oregon 97208-2946

Subject: Oaks Bottom Section 206 Habitat Restoration Project Feasibility Study and Integrated Environmental Assessment, Portland, Oregon

Dear ~~Ms. Casey~~ Joyce:

The U.S. Fish and Wildlife Service's (Service's) Oregon Fish and Wildlife Office received a letter from the Portland District Corps of Engineers (Corps) dated August 26, 2015, requesting our review and recommendations on the Oaks Bottom Section 206 Habitat Restoration Project Feasibility Study and Integrated Environmental Assessment (Feasibility Study) under the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq) (FWCA). The letter did not indicate that our review was urgent and no deadline for our response was provided. We later learned from the Corps that our response was needed in time to be included with other project materials for Corps review and approval by September 30, 2015, thus a response was needed from us in advance of that date. In the future, we request that the Corps coordinate with us much earlier in the process to allow for a longer review period. Fortunately, we were able to accommodate this request, but we may not be able to do so in the future depending on staff workloads and other priorities.

The Service is supportive of the goals of the Oaks Bottom Section 206 Habitat Restoration Project and recognizes the need for the Corps to document that it has met the intent of the FWCA in order to complete the Feasibility Study. We are able to offer a number of proposed conditions and other recommendations in-lieu of a Coordination Act Report (CAR). These in-lieu recommendations, once incorporated into the final Feasibility Report and associated planning documents, will satisfy the Service's FWCA goals for the Corps' compliance with the FWCA for this project.

The Service looks forward to further coordination with the Corps throughout the Pre-construction, Engineering, and Design (PED) phase for the Feasibility Study. We are interested in having the opportunity to review and comment on engineering designs, participate in the

development of the monitoring plan, and provide up-to-date information on any newly listed or delisted species and conservation measures as needed.

Consistent with the above, the Service has reviewed the Corps' draft Feasibility Study dated July 2015. Our comments and recommendations are provided below.

Purpose and Need of the Project

The project is located at the Oaks Bottom Wildlife Refuge in the City of Portland, Oregon. As described by the Corps, the project is designed to restore a more natural tidal hydrologic connection between Oaks Bottom and the Lower Willamette River, improve fish and wildlife habitats, reduce non-native species populations, and provide unhindered fish passage into and out of Oaks Bottom. This restoration is needed because Oaks Bottom is one of the last remaining tidal floodplain habitats in the Lower Willamette River and could provide a substantial area for juvenile salmon rearing and refuge habitat.

Proposed Action

The proposed action outlined in the draft Feasibility Study includes: 1) replacement of the existing 5-foot diameter culvert under the railroad embankment with a 16-foot wide by 10-foot high culvert with a natural substrate at a lower elevation to provide connections for 95% of all tidal cycles; 2) removal of the existing water control structure that impounds a large pond; 3) excavation of tidal slough channels to connect the south part of the refuge and other ponds to the channel and culvert; 4) removal of invasive species; and 5) revegetation with riparian and wetland species. Work is proposed to be conducted during one summer season (July through October) during the in-water work window designated for the Lower Willamette River, with revegetation work presumably carried out during appropriate timing windows that work with the in-water construction schedule.

Fish and Wildlife Resources

The Oaks Bottom Wildlife Refuge is a significant natural area that was brought into City of Portland ownership to be maintained as a public greenspace protected for fish, wildlife and people. This site is situated along the Lower Willamette River and supports a diversity of fish and wildlife species including plants, benthic invertebrates, fish, reptiles, amphibians, birds, and mammals. The Lower Willamette River is a migratory corridor for juvenile and adult anadromous fish and provides rearing habitat for several juvenile anadromous fish species including Chinook (*Oncorhynchus tshawytscha*) and coho (*O. Kisutch*) salmon, steelhead (*O. myskiss*) and coastal cutthroat (*O. clarki clarki*) trout. The site supports the now delisted bald eagle (*Haliaeetus leucocephalus*), species of concern including the northern red-legged frog (*Rana aurora*) and Pacific lamprey (*Lampetra tridentata*), and many other species that are important elements of the native biodiversity of the area.

While this project emphasizes benefits to fish, we believe there are opportunities to benefit migratory birds and other wildlife species as well. This natural area is a large, diverse landscape with a combination of open water, riparian, emergent wetland and upland habitats that are important for nesting, wintering, resting and re-fueling to more than 120 species of birds including some uncommon species for the Portland area. As a result, it has been designated by the City of Portland as a Migratory Bird Park. We ask that you continue to incorporate habitat

elements and design features that will improve habitat for sensitive native wildlife species, and reduce potential adverse impacts associated with construction using appropriate project design criteria and best management practices. Specifically, we ask that you incorporate the Conservation Recommendations below into the proposed action.

Conservation Recommendations

The long-term effects of the proposed action are intended to be beneficial to fish and wildlife and contribute to the restoration of natural riverine and floodplain processes, although there are likely to be some short-term adverse effects associated with the construction and establishment phases of the project. The Service requests that the Corps incorporate the following conservation measures into the restoration plan to provide protection to listed and sensitive species and to further minimize any short-term negative impacts to fish and wildlife and their habitats.

General Design Considerations

The Service recently completed a programmatic consultation for its Partners for Fish and Wildlife, Fisheries, Coastal, and Recovery Programs in Idaho, Oregon and Washington. A comprehensive suite of Project Design Criteria (PDCs) were compiled and developed for that consultation and were included in the biological assessment (USFWS 2014). They have been excerpted and are enclosed with this letter. We ask that the Corps incorporate any PDCs that are not already part of the proposed action and that are applicable to the project.

Endangered Species

The Corps completed a consultation with the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the ESA due to the potential for take of Lower Columbia River (LCR) Chinook salmon, Upper Willamette River (UW) Chinook salmon, LCR coho salmon, LCR steelhead, and UWR steelhead and potential modification of designated critical habitat. A biological opinion was completed by NMFS and received by the Corps for this project on August 27, 2012. We acknowledge and support the conservation measures and best management practices (BMPs) to avoid and minimize any adverse effects to listed species during construction that are described in the restoration plan and covered by the biological opinion. The Corps determined that the proposed action would have "no effect" on listed species or designated critical habitat under the jurisdiction of the Service (Corps 2015), so no further consultation is needed.

Reptiles and Amphibians

The Corps should work with the local Oregon Department of Fish and Wildlife biologist to obtain a salvage permit, if needed, and jointly develop a plan to avoid and minimize disturbance and/or mortality to native turtles, other reptiles and amphibians.

Migratory Birds

Migratory birds are protected under the Migratory Bird Treaty Act of 1918, as amended (16 USC 703-712). Under the Act, taking, killing or possessing migratory birds is unlawful. The best way to avoid disturbing nesting birds is to schedule activities outside the nesting season. The nesting season is not the same for all species, and not all sites will have nesting birds present during the entire nesting season. Here are some general guidelines to help you plan project activities:

1) The time between August 1 – January 31 is the best time to plan for tree removal, invasive plant species management, and grubbing and clearing.
2) The period between February 1 - July 31 typically covers the bird nesting season in the Portland area for most species. Disturbance to vegetated areas should be avoided during this time. If birds are not present during nesting season, vegetation removal and other disturbance activities may proceed.
3) If work must occur during the recommended avoidance time frames, the project area and specific vegetation impacted should be surveyed for nesting birds. We recommend you follow the City of Portland bird nesting guidelines (City of Portland 2010) at: http://www.portlandoregon.gov/bes/article/322164.
4) The western yellow-billed cuckoo (*Coccyzus americanus*), listed as threatened under the ESA, has been detected on rare occasions in riparian habitats in Multnomah County. In the unlikely event that this species is detected in the action area, we ask that you contact us prior to construction activity.

Bald eagle

The bald eagle was formally delisted from the federal ESA in 2008 but remains protected under the Migratory Bird Treaty Act of 1918, as amended (16 USC 703-712), and the Bald and Golden Eagle Protection Act of 1940, as amended (16 USC 668-668d). The nesting season for the bald eagle occurs between January 1 and August 31. If bald eagles are likely to be in the project area and Corps activities may disturb bald eagles during the nesting season, we recommend the Corps refer to the Service's guidance and restrictions at our website: http://www.fws.gov/pacific/eagle/disturb.html .

Lamprey

Pacific and other lamprey species may occur in the action area. To address their needs, we recommend that only the shortest linear extent of work area practicable be dewatered. In addition, we ask that you survey for lamprey and if found to be present, follow the guidance on how to salvage lamprey and dewater areas occupied by lamprey described in to the Best Management Practices to Minimize Adverse Effects to Pacific lamprey (*Entosphenus tridentatus*) (USFWS 2010), available on our web site at: http://www.fws.gov/pacific/Fisheries/sphabcon/Lamprey/index.html.

Public Use and Wildlife

Minimize increased recreational access and use in high value habitats and key areas by promoting public use where it will have the lowest impact on wildlife. Keep artificial lighting and human activity away from areas that are important for wildlife use and movement. The new culvert will include features to help allow for wildlife passage between the Willamette River and Oaks Bottom. Some wildlife species are especially vulnerable in constricted locations such as this due to risk of predation and sub-optimal site conditions. In addition to these risks, new signage proposed in the vicinity of the culvert may draw more human activity and disturbances to wildlife attempting to move through the area. While we are strongly supportive of both the wildlife passage features and interpretive signage, we ask that you carefully consider the project design features and locations of the signage and public use areas to ensure that benefits to wildlife will be maximized.

Habitat Features

We recommend adding tree snags and large wood throughout the site to enhance aquatic and terrestrial habitats for wildlife.

Contaminant Monitoring

The Service recommends that post-project monitoring be conducted to ensure that buried contaminants are not released to the surface sediment, that new exposure pathways are not created from sediment removal and restoration activities, and to confirm that contaminant levels are below those that could threaten juvenile salmonids or remain similar to or below current conditions. Service staff developed a conceptual sediment monitoring plan a few years ago due to concerns that had been raised about potential for fish and wildlife exposure to contaminants in the project area. We recommend conducting a similar sediment sampling plan to validate the expected conditions once work is completed.

Thank you for the opportunity to provide these comments. Please contact Jennifer Thompson or Rollie White at (503) 231-6179 if you have any questions or concerns regarding this letter.

Sincerely yours,

Acting for Paul Henson, Ph.D
State Supervisor

cc: Patti Clinton, Environmental Resources Specialist, U.S. Army Corps of Engineers - Portland District

Enclosure

Literature Cited

City of Portland. 2010. Terrestrial Ecology Enhancement Strategy Guidance: Avoiding Impacts to Nesting Birds During Construction and Restoration Projects, Version 2. City of Portland, Environmental Services, Portland, Oregon.

Corps (U.S. Army Corps of Engineers). 2015. Draft Integrated Feasibility Report and Environmental Assessment, Oaks Bottom Section 206 Habitat Restoration Project Feasibility Study. Portland, OR.

NMFS (U.S. National Marine Fisheries Service). 2012. Endangered Species Act Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Oaks Bottom Wildlife Refuge Tidal Reconnection Project in Multnomah County, Oregon. NMFS, Northwest Region, Portland, OR.

USFWS (U.S. Fish and Wildlife Service). 2014. Biological Assessment for Programmatic Restoration Opinion for Joint Ecosystem Conservation by the Services (PROJECTS). U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration Restoration Center in Idaho, Oregon, and Washington.

USFWS (U.S. Fish and Wildlife Service). 2010. Best management practices to minimize adverse effects to Pacific lamprey (*Entosphenus tridentatus*). U.S. Fish and Wildlife Service, Pacific Region, Fisheries Resources. Portland, Oregon.

Excerpt from U.S. Fish and Wildlife Service. 2014. Biological Assessment for Programmatic Restoration Opinion for Joint Ecosystem Conservation by the Services (PROJECTS). U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration Restoration Center, Idaho, Oregon, and Washington.

[Note: Numbers in the outline vary from those in the original document.]

1.1.1 Project Design Criteria

USFWS and NOAA RC propose to apply the following PDC, in the relevant sections, to every action authorized under this BA. Measures described under "Administration" apply to the USFWS and NOAA RC as they manage the PROJECTS program for habitat restoration activities which may impact ESA-listed species under USFWS's jurisdiction. PDC described under "General Construction" apply to actions that involve construction. PDC described under "Types of Action" are measures that apply to specific types of actions.

1.1.1.1 General Design Considerations

1. **Project Design Process**
   In addition to specific conservation measures below, it is expected that project managers will use the best available scientific information regarding the likely effects of climate change on resources in the project area, including projections of local stream flow and water temperature, and/or sea level rise and sediment transport processes, to ensure that the project will be adaptable to those changes.

   The following general design considerations will be applied for all actions completed under the PROJECTS program:
   a. Obtain all applicable regulatory permits and official project authorizations before beginning construction.
   b. Design the project to minimize the extent and duration of earthwork, *e.g.*, compacting, dredging, drilling, excavation, noise, and filling, including the following concerns:
   c. Avoid use of heavy equipment, vehicles or power tools below bankfull elevation unless project specialists determine such work is necessary, or will result in less risk of sedimentation or other ecological damage than work above that elevation.
   d. Complete earthwork in wetlands, riparian areas, and stream channels as quickly as possible.
   e. Specify that the construction contractor is to cease project operations when high flows or high tides may inundate the project area, except for efforts to avoid or minimize resource damage.
   f. Projects designs for a specific terrestrial species should include review/input from a biologist/botanist with appropriate knowledge of the particular species. The biologist has the discretion to adjust disturbance and disruption distances, based on site-specific conditions and known biology of the species.
   g. Hollow pipes, such as those used for signs, fences and gates, will be capped to prevent trapping small birds and mammals.

2. **Site Contamination Assessment**
   Pursuant to FWS policy, project managers will conduct a site contamination assessment as part of the design process to determine whether there is a likelihood of hazardous materials being present at the site, and include measures in the design to prevent release of such materials as a result of the project and to handle and dispose of them according to applicable regulations.
   a. The level of detail and resources committed to such an assessment will be commensurate with the level and type of past or current development at the site. Assessments may include the following:
      i. Review available records, such as former site use, building plans, and records of any prior contamination events.
      ii. If the project site was used for industrial processes (*i.e.*, mining or manufacturing with chemicals), inspect to determine the environmental condition of the property.
      iii. Interview people who are knowledgeable about the site, *e.g.*, site owners, operators, and occupants, neighbors, or local government officials.
   b. Retain contaminant survey information in the project file. Consult with NMFS and USFWS if ground disturbance or other activities to accomplish the proposed project has substantial potential to release contaminants into habitats that support listed fish and wildlife species.

1.1.1.2 Construction Considerations

Make the following construction considerations part of the construction contract bid package so that the construction contractor can plan and cost the work accordingly.

3. **Site Layout and Flagging**
   a. Before any significant ground disturbance or entry of mechanized equipment or vehicles into the construction area, clearly flag, mark with survey paint, other obvious boundary marker, the following areas as appropriate:
      i. Sensitive areas, *e.g.*, wetlands, water bodies, ordinary high water, spawning areas.
      ii. Equipment entry and exit points.
      iii. Road and stream crossing alignments.
      iv. Staging, storage, and stockpile areas.
   b. Before the use of herbicides, clearly flag no-application buffer zones if possible.
4. **Staging, Storage, and Stockpile Areas**
   a. Designate and use staging areas to store hazardous materials, or to store, fuel, or service heavy equipment, vehicles and other power equipment with tanks larger than 5 gallons, that are at least 150 feet from any natural water body or wetland, or on an established paved area, such that sediment and other contaminants from the staging area cannot be deposited in the floodplain or stream.
   b. Natural materials that are displaced by construction and reserved for restoration, *e.g.*, LW, gravel, and boulders, may be stockpiled within the 100-year floodplain.
   c. Dispose of any material not used in restoration and not native to the floodplain outside of the functional floodplain.

d. After construction is complete, obliterate all staging, storage, or stockpile areas, stabilize the soil, and revegetate the area.[1]

5. **Erosion Control**
   a. Use site planning and site erosion control measures commensurate with the scope of the project to prevent erosion and sediment discharge from the project site.
   b. Before significant earthwork begins, install appropriate, temporary erosion controls downslope to prevent sediment deposition in the riparian area, wetlands, or water body.
   c. During construction, if eroded sediment appears likely to be deposited in the stream, install additional sediment barriers as necessary.
   d. Temporary erosion control measures may include fiber wattles, silt fences, jute matting, wood fiber mulch and soil binder, or geotextiles and geosynthetic fabric.
   e. Soil stabilization utilizing wood fiber mulch and tackifier (hydro-applied) may be used to reduce erosion of bare soil if the materials are noxious weed-free and nontoxic to aquatic and terrestrial animals, soil microorganisms, and vegetation.
   f. Remove sediment from erosion controls if it reaches 1/3 of the exposed height of the control.
   g. Whenever surface water is present, maintain a supply of sediment control materials and an oil-absorbing floating boom at the project site.
   h. Stabilize all disturbed soils following any break in work unless construction will resume within four days.
   i. Remove temporary erosion controls after construction is complete and the site is fully stabilized.
6. **Hazardous Material Spill Prevention and Control**
   a. At the project site:
      i. Post or have available on site, written procedures for notifying environmental response agencies, including an inventory and description of all hazardous materials present, and the storage and handling procedures for their use.
      ii. Maintain a spill containment kit, with supplies and instructions for cleanup and disposal, adequate for the types and quantity of hazardous materials present.
      iii. Train workers in spill containment procedures, including the location and use of the spill containment kits.
   b. Temporarily contain any waste liquids under an impervious cover, such as a tarpaulin, in the staging area until the wastes can be properly transported to, and disposed of, at an approved receiving facility.

[1] Road and path obliteration refers to the most comprehensive degree of decommissioning and involves decompacting the surface and ditch, pulling the fill material onto the running surface, and reshaping to match the original contour.

7. **Equipment, Vehicles, and Power Tools**
    a. Select, operate and maintain all heavy equipment, vehicles, and power tools to minimize adverse effects on the environment, *e.g.*, low pressure tires, minimal hard-turn paths for track vehicles, use of temporary mats or plates to protect wet soils.
    b. Before entering wetlands or working within 150 feet of a waterbody, replace all petroleum-based hydraulic fluids with biodegradable products.[2]
    c. Take appropriate measures necessary for invasive species prevention and control:
        i. Before entering and leaving the project site, power wash all heavy equipment, vehicles and power tools, allow them to fully dry, and inspect them to make certain no plants, soil, or other organic material is adhering to their surface.
        ii. Before entering and leaving the water, inspect any watercraft, waders, boots, or other gear to be used in or near water and remove any plants, soil, or other organic material adhering to the surface.
        iii. Ensure all vehicles, equipment, and tools are as clean as possible and free from any seeds or vegetative matter.
    d. Inspect all equipment, vehicles, and power tools for fluid leaks before they leave the staging area.
    e. Before operation within 150 feet of any waterbody, and as often as necessary during operation, thoroughly clean all equipment, vehicles, and power tools to keep them free of external fluids and grease and to prevent leaks and spills from entering the water.
    f. Generators, cranes or other stationary heavy equipment operated within 150 feet of any waterbody will be maintained and protected as necessary to prevent leaks and spills from entering the water.
8. **Temporary Access Roads and Paths**
    a. Whenever reasonable, preferentially use existing access roads and paths.
    b. Minimize the number and length of temporary access roads and paths through riparian areas and floodplains.
    c. Minimize removal of riparian vegetation.
    d. When it is necessary to remove vegetation, cut at ground level (no grubbing).
    e. Do not build temporary access roads or paths where grade, soil, or other features suggest slope instability.
    f. Any road on a slope steeper than 30% will be designed by a civil engineer with experience in steep road design.
    g. After construction is complete, obliterate all temporary access roads and paths, stabilize the soil, and revegetate the area.

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[2] For additional information and suppliers of biodegradable hydraulic fluids, motor oil, lubricant, or grease, see Environmentally Acceptable Lubricants by the U.S. EPA (2011); *e.g.*, mineral oil, polyglycol, vegetable oil, synthetic ester; Mobil® biodegradable hydraulic oils, Total® hydraulic fluid, Terresolve Technologies Ltd.® bio-based biodegradable lubricants, Cougar Lubrication® 2XT Bio engine oil, Series 4300 Synthetic Bio-degradable Hydraulic Oil, 8060-2 Synthetic Bio-Degradable Grease No. 2, *etc*. 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 Interior or USFWS of any product or service to the exclusion of others that may be suitable.

h. Temporary roads and paths in wet areas or areas prone to flooding will be obliterated by the end of the in-water work window. Decompact road surfaces and drainage areas, pull fill material onto the running surface, and reshape to match the original contours.

9. Dust Abatement

a. Employ dust abatement measures commensurate with soil type, equipment use, wind conditions, and the effects of other erosion control measures.
b. Sequence and schedule work to reduce the exposure of bare soil to wind erosion.
c. Maintain spill containment supplies on-site whenever dust abatement chemicals are applied.
d. Do not use petroleum-based products.
e. Do not apply dust-abatement chemicals, *e.g.*, magnesium chloride, calcium chloride salts, ligninsulfonate, within 25 feet of water body, or in other areas where there may be runoff into a wetland or water body.
f. Do not apply ligninsulfonate at rates exceeding 0.5 gallons per square yard of road surface, assuming a 50:50 solution of ligninsulfonate to water.

10. Temporary Stream Crossings

a. No stream crossing may occur where listed amphibians are present.
b. No stream crossing may occur at active spawning sites when holding adult listed fish are present, or when eggs or alveins are in the gravel.
c. Do not place temporary crossings in areas that may increase the risk of channel re-routing or avulsion, or in potential spawning habitat, *e.g.*, pools and pool tailouts.
d. Minimize the number of temporary stream crossings; use existing stream crossings whenever reasonable.
e. Install temporary bridges and culverts to allow for equipment and vehicle crossing over perennial streams to access construction areas.
f. Wherever possible, vehicles and machinery will cross streams at right angles to the main channel.
g. Equipment and vehicles may cross the stream in the wet only where the streambed is bedrock, where the streambed is naturally stable, or where mats or off-site logs are placed in the stream and used as a crossing.
h. Obliterate all temporary stream crossings as soon as they are no longer needed, and restore any damage to affected stream banks or channel.

11. Surface Water Withdrawal and Construction Discharge Water

a. Surface water may be diverted to meet construction needs, but only if developed sources are unavailable or inadequate.
b. Diversions may not exceed 10% of the available flow and will have a juvenile fish exclusion device that is consistent with NMFS's criteria (NMFS 2011).[3]
c. Treat all construction discharge water using best management practices to remove debris, sediment, petroleum products, and any other pollutants likely to be present (*e.g.*, green concrete, contaminated water, silt, welding slag, sandblasting abrasive, grout cured less than 24 hours, drilling fluids), to ensure that no pollutants are discharged to any perennial or intermittent waterbody.

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[3] National Marine Fisheries Service. 2011. Anadromous salmonid passage facility design. Northwest Region.

12. Temporary Fish Passage

a. Provide fish passage for any adult or juvenile ESA-listed fish likely to be present in the action area during construction, unless passage did not exist before construction. Stream isolation and dewatering is required during project implementation, or if the stream is naturally impassable at the time of construction.

b. After construction, provide fish passage that meets NMFS's fish passage criteria for any adult or juvenile ESA-listed fish (NMFS 2011), for the life of the action.

13. Timing of In-Water Work

a. The in-water work window will limit in-water construction to the times specified in the project notification form. The construction schedule will conform to the windows established in Oregon, Washington, and Idaho by the Oregon Department of Fish and Wildlife (ODFW 2008), Washington Department of Fish and Wildlife (WDFW 2010), and Idaho Department of Fish and Game, respectively, or the USFWS for bull trout. For nearshore projects in Puget Sound, no in-water work is allowed in bull trout FMO habitat from February 16 – July 15, and near the Duwamish River from February 16 - September 30. Any exceptions to in-water work windows recommended by ODFW, WDFW, or IDFG will be approved by NMFS and the USFWS.

b. Hydraulic and topographic measurements and placement of LW, boulders, or gravel may be completed anytime, provided there is no excavation in areas occupied by adult fish congregating for spawning, or in areas where redds are occupied by eggs or pre-emergent alevins.

14. Fisheries, Hydrology, Geomorphology, Wildlife, Botany, and Cultural Surveys in Support of Habitat Restoration

This includes assessments and monitoring projects that are associated with planning, implementation, and monitoring of restoration projects covered by this BA. Such support projects may include surveys to document the following aquatic, riparian, and upland attributes: habitat, hydrology, channel geomorphology, water quality, fish spawning, fish presence4, macroinvertebrates, riparian vegetation, wildlife, and cultural resources (including excavating test pits less than 1 m^2 in size). This also includes effectiveness monitoring associated with projects implemented under this BA, provided the effectiveness monitoring is limited to the same survey techniques described in this section.

a. Train personnel in survey methods to prevent or minimize disturbance of fish and wildlife. Contract specifications should include these methods where appropriate.

b. Avoid impacts to fish redds. When possible, avoid sampling during spawning periods.

c. Coordinate with other local agencies to prevent redundant surveys.

d. Locate excavated material from cultural resource test pits away from stream channels. Replace all material in test pits when survey is completed and stabilize the surface.

e. Does not include research projects that have or should obtain a permit pursuant to section 10(a) of the ESA.

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[4] Capture or enumeration by non-lethal techniques, *i.e.,* snorkel, minnow trapping; not hooking or electrofishing.

15. Work Area Isolation

a. Isolate any work area within the wetted channel from the active stream whenever ESA-listed fish are reasonably certain to be present, or if the work area is less than 300 feet upstream from known spawning habitats. However, work area isolation may not always be necessary or practical in certain settings; *i.e.,* dry streambeds and tidal zones, respectively.

b. Engineering design plans for work area isolation will include all isolation elements. Final site specific plans by contractors will be approved by project sponsor and biologist.

c. Dewater the shortest linear extent of work area practicable, unless wetted in-stream work is deemed to be minimally harmful to fish, and is beneficial to other aquatic species.[5]

   i. Use a coffer dam and a by-pass culvert or pipe, or a lined, non-erodible diversion ditch to divert flow around the dewatered area. Dissipate flow energy to prevent damage to riparian vegetation or stream channel and provide safe downstream re-entry for fish, preferably into pool habitat with cover.

   ii. Where gravity feed is not possible, pump water from the work site to avoid re-watering. Maintain a fish screen on the pump intake to avoid juvenile fish entrainment (NMFS 2011).

   iii. Pump seepage water to a temporary storage and treatment site, or into upland areas, to allow water to percolate through soil or to filter through vegetation before reentering the stream channel. The water treatment site should have a treatment system comprised of either a hay bale basin or other sediment control device.

   iv. Monitor water levels below the construction site to prevent stranding of aquatic organisms.

   v. When construction is complete, re-water the construction site slowly to prevent loss of surface flow downstream, and to prevent a release of suspended sediment.

d. Whenever a pump is used to dewater the isolation area and ESA-listed fish may be present, a fish screen will be used that meets the most current version of NMFS's fish screen criteria (NMFS 2011). NMFS approval is required for pumping that exceeds 3 cfs.

16. Fish Capture and Release

a. If practicable, allow listed fish species to migrate out of the work area or remove fish before dewatering; otherwise remove fish from an exclusion area as it is slowly dewatered with methods such as hand or dip-nets, seining, and trapping with minnow traps (or gee-minnow traps).

b. Fish capture will be supervised by a qualified fisheries biologist, with experience in work area isolation and competence to ensure the safe handling of fish.

c. Conduct fish capture activities during periods of the day with the coolest air and water temperatures possible, normally early in the morning to minimize stress and injury of species present.

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[5] For instructions on how to dewater areas occupied by lamprey, see *Best management practices to minimize adverse effects to Pacific lamprey* (*Entosphenus tridentatus*) (USFWS 2010).

d. Monitor the nets frequently enough to ensure they stay secured to the banks and free of organic accumulation.
e. Electrofish during the coolest time of day, and only after other means of fish capture are determined to be not feasible or ineffective.
    i. Follow the most recent version of NMFS (2000) electrofishing guidelines.
    ii. Do not electrofish when the water appears turbid, *e.g.*, when objects are not visible at depth of 12 inches.
    iii. Do not intentionally contact fish with the anode.
    iv. Use direct current (DC) or pulsed direct current within the following ranges:
        1. If conductivity is less than 100 µs, use 900 to 1100 volts.
        2. If conductivity is between 100 and 300 µs, use 500 to 800 volts.
        3. If conductivity greater than 300 µs, use less than 400 volts.
    v. Begin electrofishing with a minimum pulse width and recommended voltage, then gradually increase to the point where fish are immobilized.
    vi. Immediately discontinue electrofishing if fish are killed or injured, *i.e.*, dark bands visible on the body, spinal deformations, significant de-scaling, fish are torpid or not able to maintain upright attitude after sufficient recovery time. Recheck machine settings, water temperature and conductivity, and adjust or postpone procedures as necessary to reduce injuries.
f. If buckets are used to transport fish:
    i. Minimize the time fish are in a transport bucket.
    ii. Keep buckets in shaded areas or, if no shade is available, covered by a canopy.
    iii. Limit the number of fish within a bucket; fish will be of relatively comparable size to minimize predation.
    iv. Use aerators or replace the water in the buckets at least every 15 minutes with cold clear water.
    v. Release fish in an area upstream with adequate cover and flow refuge; downstream release is acceptable provided the release site is below the influence of construction.
    vi. Be careful to avoid mortality counting errors.
g. Monitor and record fish presence, handling, and injury during all phases of fish capture and submit a fish salvage report to NMFS/ USFWS for any listed fish species that may be present, within 60 days of capture. The report must, document the date, time of day, fish handling procedures, air and water temperatures, and total numbers of each fish species handled, and numbers of ESA-listed fish injured or killed.

17. Invasive species and non-native plant control

Invasive species impacts are of concern to USFWS and NMFS. Invasive species degrade, change, or displace native habitats and compete with native wildlife and are thus harmful to fish, wildlife, and plant resources. Preventing the introduction or spread of invasive and non-target species is the most effective strategy to avoid impacts to native species and ecosystems. Preventive measures typically offer the most cost-effective

means to minimize or eliminate environmental and economic impacts due to invasive species.

Invasive Species Prevention Measures

a. Each project must clearly identify invasive species prevention measures, including:
    i. Invasive species of concern for importing or exporting from the project site.
    ii. Methods to be used to reduce the risk of spreading invasive species.
    iii. Monitoring that will occur to detect invasive species and;
    iv. Actions that will be implement to control invasive species if identified and it is deemed necessary to take action.

Invasive Plant Treatment Measures

b. Non-herbicide methods. Limit vegetation removal and soil disturbance within the riparian zone by limiting the number of workers to the minimum necessary to complete manual, mechanical, or hydro-mechanical plant control (e.g., hand pulling, bending[6], clipping, stabbing, digging, brush-cutting, mulching, radiant heat, portable flame burner, super-heated steam, pressurized hot water, or hot foam (Arsenault et al. 2008; Donohoe et al. 2010))[7]. Do not allow cut, mowed, or pulled vegetation to enter waterways.
c. Herbicide methods.
    i. Herbicide Label. Herbicide applicators will comply with all label instructions.
    ii. Power equipment. Refuel gas-powered equipment with tanks larger than 5 gallons in a vehicle staging area placed 150-feet or more from any natural waterbody, or in an isolated hazard zone such as a paved parking lot.
    iii. Maximum herbicide treatment area. Do not exceed treating 10% of the acres of riparian habitat within a 6th-field HUC with herbicides per year.
    iv. Herbicide applicator qualifications. Herbicides may only be applied by an appropriately licensed applicator, or under the direct supervision of a licensed applicator. Only use 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 the herbicide transportation and safely plan, as follows.
    v. 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. The following measures will be used to reduce the risk of a spill during water transport: (a) No more than 2.5 gallons of herbicide concentrate will be transported per person or raft, and typically it will be one gallon or less; (b) glyphosate will be carried in 1 gallon or smaller plastic containers. The containers will be wrapped in plastic bags

[6] Knotweed treatment pre-treatment; See Nickelson (2013).

[7] See http://ahmct.ucdavis.edu/limtask/equipmentdetails.html

and then sealed in a secondary watertight container. If transported by raft, the container will be secured to the watercraft.

d. Permitted Herbicides. The only herbicides allowed for use under this BA are divided into "Aquatic and Upland" and "Upland use only". Upland use only herbicides cannot be used within 300 feet of streams, rivers, wetlands, or riparian areas where there is chance of drifting or leaching into aquatic habitats. Permitted herbicides, common trade names[8], and allowable uses under this BA are as follows::
    i. aquatic imazapyr (e.g., Habitat) – Aquatic and Upland
    ii. aquatic glyphosate (e.g., AquaMaster, AquaPro, Rodeo) – Aquatic and Upland
    iii. aquatic triclopyr-TEA (e.g., Renovate 3) – Aquatic and Upland
    iv. chlorsulfuron (e.g., Telar, Glean, Corsair) – Aquatic and Upland
    v. clopyralid (e.g., Transline) – Aquatic and Upland
    vi. imazapic (e.g., Plateau) – Aquatic and Upland
    vii. imazapyr (e.g., Arsenal, Chopper) – Aquatic and Upland
    viii. metsulfuron-methyl (e.g., Escort) – Aquatic and Upland
    ix. picloram (e.g., Tordon) – Aquatic and Upland
    x. sethoxydim (e.g., Poast, Vantage) – Aquatic and Upland
    xi. sulfometuron-methyl (e.g., Oust, Oust XP) - Aquatic and Upland
    xii. glyphosate (nonaquatic formulation) – Upland use only
    xiii. triclopyr (e.g., Garlon4Ultra) – Upland use only
    xiv. fluazifop-p-butyl (e.g., Fusilade) – Upland use only
    xv. clethondim (e.g., Envoy) – Upland use only
    xvi. triclopyr +2,4-D ester (e.g., Crossbow) – Upland use only
    xvii. diquat dibromide (e.g., Reward) – Upland use only

e. Permitted Herbicide adjuvants. When recommended by the label, an approved aquatic surfactant or drift retardant can be used to improve herbicidal activity or application characteristics. Adjuvants that contain alky amine etholoxylates, i.e., polyethoxylated tallow amine (POEA), alkylphenol ethoxylate (including alkyl phenol ethoxylate phosphate esters), or herbicides that contain these compounds are not covered by this BA. The following product names are covered by this BA:
    i. Agri-Dex
    ii. AquaSurf
    iii. Bond
    iv. Bronc Max
    v. Bronc Plus Dry-EDT
    vi. Class Act NG
    vii. Competitor
    viii. Cut Rate
    ix. Cygnet Plus
    x. Destiny HC

[8] The use of trade, firm, or corporation names in this BA 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 Interior or USFWS of any product or service to the exclusion of others that may be suitable.

xi. Exciter Fraction
xii. InterLock
xiii. Kinetic
xiv. Level 7
xv. Liberate
xvi. Magnify
xvii. One-AP XL
xviii. Pro AMS Plus Spray-Rite
xix. Superb HC
xx. Tactic
xxi. Tronic
xxii. Nufilm – Upland use only

f. Herbicide carriers. Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil. Use of diesel oil as an herbicide carrier is not covered by this BA.
g. Dyes. Use a non-hazardous indicator dye (e.g., Hi-Light or Dynamark) with herbicides within 100-feet of water. The presence of dye makes it easier to see where the herbicide has been applied and where or whether it has dripped, spilled, or leaked. Dye also makes it easier to detect missed spots, avoid spraying a plant or area more than once, and minimize over-spraying (SERA 1997).
h. Herbicide mixing. Mix herbicides and adjuvants, carriers, and/or dyes more than 150-feet from any perennial or intermittent waterbody to minimize the risk of an accidental discharge.
i. Tank Mixtures. The potential interactive relationships that exist among most active ingredient combinations have not been defined and are uncertain. Therefore, combinations of herbicides in a tank mix are not covered by this BA.
j. Spill Cleanup Kit. Provide a spill cleanup kit whenever herbicides are used, transported, or stored. At a minimum, cleanup kits will include Material Safety Data Sheets, the herbicide label, emergency phone numbers, and absorbent material such as cat litter to contain spills.
k. Herbicide application rates. Apply herbicides at the lowest effective label rates.
l. Herbicide application methods. Apply liquid or granular forms of herbicides as follows:
    i. Broadcast spraying – hand held nozzles attached to back pack tanks or vehicles, or by using vehicle mounted booms.
    ii. 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.
    iii. Hand/selective – wicking and wiping, basal bark, fill ("hack and squirt"), stem injection, cut-stump.
    iv. Triclopyr – will not be applied by broadcast spraying closer than 500-feet from any aquatic habitat.
    v. Keep the spray nozzle within four feet of the ground when applying herbicide. If spot or patch spraying tall vegetation more than 15 feet away from the high water mark (HWM), keep the spray nozzle within 6 feet of the ground.

vi. Apply spray in swaths parallel towards the project area, away from the creek and desirable vegetation, i.e., the person applying the spray will generally have their back to the creek or other sensitive resource.

vii. Avoid unnecessary run off during cut surface, basal bark, and hack-squirt/injection applications.

m. Washing spray tanks. Wash spray tanks 300-feet or more away from any surface water.

n. Minimization of herbicide drift and leaching. Minimize herbicide drift and leaching as follows:

   i. Do not broadcast spray when wind speeds exceed 10 miles per hour, or are less than 2 miles per hour. Do not spot spray when wind speeds exceed 10 miles per hour. Winds less than 2 miles per hour are OK for spot spraying.

   ii. Be aware of wind directions and potential for herbicides to affect aquatic habitat area downwind.

   iii. Keep boom or spray as low as possible to reduce wind effects.

   iv. 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.

   v. Do not apply herbicides during temperature inversions, or when air temperature exceeds 80 degrees Fahrenheit.

   vi. Wind and other weather data will be monitored and reported for all broadcast applications.

o. Rain. Do not apply herbicides when the soil is saturated or when a precipitation event likely to produce direct runoff to salmon/bull trout bearing waters from the treated area is forecasted by the NOAA National Weather Service or other similar forecasting service within 48 hours following application. Soil-activated herbicides may follow label instructions. Do not conduct hack-squirt/injection applications during periods of heavy rainfall.

p. Herbicide buffer distances. Observe the following no-application buffer-widths, measured in feet, as map distance perpendicular to the bankfull elevation for streams, the upland boundary for wetlands, or the upper bank for roadside ditches. Widths are based on herbicide formula, stream type, and application method, during herbicide applications (Table 4). Before herbicide application begins, flag or mark the upland boundary of each applicable herbicide buffer to ensure that all buffers are in place and functional during treatment.

Table 1: Herbicide buffer distances by herbicide formula, stream type, and application method for aquatic habitat restoration projects. Upland only herbicides must be used at least 300-feet from any aquatic habitat.

Herbicide	**No Application Buffer Width (feet)**					
	Streams and Roadside Ditches with flowing or standing water present and Wetlands			Dry Streams, Roadside Ditches, and Wetlands		
	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						
Picloram	100	50	50	100	50	50
Sethoxydim	100	50	50	100	50	50

18. Piling Installation

a. Pilings may be concrete, steel round pile 24 inches in diameter or smaller, steel H-pile designated as HP24 or smaller, or untreated wood.[9]
b. When possible, use a vibratory hammer for piling installation.
c. When using an impact hammer to drive or proof steel piles, use one of the following sound attenuation methods to effectively dampen sound pressure waves in all areas to a single strike peak threshold of 206 decibels. For cumulative strikes, a 187 decibel sound exposure level (SEL) is allowed in areas and times where fish are larger than 2 grams; and a 183 decibel SEL is allowed in areas and times when fish are smaller than 2 grams.
d. Completely isolate the pile from flowing water by dewatering the area around the pile if dewatering is practicable.
e. If area cannot be dewatered, and water velocity is 1.6 feet per second or less, surround the piling being driven by a confined or unconfined bubble curtain that will distribute small air bubbles around 100% of the piling perimeter for the full depth of the water column, as described in NMFS and USFWS (2006).[10]
f. If water velocity is greater than 1.6 feet per second, surround the piling being driven by a confined bubble curtain (*e.g.,* a bubble ring surrounded by a fabric or non-metallic sleeve) that will distribute air bubbles around 100% of the piling perimeter for the full depth of the water column.
g. NMFS/USFWS review and approval. Provide NMFS/USFWS the following information: the timing of in-water work, the number of impact hammer strikes per pile and the estimated time required to drive piles; the hours per day pile driving will occur, the depth of water, the type of substrate, the hydroacoustic assumptions; and the pile type, diameter, and spacing of the piles.

19. Site Restoration

a. Restore any significant disturbance of riparian, wetland or upland vegetation, soils, stream banks or stream channel.
b. Remove all project related waste; *e.g.*, pick up trash, sweep roadways in the project area to avoid runoff-containing sediment, *etc.*
c. Obliterate all temporary access roads, crossings, and staging areas.
d. Loosen soil in compacted areas when necessary for revegetation or infiltration.
e. Although no single criterion is sufficient to measure restoration success, the intent is that the following features should be present in the upland parts of the project area, within reasonable limits of natural and management variation:
    i. Human and livestock disturbance, if any, are confined to small areas necessary for access or other special management situations.

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[9] An individual consultation and site-specific risk assessment are required for actions that propose the use of pilings made of treated wood, including chromated copper arsenate (CCA), ammoniacal copper zinc arsenate (ACZA), alkaline copper quaternary (ACQ-B and ACQ-D), ammoniacal copper citrate (CC), copper azole (CBA-A), copper dimethyldithiocarbamate (CDDC), borate preservatives, and oil-type wood preservatives, such as creosote, pentachlorophenol, and copper naphthenate.

ii. Areas with signs of significant past erosion are completely stabilized and healed, bare soil spaces are small and well-dispersed.
iii. Soil movement, such as active rills and soil deposition around plants or in small basins, is absent or slight and local.
iv. Native woody and herbaceous vegetation, and germination microsites, are present and well distributed across the site; invasive plants are minimal or absent.
v. Plants have normal, vigorous growth form, and a high probability of remaining vigorous, healthy and dominant over undesired competing vegetation.
vi. Plant litter is well distributed and effective in protecting the soil with little or no litter accumulated against vegetation as a result of active sheet erosion ("litter dams").
vii. A continuous corridor of shrubs and trees appropriate to the site are present to provide shade and other habitat functions for the entire streambank/shoreline.

20. Revegetation

a. Plant and seed disturbed areas before or at the beginning of the first growing season after construction.
b. Use an assemblage of vegetation species appropriate for long term productivity of the site, including native trees, shrubs, and herbaceous species. Vegetation, such as willow, sedge and rush mats, may be gathered from abandoned floodplains, stream channels, *etc.* When feasible, use vegetation salvaged from local areas scheduled for clearing due to development.
c. Use species that will achieve shade and erosion control objectives, including forb, grass, shrub, or tree species that are appropriate for the site and native to the project area or region.
d. Short-term stabilization measures may include use of non-native sterile seed mix if native seeds are not available, weed-free certified straw, jute matting, and similar methods.
e. Do not apply surface fertilizer within 50 feet of any wetland or water body.
f. Install fencing as necessary to prevent access to revegetated sites by livestock or unauthorized persons.
g. Do not use invasive or non-native species for site restoration with the exception of sterile seed for stabilization if native seed is not available.
h. Conduct post-construction monitoring and treatment to remove or control invasive plants until native plant species are well-established.

1.1.1.3 Restoration Actions

Projects within the 20 restoration activity categories will be designed and implemented to help restore watershed, coastal, and upland processes. As such, these improvements may help address limiting factors of ESA-listed species. Habitat restoration and enhancement projects are conducted within stream channels, adjacent riparian/floodplain areas, wetlands, nearshore, coastal areas, and uplands. Upland projects will address habitat requirements of prairie, oak, forest, and dune species. The 20 types of Restoration Actions are listed below:

21. Fish Passage Restoration (Stream Simulation Culvert and Bridge Projects; Headcut and Grade Stabilization; Fish Ladders; Irrigation Diversion Replacement/Relocation and Screen Installation/Replacement)
22. Large Wood (LW), Boulder, and Gravel Placement; Engineered Logjams (ELJ); Constructed Riffles, Porous Boulder Step Structures and Vanes; Gravel Augmentation; Tree Removal for LW Projects
23. Dam and Legacy Structure Removal
24. Fluvial Channel Reconstruction/Relocation
25. Off- and Side-Channel Habitat Restoration
26. Streambank Restoration
27. Set-Back or Removal of Existing Berms, Dikes, and Levees
28. Reduction/Relocation of Recreation Impacts
29. Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering
30. Piling and other Structure Removal
31. Shellfish Bed/Nearshore Habitat Restoration
32. In-channel Nutrient Enhancement
33. Road and Trail Erosion Control and Decommissioning
34. Juniper Removal
35. Native Fish Protection
36. Beaver Habitat Restoration
37. Wetland Restoration
38. Tide/Flood Gate Removal, Replacement, or Retrofit
39. Restore Native Vegetation
40. Upland Silvicultural Treatments

33. Fish Passage Restoration

Typical projects include the following: total removal, replacement, or resetting of culverts or bridges; stabilizing headcuts and other channel instabilities; removing, relocating, constructing, repairing, or maintaining fish ladders; and replacing, relocating, or constructing fish screens and irrigation diversions. Such projects will take place where fish passage has been partially or completely eliminated.

a. Stream simulation culvert and bridge projects. All road-stream crossing structures shall adhere to the most recent version of NMFS fish passage criteria (NMFS 2011) or most recent located under at: http://www.westcoast.fisheries.noaa.gov/publications/hydropower/fish_passage_design_criteria.pdf. USFWS in consultation with NMFS engineering review, if

required, shall occur at the conceptual, post-modeling, and final design phases, which is approximated by 30%, 60%, and 90% designs.

b. All road-stream crossing structures shall simulate stream channel conditions per industry design standards found in any one of the following:
    i. Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings (USDA-Forest Service 2008) or the most recent version, located at: http://stream.fs.fed.us/fishxing/aop_pdfs.html
    ii. Part XII Fish Passage Design and Implementation, Salmonid Stream Habitat Restoration Manual (California Department of Fish and Game 2009) or the most recent version, located at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=12512
    iii. Water Crossings Design Guidelines (Barnard et al. 2013) or the most recent version), located at: http://wdfw.wa.gov/publications/01501/

c. General road-stream crossing criteria
    i. Span
        1. Span is determined by the bankfull channel width at crossing location.
        2. Single span structures shall maintain a clear, unobstructed opening above the general scour elevation that is at least as wide as 1.5 times the bankfull width for alluvial channels.
        3. Multi-span structures shall maintain clear, unobstructed openings above the general scour elevation (except for piers or interior bents) that are at least as wide as 2.2 times the bank full width for alluvial channels.
        4. Entrenched streams: If a stream is entrenched (entrenchment ratio of less than 1.4), the crossing span shall accommodate the flood prone width. Flood prone width is the channel width measured at twice the maximum bankfull depth (Rosgen 1996).
        5. Minimum structure span is 6 feet.
    ii. Scour Prism
        1. Designs shall maintain the general scour prism, as a clear, unobstructed opening (*i.e.,* native streambed material can move freely without countermeasures, or structural material to include abutments, footings, and culvert inverts).
        2. When bridge abutments are set back beyond the applicable criteria span they may be located above the general scour elevation.
    iii. Embedment
        1. All culvert footings and inverts shall be placed below the thalweg at a depth of 3 feet, or the Lower Vertical Adjustment Potential (LVAP) line, whichever is deeper.
        2. LVAP, as calculated in *Stream Simulation: An ecological approach to providing passage for aquatic organisms at road crossings* (USDA-Forest Service 2008)
        3. In addition to embedment depth, embedment of closed bottom culverts shall be between 30% and 50% of the culvert height.

iv. Bridges

1. Primary bridge structural elements will be concrete, metal, fiberglass, or untreated timber. The use of treated wood for bridge construction or replacement is not allowed under this BA. Old railroad cars, which are commonly used as bridges, may have treated wood decking. Sample for the presence of treatment chemicals and replace treated elements with untreated wood.
2. All concrete will be poured in the dry, or within confined waters not connected to surface waters, and will be allowed to cure a minimum of 7 days before contact with surface water as recommended by Washington State Department of Transportation (2010).
3. Riprap will not be placed within the bankfull width of the stream. Riprap may only be placed below bankfull height when necessary for protection of abutments and pilings. The amount and placement of riprap will not constrict the bankfull flow.
4. Temporary work bridges will also meet NMFS[11] (2011) (or the latest version).
5. USFWS fish passage review and approval. USFWS in consultation with NMFS engineering will review crossing structure designs if the span width is determined to be less than the criteria established above or if the design is inconsistent with criteria in *Anadromous Salmonid Passage Facility Design* (NMFS 2011).

d. Headcut and grade stabilization. Headcuts (vertical off-sets in the streambed) often occur in meadow areas, where floodplain soils are fine textured. Headcuts may develop because of channel straightening, channel avulsion, culvert replacement or removal, or loss of riparian vegetation. Grade (streambed elevation) stabilization measures minimize the migration of headcuts upstream.

i. Methods

1. In streams with current or historical fish presence, provide fish passage over a headcut through use of morphologically appropriate grade stabilization. This includes constructed riffles for riffle-pool morphologies, rough constructed riffles/ramps for plane bed morphologies, wood jams, rock sills, and boulder weirs for step-pool morphologies, and roughened channels for cascade morphologies as described in part ii below.
2. Grade control materials can include both rock and LW. Material shall not in any part consist of gabion baskets, sheet piles, concrete, articulated concrete blocks, or cable anchors.
3. Rock for structures shall be durable and of suitable quality to assure permanence in the climate in which it is to be used. Gravel sizing depends on the size of the stream, size of bed material

[11] http://www.habitat.noaa.gov/pdf/salmon_passage_facility_design.pdf

upstream, maximum depth of flow, plan form, entrenchment, and ice and debris loading.

4. Short-term headcut stabilization (including emergency stabilization projects) may occur without associated fish passage measures. However, fish passage will be incorporated into the final headcut stabilization action and be completed during the first subsequent in-water work period.

ii. Grade Stabilization to Promote Fish Passage

1. USFWS fish passage review and approval. USFWS (in aquatic habitats) will review all projects containing grade control, stream bed stability, or headcut countermeasures that are proposed to promote fish passage.
2. Provide fish passage over grade control structures through use of constructed riffles for pool/riffle streams or a series of log or rock weirs for step/pool channels. If LW and boulder placement is used for headcut stabilization, refer to Large Wood, Boulder, and Gravel Placement (PDC 34) below.
3. Construct structures in a 'V' or 'U' shape in plan view, oriented with the apex upstream, lower in the center to direct flows to the middle of channel.
4. Key structures into the stream bed to minimize structure undermining due to scour, preferably at least 2.5 times their exposure height. The structures should also be keyed into both banks.
5. If several structures will be used in series, space them at the appropriate distances to promote fish passage of all life stages of native fish. Incorporate NMFS (2011) fish passage criteria (jump height, pool depth, *etc.*) in the design of step structures. Recommended spacing should be no closer than the net drop divided by the channel slope (for example, a one-foot high step structure in a stream with a two-percent gradient will have a minimum spacing of 50-feet [1/0.02]).
6. Include gradated (cobble to fine) material in the rock structure material mix to help seal the structure/channel bed, thereby preventing subsurface flow and ensuring fish passage immediately following construction if natural flows are sufficient.
7. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.

e. Fish Ladders

i. USFWS fish passage review and approval. USFWS will review fishways designs for consistency with criteria in *Anadromous Salmonid Passage Facility Design* (NMFS 2011).

ii. Design preference is based on project type, level of maintenance, and required monitoring essential for reliable fish passage. Typical fishway designs include: (a) roughened channels/boulder step structures, (b)

channel spanning concrete sills, (c) pool and chute, and (d) pool and weir fishways. Roughened channel and boulder step structure fishways consist of a properly sized mix of rock and sediment in an open channel that creates enough roughness and diversity to facilitate fish passage. Our review will include any appurtenant facilities (*i.e.*, fish counting equipment, pit tag detectors, lighting, trash racks, attraction water) that may be included with the fish ladder design. See the most recent version of *Anadromous Salmonid Passage Facility Design* (NMFS 2011) for guidelines and PDC.

iii. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.

f. Irrigation diversion replacement/relocation and screen installation/ replacement

i. USFWS fish passage review and approval. USFWS in consultation with NMFS engineering will review irrigation diversion replacement/relocation and screen installation/ replacement projects for consistency with criteria in *Anadromous Salmonid Passage Facility Design* (NMFS 2011).

ii. Diversion structures—associated with points of diversion and future fish screens—will pass all life stages of threatened and endangered aquatic species that historically used the affected aquatic habitat.

iii. Water diversion intake and return points will be designed (to the greatest degree possible) to prevent all native fish life stages from swimming or being entrained into the diversion.

iv. NMFS fish screen criteria (NMFS 2011) applies to salmonid species but generally may be applied to other aquatic fish species. This includes screens in temporary and permanent pump intakes.

v. All fish screens will be sized to match the irrigator's state water right or estimated historical water use, whichever is less.

vi. Size of bypass structure should be big enough to pass adult fish back to the stream.

vii. Abandoned ditches and other similar structures will be plugged or backfilled, as appropriate, to prevent fish from swimming or being entrained into them.

viii. When making improvements to pressurized diversions, install a totalizing flow meter capable of measuring rate and duty of water use. For non-pressurized systems, install a staff gage or other measuring device capable of measuring instantaneous rate of water flow.

ix. Conversion of instream diversions to groundwater wells will only be used in circumstances where there is an agreement to ensure that any surface water made available for instream flows is protected from surface withdrawal by another water user.

x. For the removal of diversion structures constructed of local rock and dirt, the project sponsor will dispose of the removed material in the following manner:

1. Material more than 60% silt or clay will be disposed in uplands, outside of the active floodplain.

2. Material with more than 40% gravel will be deposited within the active floodplain, but not in wetlands.
3. Material with more than 50% gravel and less than 30% fines (silt or clay) may be deposited below the bankfull elevation.

34. Stream Channel Enhancement (Large Wood (LW), Boulder, and Gravel Placement)
Typical projects include LW and boulder placement, ELJs, constructed riffles, porous boulder structures and vanes, gravel placement, and tree removal for LW projects. Engineered log jams are a type of large wood placement that employs an engineered anchoring system such as ballast, pinning, or vertical piles. Such activities will occur in areas where channel structure is lacking due to past stream cleaning (LW removal), riparian timber harvest, and in areas where alluvial gravel supplies are low due to anthropogenic disruptions. These projects will occur in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, spawning gravel deposition, channel complexity, hiding cover, low velocity areas, and floodplain function.

a. Large wood and boulder projects
   i. Place LW and boulders in areas where they would naturally occur, and in a manner that closely mimics natural accumulations for that particular stream type. For example, boulder placement may not be appropriate in low-gradient meadow streams.
   ii. Structure types shall simulate disturbance events to the greatest degree possible and include, but are not limited to, log jams, debris flows, wind-throw, and tree breakage.
   iii. No limits are to be placed on the size or shape of structures as long as such structures are within the range of natural variability of a given location and do not block fish passage.
   iv. Projects can include grade control and streambank stabilization structures, as long as the size and configuration of such structures will be commensurate with scale of project site and hydraulic forces, and provided that streambank stabilization, if any, is not the principal objective of the restoration action.
   v. The partial burial of LW and boulders is permitted and may constitute the dominant means of placement. This applies to all stream systems but more so for larger stream systems where use of adjacent riparian trees or channel features is not feasible or does not provide the full stability desired.
   vi. LW includes whole conifer and hardwood trees, logs, and rootwads. LW size (diameter and length) should account for bankfull width and stream discharge rates, and the geomorphic function of the LW in that stream type. An example is, in stream reaches where LW forms immobile steps or channel-spanning jams. When available, trees with rootwads should be a minimum of 1.5x bankfull channel width, while logs without rootwads should be a minimum of 2.0 x bankfull widths. In larger, wider streams, where LW is readily transported and forms complex log jams along the channel margins, bar apexes, or side channel junctions, LW should be of sufficient diameter to avoid breakage due to hydraulic forces, , and of

sufficient length to be fitted into a structure that can be stabilized through gravity, placement orientation, or keying the structure into the streambank.

vii. Structures may partially or completely span stream channels or be positioned along stream banks.

viii. Stabilizing or key pieces of LW will be intact, hard, with little decay, and if possible have root wads (untrimmed) to provide functional refugia habitat for fish. Consider orienting key pieces such that the hydraulic forces upon the LW increase stability.

ix. Anchoring LW – Anchoring alternatives may be used in preferential order:

1. Use of adequate sized wood sufficient for stability due to gravity and placement orientation.
2. Orient and place wood in such a way that movement is limited.
3. Ballast the wood using gravel or rock to increase the mass of the structure to resist movement.
4. Use large boulders as anchor points for the LW.
5. Pin LW with rebar to large rock to increase its weight.
6. Anchoring LW by cable is not allowed under this BA.

b. Engineered Logjams (ELJs) are structures designed to redirect flow, change scour and deposition patterns, and retain mobile LW that might otherwise be exported by the flow.[12] While providing valuable fish and wildlife habitat, they are also designed to redirect flow and can provide stability to a streambank or downstream gravel bar. To the extent practical, ELJs are designed to simulate stable natural log jams and can be either naturally stable due to LW size and/or stream width or anchored in place using rebar, rock, or piles (driven into a dewatered area or the streambank, but not in water). They are also designed to create a hydraulic shadow, a low-velocity zone downstream that allows sediment to settle out, and allows scour holes to form adjacent to the structure.

i. USFWS fish passage review and approval. For ELJs that occupy greater than 25% of the bankfull cross sectional area, USFWS in consultation with NMFS engineering will review the action for consistency with criteria in *Anadromous Salmonid Passage Facility Design* (NMFS 2011).

ii. ELJs will be patterned, to the greatest degree possible, after stable natural log jams.

iii. Grade control ELJs are designed to arrest channel down-cutting or incision by providing a grade control that retains sediment, lowers stream energy, and increases water elevations to reconnect floodplain habitat and diffuse downstream flood peaks.

iv. Stabilizing or key pieces of LW that will be relied on to provide streambank stability or redirect flows will be intact and solid (little decay). If possible, acquire LW with untrimmed rootwads to provide functional refugia habitat for fish.

v. When available, key pieces with rootwads attached should be a minimum length of 1.5 times the bankfull channel width, while logs without rootwads should be a minimum of 2.0 times the bankfull width.

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[12] ELJs are defined as structures composed of LW with at least three key members incorporating the use of an anchoring system as defined in PDC 33.a.ix.

vi. The partial burial of LW may constitute the dominant means of placement, and LW can be buried into the streambank or channel.

vii. Angle and offset – The LW portions of ELJ structures should be oriented such that the force of water upon the LW increases stability. If a rootwad is left exposed to the flow, the bole placed into the streambank should be oriented downstream parallel to the flow direction so the pressure on the rootwad pushes the bole into the streambank and bed.

viii. If LW anchoring is required, a variety of methods may be used. These include buttressing the wood between riparian trees, or the use of manila, sisal, or other biodegradable ropes for lashing connections. If hydraulic conditions warrant use of structural connections, rebar pinning, chains, or bolted connections may be used. Rock may be used for ballast but is limited to that needed to anchor the LW.

c. Constructed riffles

i. USFWS fish passage review and approval. USFWS in consultation with NMFS engineering will review all constructed or engineered riffles for consistency with criteria in *Anadromous Salmonid Passage Facility Design* (NMFS 2011).

ii. Constructed riffles are to be constructed to allow upstream and downstream passage of all native fish species and life stages that occur in the stream. A low flow notch shall be constructed to concentrate flows in channels where minimum flows may restrict fish passage.

iii. Constructed riffles will be constructed out of an appropriately sized gravel mix, including the appropriate level of fines, to allow for compaction for stability and sealing to ensure minimal loss of surface flow through the newly placed material.

iv. Gravel sizing depends on the size of the stream, maximum depth of flow, planform, entrenchment, and ice and debris loading.

v. The project designer or an inspector experienced in these structures should be present during installation.

vi. Ensure that the structure is appropriately sealed according to project objectives before equipment leaves the site.

vii. For projects where hyporheic flow is a project objective, levels of compaction must be adjusted to allow appropriate balance of surface and sub-surface flow.

d. Porous boulder step structures and vanes

i. Full channel spanning boulder structures are to be installed only in highly uniform, incised, bedrock-dominated channels, with the goal to enhance or provide fish habitat in stream reaches where log placements are not practicable due to channel conditions (not feasible to place logs of sufficient length, bedrock dominated channels, deeply incised channels, artificially constrained reaches, *etc.*), or where damage to infrastructure on public or private lands is of concern, or where private landowners will not allow log placements due to concerns about damage to their streambanks or property.

ii. Install boulder structures low in relation to channel dimensions so that they are completely overtopped during bankfull channel events.
iii. Boulder step structures are to be placed diagonally across the channel or in more traditional upstream pointing "V" or "U" configurations with the apex oriented upstream.
iv. Boulder step structures are to be constructed to allow upstream and downstream passage of all native fish species and life stages that occur in the stream. Plunges shall be kept less than 6 inches in height.
v. The use of gabions, cable, or other means to prevent the movement of individual boulders in a boulder step structure is not allowed.
vi. Rock for boulder step structures shall be durable and of suitable quality to assure long-term stability in the climate in which it is to be used. Rock sizing depends on the size of the stream, maximum depth of flow, planform, entrenchment, and ice and debris loading.
vii. The project designer or an inspector experienced in these structures should be present during installation.
viii. Full spanning boulder step structure placement should be coupled with measures to improve habitat complexity and protection of riparian areas to provide long-term inputs of LW.

e. Gravel augmentation
i. Gravel can be placed directly into the stream channel, at tributary junctions, or other areas in a manner that mimics natural debris flows and erosion.
ii. Augmentation will only occur in areas where the natural supply has been eliminated, significantly reduced through anthropogenic disruptions, or used to initiate gravel accumulations in conjunction with other projects, such as simulated log jams and debris flows. Most importantly, gravel augmentation should only be used in streams that are geomorphically appropriate for gravel bed features such as bars, pool-riffle sequences, etc., to persist. That is, where the stream morphology and hydraulics are such that gravel cannot be stable or retained, augmentation will not be effective.
iii. Gravel to be placed in streams shall be a sized for that stream, and clean alluvium with similar angularity as the natural bed material. When possible use gravel of the same lithology as found in the watershed. Reference *Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings* (USDA-Forest Service 2008) to determine gravel sizes appropriate for the stream.
iv. Gravel can be mined from the floodplain at elevations above bankfull, but not in a manner that will cause stranding during future flood events.
v. Crushed rock is not permitted, unless sediment in the stream reach is sub-angular to angular.
vi. After gravel placement in areas accessible to higher stream flow, allow the stream to naturally sort and distribute the material.
vii. Do not place gravel directly on bars and riffles that are known spawning areas, which may cause fish to spawn on the unsorted and unstable gravel, thus potentially resulting in redd destruction.

viii. Imported gravel will be free of invasive species and non-native seeds. If necessary, wash gravel prior to placement.

f. Tree removal for LW projects

i. Live conifers and other trees can be felled or pulled/pushed over for in-channel LW placement only when riparian zone tree stands are fully stocked[13] or over-stocked.[14] Tree felling shall not create excessive streambank erosion or increase the likelihood of channel avulsion during high flows.

ii. Trees may be removed by cable, ground-based equipment, horses or helicopters.

iii. Trees may be felled or pushed/pulled directly into a stream or floodplain.

iv. Trees may be stock-piled for future instream restoration projects.

v. The project manager for an aquatic restoration action will coordinate with a USFWS wildlife biologist in tree-removal planning efforts to ensure no listed species or critical habitat is impacted.

35. Dam and Legacy Structure Removal

Typical projects include removal of dams, channel-spanning weirs, legacy habitat structures, earthen embankments, subsurface drainage features, spillway systems, outfalls, pipes, instream flow redirection structures (e.g., drop structure, gabion, groin), or similar devices used to control, discharge, or maintain water levels. Legacy structures include past projects, such as LW, boulder, rock gabions, and other in-channel and floodplain structures. Removal projects will be implemented to reconnect stream corridors, floodplains, and estuaries, reestablish wetlands, improve aquatic organism passage, and restore more natural channel and flow conditions. Instream water control structures that impound contaminated sediment are not covered by this BA.

a. Dam removal

i. Design Review

1. USFWS fish passage review and approval. USFWS in consultation with NMFS engineering will review the action for consistency with criteria in Anadromous Salmonid Passage Facility Design (NMFS 2011).

2. Restoration Review Team (RRT). The action will be reviewed by the RRT prior to submission to USFWS for fish passage approval.

ii. Project Documentation – At a minimum, the following information will be necessary for review:

1. A longitudinal profile of the stream channel thalweg for 20 channel widths downstream of the structure and 20 channel widths upstream of the reservoir area (outside of the influence of the structure) shall be used to determine the potential for channel degradation.

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[13] Fully stocked stands – Stands in which all the growing space is effectively occupied but which still have ample room for development of the crop trees.

[14] Overstocked stands – Stands in which the growing space is so completely utilized that growth has slowed down and many trees, including dominants, are being suppressed.

2. A minimum of three riffle cross-sections – one downstream of the structure, one through the reservoir area upstream of the structure, and one upstream of the reservoir area (outside of the influence of the structure) to characterize the channel morphology and quantify the stored sediment.
3. Sediment characterization to determine the proportion of coarse sediment (greater than 2 mm) in the reservoir area.
4. A survey of any downstream spawning areas that may be affected by sediment released by removal of the water control structure or dam. Dams with reservoirs with sediments having a d35 greater than 2 mm (i.e., 65% of the sediment by weight exceeds 2 mm in diameter) may be removed without excavation of stored material, if the sediment contains no contaminants; sediments with a d35 less than 2 mm (i.e., 65% of the sediment by weight is less than 2 mm in diameter) will require partial removal of the fine sediment to create a pilot channel, in conjunction with stabilization of the newly exposed streambanks with native vegetation.

iii. Design Guidance – If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.

iv. Monitoring – Dams greater than 10-feet in height (measured at the upstream side of the structure at the approximate centerline of the stream) require a long-term monitoring and adaptive management plan that will be developed between the USFWS or NOAA RC.

b. Removal of legacy structures

i. Remove material not typically found within the stream or floodplain at project sites (i.e., boulders, concrete, etc.) from the 100-year floodplain.

ii. Materials (i.e., LW and boulders.) typically found within the stream or floodplain at that site can be reused to implement habitat improvements described under the Large Wood, Boulder, and Gravel Placement (PDC 34) activity category in this opinion.

iii. If the structure being removed is keyed into the bank, fill in "key" holes with native materials to restore contours of streambank and floodplain. Compact the fill material adequately to prevent washing out of the soil during over-bank flooding. Do not mine material from the stream channel bed to fill in "key" holes.

iv. When removal of buried log structures may result in significant disruption to riparian vegetation or the floodplain, consider using a chainsaw to extract the portion of log within the channel and leaving the buried sections within the streambank.

v. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.

vi. If the legacy structures (log, rock, or gabion weirs) were placed to provide grade control, evaluate the site for potential headcutting and incision due to structure removal. This will require surveying a streambed longitudinal

profile. If headcutting and channel incision are likely to occur due to structure removal, additional measures will be taken to reduce these impacts.

vii. If the structure is being removed because it has caused an over-widening of the channel, consider implementing other restoration categories to decrease the width to depth ratio of the stream to a level commensurate with the geomorphic setting.

36. Fluvial Channel Reconstruction/Relocation

Typical projects include reconstruction of existing alluvial stream channels through excavation and structure placement (LW and boulders) or relocation (rerouting of flow) into historical or newly constructed channels that are typically more sinuous and complex. This proposed action applies to stream systems that have been straightened, channelized, dredged, or otherwise modified for the purpose of flood control, increasing arable land, realignment, or other land use management goals, or for streams that are incised or otherwise disconnected from their floodplains due to watershed disturbances. For tidal wetland and estuarine projects, refer to PDCs 39b and 49.

a. General project design criteria

i. Design Review

1. USFWS fish passage review and approval. USFWS in consultation with NMFS engineering will review the action for consistency with criteria in Anadromous Salmonid Passage Facility Design (NMFS 2011).
2. Restoration Review Team (RRT). The action will be individually reviewed by the RRT prior to submission to USFWS for approval.

ii. Design Guidance

1. Construct geomorphically appropriate stream channels and floodplains within a watershed and reach context.
2. Design actions to restore floodplain characteristics—elevation, width, gradient, length, and roughness—in a manner that closely mimics, to the extent possible, those that will naturally occur at that stream and valley type.
3. To the greatest degree possible, remove non-native fill material from the channel and floodplain to an upland site.
4. When necessary, loosen compacted soils once overburden material is removed. Overburden or fill comprised of native materials, which originated from the project area, may be used within the floodplain where appropriate to support the project goals and objectives.
5. Structural elements shall fit within the geomorphic context of the stream system. For bed stabilization and hydraulic control structures, constructed riffles shall be preferentially used in pool-riffle stream types, while roughened channels and boulder step structures shall be preferentially used in step-pool and cascade stream types.
6. Material selection (LW, rock, gravel) shall also mimic natural stream system materials.

7. Construction of the streambed should be based on Stream Simulation Design principles as described in section 6.2 of Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings (USDA-Forest Service 2008) or other appropriate design guidance documents (see PDC 33b).

b. Project documentation. Provide USFWS and the RRT with the following documentation:
   i. Background and problem statement
      1. Site history
      2. Environmental baseline
      3. Problem description
      4. Cause of problem
   ii. Project description
      1. Goals/objectives
      2. Project elements
      3. Sequencing, implementation
      4. Recovery trajectory: how does it develop and evolve?
   iii. Design analysis
      1. Technical analyses
      2. Computations relating design to analysis
      3. References
   iv. River Restoration Analysis Tool. The River Restoration Analysis Tool (www.restorationreview.com) was created to assist the USFWS with design and monitoring of aquatic restoration projects. The following questions taken from the tool will be used by the RRT to evaluate the project, and should therefore be addressed in the project documentation:
      1. Problem Identification
         a. Is the problem identified?
         b. Are causes identified at appropriate scales?
      2. Project Context
         a. Is the project identified as part of a plan, such as a watershed action plan or recovery plan?
         b. Does the project consider ecological, geomorphic, and socioeconomic context?
      3. Goals & Objectives
         a. Do goals and objectives address problem, causes, and context?
         b. Are objectives measurable?
      4. Alternatives/Options Evaluation
         a. Were alternatives/options considered?
         b. Are uncertainties and risk associated with selected alternative acceptable?
      5. Project Design
         a. Do project elements collectively support project objectives?
         b. Are PDC defined for all project elements?

c. Do project elements work with stream processes to create and maintain habitat?
d. Is the technical basis of design sound for each project element?

6. Implementation
    a. Are plans and specifications sufficient in scope and detail to execute the project?
    b. Does plan address potential implementation impacts and risks?
7. Monitoring & Management
    a. Does monitoring plan address project compliance?
    b. Does monitoring plan directly measure project effectiveness?

c. Monitoring. Develop a monitoring and adaptive plan that has been reviewed and approved by the RRT and USFWS 30 days prior to the planned start of construction. The plan will include the following:
    i. Introduction
    ii. Existing Monitoring Protocols
    iii. Project Effectiveness Monitoring Plan
        1. Immediately upon completion of the new channel construction, the contractor shall survey the project and provide as-built monitoring data, which will be supplied to USFWS and the RRT for review. This survey will compare as-built metrics to proposed design metrics on channel length, substrate size, residual pool depth, pieces of LW, etc.
    iv. Monitoring Frequency, Timing, and Duration
    v. Monitoring Technique Protocols
    vi. Data Storage and Analysis
    vii. Monitoring Quality Assurance Plan
    viii. Literature cited

37. Off- and Side-Channel Habitat Restoration

These projects will be implemented to reconnect historical side-channels with floodplains by removing off-channel fill and plugs. Furthermore, new side-channels and alcoves can be constructed in geomorphic settings that will accommodate such features. This activity category typically applies to areas where side channels, alcoves, and other backwater habitats have been filled or blocked from the main channel, disconnecting them from most if not all flow events.

a. USFWS fish passage review and approval. When a proposed side channel will contain greater than 20% of the bankfull flow,15 the action will be reviewed by the RRT and reviewed and approved by USFWS in consultation with NMFS engineering for consistency with NMFS (2011b) Anadromous Salmonid Passage Facility Design criteria.
b. Data requirements. Data requirements and analysis for off- and side-channel habitat restoration include evidence of historical channel location, such as land

[15] Large side channels projects are essentially channel construction projects if they contain more than 20% of flow.

use surveys, historical photographs, topographic maps, remote sensing information, or personal observation.

c. Allowable excavation. Off- and side-channel improvements can include minor excavation (less than or equal to 10% of volume) of naturally accumulated sediment within historical channels, i.e., based on the OHW level as the elevation datum. The calculation of the 10% excavation volume does not include manually placed fill, such as dikes, berms, or earthen plugs (see PDC 39). There is no limit as to the amount of excavation of anthropogenic fill within historical side channels as long as such channels can be clearly identified through field or aerial photographs. Excavation depth will not exceed the maximum thalweg depth in the main channel. Excavated material removed from off- or side-channels shall be hauled to an upland site or spread across the adjacent floodplain in a manner that does not restrict floodplain capacity.

38. Streambank Restoration

Streambank restoration as defined in this BA is an action used in conjunction with other techniques such as dam removal, bridge placement, channel reconstruction, etc. It is not a stand-alone restoration action.

a. The following streambank restoration methods may be used individually or in combination:
    i. Alluvium placement
    ii. LW placement
    iii. Roughened toe
    iv. Woody plantings
    v. Herbaceous cover, in areas where the native vegetation does not include trees or shrubs
    vi. Bank reshaping and slope grading
    vii. Coir logs
    viii. Deformable soil reinforcement
    ix. Engineered log jams (ELJ)
    x. Floodplain flow spreaders
    xi. Floodplain roughness

b. For more information on the above methods see Federal Emergency Management Agency (2009)16 or Cramer et al. (2003).17 Other than those methods relying solely upon woody and herbaceous plantings, streambank stabilization projects should be designed by a qualified engineer that is appropriately registered in the state where the work is performed.

c. Rock will not be used for streambank restoration, except as ballast to stabilize LW. Stream barbs and full-spanning weirs are not allowed for stream bank stabilization under this BA.

d. Alluvium Placement can be used as a method for providing bank stabilization using imported gravel/cobble/boulder-sized material of the same composition and size as that in the channel bed and banks to halt or attenuate streambank erosion, stabilize riffles, and provide critical spawning substrate for native fish. This

[16] http://www.fema.gov/pdf/about/regions/regionx/Engineering_With_Nature_Web.pdf

[17] http://wdfw.wa.gov/publications/00046/wdfw00046.pdf

method is predominately for use in small to moderately sized channels and is not appropriate for application in mainstem systems. These structures are designed to provide roughness, redirect flow, and provide stability to adjacent streambed and banks or downstream reaches, while providing valuable fish and wildlife habitat.

i. USFWS fish passage review and approval. USFWS in consultation with NMFS engineering will review alluvium placement projects that occupy more than 25% of the channel bed or more than 25% of the bankfull cross sectional area.
ii. This design method is only approved in those areas where the natural sediment supply has been eliminated, significantly reduced through anthropogenic disruptions, or used to initiate or simulate sediment accumulations in conjunction with other structures, such as LW placements and ELJs.
iii. Material used to construct the toe should be placed in a manner that mimics attached longitudinal bars or point bars.
iv. Size distribution of toe material will be diverse and predominately comprised of D_{84} to D_{max} size class material based on measurements for sediments in similar segments of the streambed.
v. Spawning gravels will constitute at least one-third of the total alluvial material used in the design except where the reach does not support spawning or velocities are sufficient to scour out spawning gravels.
vi. Spawning gravels are to be placed at or below an elevation consistent with the water surface elevation of a bankfull event.
vii. Spawning size gravel can be used to fill the voids within toe and bank material and placed directly onto stream banks in a manner that mimics natural debris flows and erosion.
viii. All material will be clean alluvium with similar angularity as the natural bed material. When possible use material of the same lithology as found in the watershed. Reference Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings (USDA-Forest Service 2008) to determine gravel sizes appropriate for the stream.
ix. Material can be mined from the floodplain at elevations above bankfull, but not in a manner that will cause stranding during future flood events.
x. Crushed rock is not permitted unless natural bed material is sub-angular to angular.
xi. After placement in areas accessible to higher stream flow, allow the stream to naturally sort and distribute the material.
xii. Do not place material directly on bars and riffles that are known spawning areas, which may cause fish to spawn on the unsorted and unstable gravel, thus potentially resulting in redd destruction.
xiii. Imported material will be free of invasive species and non-native seeds. If necessary, wash prior to placement.

e. Large Wood Placements are defined as structures composed of LW that do not use mechanical methods as the means of providing structure stability (i.e., large rock, rebar, rope, cable, etc.). The use of native soil, run of alluvium, wood, or

buttressing with adjacent trees as methods for providing structure stability are authorized. This method is predominately for use in small to moderately sized channels and is not appropriate for application in mainstem systems. These structures are designed to provide roughness, redirect flow, and provide stability to adjacent streambed and banks or downstream reaches, while providing valuable fish and wildlife habitat.

i. USFWS Review and Approval. USFWS will review LW placement projects that would occupy greater than 25% of the bankfull cross section area.
ii. Structure shall simulate disturbance events to the greatest degree possible and include, but are not limited to, log jams, debris flows, wind-throw, and tree breakage.
iii. Structures may partially or completely span stream channels or be positioned along stream banks.
iv. Where structures partially or completely span the stream channel LW should be comprised of whole conifer and hardwood trees, logs, and rootwads. LW size (diameter and length) should account for bankfull width and stream discharge rates. See Section 34.a.vi
v. Structures will incorporate a diverse size (diameter and length) distribution of rootwad or non-rootwad, trimmed or untrimmed, whole trees, logs, snags, slash, etc.
vi. For individual logs that are completely exposed, or embedded less than half their length, logs with rootwads should be a minimum of 1.5 times bankfull channel width, while logs without rootwads should be a minimum of 2.0 times bankfull widths where appropriate.
vii. Consider orienting key pieces such that the hydraulic forces upon the LW increase stability.

f. Engineered log jams
   i. See PDC 34b.
   ii. If LW mechanical anchoring is required, a variety of methods may be used. These include large angular rock, buttressing the wood between adjacent trees, or the use of manila, sisal or other biodegradable ropes for lashing connections. If hydraulic conditions warrant use of structural connections, rebar pinning or bolted connections may be used. Use of cable is not covered by this BA.
   iii. Use a diverse assemblage of vegetation species native to the action area or region, including trees, shrubs, and herbaceous species. Vegetation, such as willow, sedge and rush mats, may be gathered from abandoned floodplains, stream channels, etc.
   iv. Do not apply surface fertilizer within 50 feet of any stream channel.
   v. Install fencing as necessary to prevent access to revegetated sites by livestock or unauthorized persons.
   vi. Conduct post-construction monitoring and treatment or removal of invasive plants until native plant species are well established.

39. Set-Back or Removal of Existing Berms, Dikes, and Levees

These projects will be conducted to reconnect historical fresh-water deltas to inundation, stream channels with floodplains, and historical estuaries to tidal influence. Such projects will take place where estuaries and floodplains have been disconnected from adjacent rivers or estuaries through drain pipes and anthropogenic fill.

a. Floodplains and freshwater deltas
b. Design actions to restore floodplain characteristics—elevation, width, gradient, length, and roughness—in a manner that closely mimics, to the extent possible, those that would naturally occur at that stream and valley type.
c. Remove drain pipes, fences, and other anthropogenic features to the extent possible.
d. To the extent possible, remove non-native fill material from the floodplain to an upland site.
e. Where it is not possible to remove or set-back all portions of dikes and berms, or in areas where existing berms, dikes, and levees support abundant riparian vegetation, breaches will be created. Breaches shall be equal to or greater than the bankfull channel width to reduce the potential for scour during flood events. In addition to other breaches, the berm, dike, or levee shall always be breached at the downstream end of the project or at the lowest elevation of the floodplain to ensure the flows will naturally recede back into the main channel, thus minimizing fish entrapment.
f. When necessary, loosen compacted soils once overburden material is removed. Overburden or fill comprised of native materials, which originated from the project area, may be used within the floodplain to create set-back dikes and fill anthropogenic holes provided that floodplain function is not impeded.
g. Estuary restoration
    i. Culverts and tide gates will be removed using the PDC and conservation measures, where appropriate, as described in Work Area Isolation (PDC 27), Surface Water Withdrawals (PDC 23), and Fish Capture and Release (PDC 28) and Fish Passage Restoration (PDC 33) above.
    ii. Temporary roads within the project area should be removed to allow free flow of water. Material either will be placed in a stable area above the ordinary high water line or highest measured tide or be used to restore topographic variation in wetlands.
    iii. To the extent possible, remove segmented drain tiles placed to drain wetlands. Fill generated by drain tile removal will be compacted back into the ditch created by removal of the drain tile.
    iv. Channel construction may be done to recreate channel morphology based on aerial photograph interpretation, literature, topographic surveys, and nearby undisturbed channels. Channel dimensions (width and depth) are based on measurements of similar types of channels and the drainage area. In some instances, channel construction is simply breaching the levee. For these sites, further channel development will occur through natural processes. Fill ditches constructed and maintained to drain wetlands. Some points in an open ditch may be over-filled, while other points may

be left as low spots to enhance topography and encourage sinuosity of the developing channel.

v. In areas that may be prone to mosquito infestations, insure that the site is not likely to provide ponded, stagnate, water that would support significant populations of mosquito larvae.

40. Reduction/Relocation of Recreation Impacts

These projects are intended to close, better control, or relocate recreation infrastructure and use along streams, shorelines, estuaries, and within riparian areas. This includes removal, improvement, or relocation of infrastructure associated with designated campgrounds, dispersed camp sites, day-use sites, foot trails, and off-road vehicle roads/trails in riparian areas.

a. Design remedial actions to restore floodplain characteristics—elevation, width, gradient, length, and roughness—in a manner that closely mimics, to the extent possible, those that would naturally occur at that stream and valley type.
b. To the extent possible, non-native fill material shall be removed from the floodplain to an upland site.
c. Overburden or fill comprised of native materials, which originated from the project area, can be used to reshape the floodplain, placed in small mounds on the floodplain, used to fill anthropogenic holes, buried on site, or disposed into upland areas.
d. For recreation relocation projects—such as campgrounds, horse corrals, off-road vehicle trails—move current facilities out of the riparian area or as far away from the stream/shoreline as possible.
e. Consider de-compaction of soils and vegetation planting once overburden material is removed.
f. Place barriers—boulders, fences, gates, etc.—outside of the bankfull width and across traffic routes to prevent off-road vehicle access into and across streams.
g. For work conducted on off-road vehicle roads and trails, follow relevant PDC in Road and Trail Erosion Control and Decommissioning (PDC 45) below.

41. Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering

Projects will be implemented by constructing fences to exclude riparian grazing, providing controlled access for walkways that livestock use to transit across streams and through riparian areas, and reducing livestock use in riparian areas and stream channels by providing upslope water facilities.

a. Livestock fencing
    i. To the extent possible, fences will be placed outside the channel migration zone and allow for lateral stream movement.
    ii. Minimize vegetation removal, especially potential LW recruitment sources, when constructing fence lines.
    iii. Where appropriate, construct fences at water gaps in a manner that allows passage of LW and other debris.
    iv. Hollow fence post will be capped to prevent trapping small birds and mammals.
b. Livestock stream crossings
    i. The number of crossings will be minimized.

ii. Locate crossings or water gaps where streambanks are naturally low. Livestock crossings or water gaps will not be located in areas where compaction or other damage can occur to sensitive soils and vegetation (e.g., wetlands) due to congregating livestock.
iii. To the extent possible, crossings will not be placed in areas where ESA-listed species spawn or are suspected of spawning (e.g., pool tailouts where spawning may occur), or within 300-feet upstream of such areas.
iv. Existing access roads and stream crossings will be used whenever possible, unless new construction will result in less habitat disturbance and the old trail or crossing is retired.
v. Access roads or trails will be provided with a vegetated buffer that is adequate to avoid or minimize runoff of sediment and other pollutants to surface waters.
vi. Essential crossings will be designed and constructed or improved to handle reasonably foreseeable flood risks, including associated bedload and debris, and to prevent the diversion of streamflow out of the channel and down the trail if the crossing fails.
vii. If necessary, the streambank and approach lanes can be stabilized with native vegetation or angular rock to reduce chronic sedimentation. The stream crossing or water gap should be armored with sufficient sized rock (e.g., cobble-size rock) and use angular rock if natural substrate is not of adequate size.
viii. Livestock crossings will not create barriers to the passage of adult and juvenile fish. Whenever a culvert or bridge—including bridges constructed from flatbed railroad cars, boxcars, or truck flatbeds—is used to create the crossing, the structure width will tier to project design criteria listed for Stream Simulation Culvert and Bridge Projects under Fish Passage Restoration (PDC 33).
ix. Stream crossings and water gaps will be designed and constructed to a width of 10 to 15 feet in the upstream-downstream direction to minimize the time livestock will spend in the crossing or riparian area.
x. When using pressure treated lumber for fence posts, complete all cutting/drilling offsite (to the extent possible) so that treated wood chips and debris do not enter water or flood prone areas.
xi. Riparian fencing is not to be used to create livestock handling facilities.

c. Off-channel livestock watering facilities
i. The development of a spring is not allowed if the spring is occupied by ESA-listed species.
ii. Water withdrawals will not dewater habitats or cause low stream flow conditions that could affect ESA-listed fish. Withdrawals may not exceed 10% of the available flow.
iii. Troughs or tanks fed from a stream or river will have an existing valid water right. Surface water intakes will be screened to meet the most recent version of NMFS fish screen criteria in Anadromous Salmonid Passage Facility Design (NMFS 2011), be self-cleaning, or regularly maintained by removing debris buildup. A responsible party will be

designated to conduct regular inspection and as-needed maintenance to ensure pumps and screens are properly functioning.

iv. Place troughs far enough from a stream or surround with a protective surface to prevent mud and sediment delivery to the stream. Avoid steep slopes and areas where compaction or damage could occur to sensitive soils, slopes, or vegetation due to congregating livestock.

v. Ensure that each livestock water development has a float valve or similar device, a return flow system, a fenced overflow area, or similar means to minimize water withdrawal and potential runoff and erosion.

vi. Minimize removal of vegetation around springs and wet areas.

vii. When necessary, construct a fence around the spring development to prevent livestock damage.

42. Piling and Other Structure Removal

Typical projects include the removal of untreated and chemically treated wood pilings, piers, vessels, boat docks, derelict fishing gear, as well as similar structures comprised of plastic, concrete, and other material. Pilings and other structures occur in estuaries, lakes, floodplains, rivers, and nearshore or deeper water habitat, and are typically used in association with boat docks, structures, and other facilities.

a. When removing an intact pile

i. Install a floating surface boom to capture floating surface debris.

ii. To the extent possible, keep all equipment (e.g., bucket, steel cable, vibratory hammer) out of the water, grip piles above the waterline, and complete all work during low water and low current conditions.

iii. Dislodge the piling with a vibratory hammer, whenever feasible. Never intentionally break a pile by twisting or bending.

iv. Slowly lift piles from the sediment and through the water column.

v. Place chemically-treated piles in a containment basin on a barge deck, pier, or shoreline without attempting to clean or remove any adhering sediment. A containment basin for the removed piles and any adhering sediment may be constructed of durable plastic sheeting with sidewalls supported by hay bales or another support structure to contain all sediment and return flow which may otherwise be directed back to the waterway.

vi. After piling removal, fill the holes with clean, native sediments from the project area when possible, or analogous material from other sources if excavation of native material would increase impacts to listed species.

vii. Dispose of all removed piles, floating surface debris, any sediment spilled on work surfaces, and all containment supplies at a permitted upland disposal site.

b. When removing a broken pile

i. If a pile breaks above the surface of uncontaminated sediment, or less than 2 feet below the surface, make every attempt short of excavation to remove it entirely. If the pile cannot be removed without excavation, drive the pile deeper if possible.

ii. If dredging is likely in the area of piling removal, use a GPS (global positioning device) to note the location of all broken piles for future use in site debris characterization.

c. Removal of derelict vessels and fishing gear.
    i. Removal operations must follow state approved guidelines.

43. Shellfish Bed/Nearshore Habitat Restoration

Typical projects may involve shellfish bed restoration, replacing shore line armoring, and providing beach nourishment. An example of a sustainable restoration action might include restoration of sediment input to the nearshore by removing bulkheads at historical feeder bluff sites, thereby allowing gradual and ongoing erosion/mass wasting of bluffs and LW recruitment, instead of one-time beach nourishment. This BA does not cover projects where the sole objective is to protect upland property or to cap contaminants.

a. Shellfish bed restoration
    i. Shell or other substance used for substrate enhancement will be procured from clean sources that do not deplete the existing supply of shell bottom. Shells should be steam cleaned, left on dry land for a minimum of one month, or both, before placement in the aquatic environment. Shells from the local area should be used whenever possible.
    ii. When placing shell substrate, juveniles, adults, or spat-on-shell in areas occupied by submerged aquatic vegetation, there will be an implementation plan submitted, detailing existing condition, density, and spatial extent of native eelgrass; and proposed planting density and anticipated effects on eelgrass density and long-term viability. The implementation plan will provide reasonable assurances that submerged aquatic vegetation (eelgrass, kelp, etc.) will not be significantly affected, that there will be a net environmental benefit resulting from the action, or both.
    iii. Molluscan shellfish (live) and any co-planted submerged aquatic vegetation used for restoration will be species native to the project area.
b. Replacing hard shoreline armoring (riprap and bulkheads) with alternative or soft shore armoring to protect property Project selection will require accurate assessment of existing conditions, erosion risks, and patterns of future degradation.
    i. Conduct a site assessment describing the conditions that created the need for the restoration project and the mechanisms that underlie it. Site assessments also describe the natural resources and the human infrastructure within the project area and their vulnerability to shoreline erosion. Effective project plans also will consider how the project fits in a broader geomorphologic context of the associated drift cell or other ecosystem component. Alternatives to "hard armor" might include:
        1. Restoration of original shore geometry (bulkhead removal or setback)
        2. Beach nourishment (gravel beach design) when the goal of importing sediment is to reduce wave energy to the upper beach
        3. Grade control/slope support with large wood and/or rock
        4. Wood revetment or wood/rock revetment

5. Biotechnical slope support (vegetated geogrids, soil pillows, etc.).18

ii. Restrict plantings to native vegetation.

c. Beach nourishment. Projects may use sediment harvested during already permitted dredging activities and/or gravel from upland sources. Imported material will be free of invasive species and non-native seeds. Sediment is either trucked or barged in and placed in the high tide zone of the beach, where it is likely to be reworked and redistributed by wave action. The goal is to use indigenous materials to mimic natural processes, with the expectation that the nourished beach will perform much as a natural one, for a limited period of time following material placement. Consider extant wave exposure, supply and types of natural sources of sediment, net longshore sediment transport, predicted sea level rise and the size of sediment. For example: if the goal is to restore historical surf smelt spawning habitat, sediment placement should include a sand/pea gravel mix, with the bulk in the 1-7 mm diameter range within the uppermost one-third of the tidal range (approximately +7 feet upward) (Penttila 2007).

i. USFWS review and approval. USFWS in consultation with NMFS engineering will review beach nourishment project plans to minimize potential adverse impacts to designated critical habitat/EFH such as eelgrass or other submerged aquatic vegetation (SAV), sea lion haulouts, and other resources that may be present. USFWS will also review monitoring reports.

ii. Conduct topographic and bathymetric profile surveys of the beach and offshore within the project and control areas. Pre- and post-construction surveys shall be conducted no more than 90 days before construction commences and no more than 60 days after construction ends.

iii. Develop post-project monitoring plan. The frequency and duration of monitoring should be commensurate with the scale and complexity of the project. Comparisons will be made between conditions at the project site after construction and those that were present before construction, or which exist on an adjacent reference beach similar in form to the constructed beach. (For very large projects performance monitoring of beach restoration projects often continue for 10 (biological performance) to 20 (physical performance) years.)

1. Physical monitoring surveys shall be conducted in years 1, 2, 3, 5, and 10, and during interim years as needed to investigate the functioning of the new beach. Beach/depth profile transect surveys shall be conducted during a spring or summer month and repeated as close as practicable during that same month of the year. Detailed maps of sampling locations shall be presented as needed.

2. Biological monitoring shall be conducted in years 2, 5, and 10 after completion of construction. Biological evaluation of the restored beach may include comparing pre-post project differences in the density of epibenthic zooplankton, numbers and length frequency

[18] See *Marine Shoreline Design Guidelines* (Johannessen *et al.*) for examples of a variety of erosion control techniques, including bioengineering, gravel beach nourishment, and the active use of logs and woody debris

of juvenile salmonids, and forage fish spawning. Detailed maps of sampling locations shall be presented as needed.

44. In-Channel Nutrient Enhancement

Typical projects include the placement of salmon carcasses, salmon carcass analogs (SCA), or inorganic fertilizers in stream channels to help return stream nutrient levels back to historical levels. This action helps restore marine-derived nutrients to aquatic systems, thereby adding an element to the food chain that is important for growth of macroinvertebrates, juvenile salmonids, and riparian vegetation. Application and distribution of nutrients throughout a stream corridor can occur from bridges, stream banks, boats, or helicopter.

a. In Oregon, follow guidelines for the placement of carcasses in the Oregon Watershed Enhancement Board's (1999) Oregon Aquatic Habitat Restoration and Enhancement Guide[19]. Projects are permitted through Oregon Department of Environmental Quality, which regulates the placement of carcasses instream as a discharge. Use carcasses from the treated watershed or those that are certified disease free by an Oregon Department of Fish and Wildlife (ODFW) pathologist.
b. In Washington, follow WDFW's Protocols and Guidelines for Distributing Salmonid Carcasses, Salmon Carcass Analogs, and Delayed Release Fertilizers to Enhance Stream Productivity in Washington State (Cramer 2012) or the most recent edition.
c. Ensure that the relevant streams have the capacity to capture and store placed carcasses.
d. Carcasses should be of species native to the watershed and placed during the normal migration and spawning times that would naturally occur in the watershed.
e. Do not supplement nutrients in eutrophic or naturally oligotrophic systems.

45. Road and Trail Erosion Control and Decommissioning

Typical projects include hydrologically closing or decommissioning roads and trails, including culvert removal in perennial and intermittent streams; removing, installing or upgrading cross-drainage culverts; upgrading culverts on non-fish-bearing steams; constructing water bars and dips; reshaping road prisms; vegetating fill and cut slopes; removing and stabilizing of side-cast materials; grading or resurfacing roads that have been improved for aquatic restoration with gravel, bark chips, or other permeable materials; contour shaping of the road or trail base; removing road fill to native soils; and soil stabilization and tilling compacted surfaces to reestablish native vegetation. Such actions will target priority roads that contribute sediment to streams and wetlands, block fish passage, or disrupt floodplain and riparian functions.

a. Road decommissioning and stormproofing
    i. For road decommissioning projects within riparian areas, recontour the affected area to mimic natural floodplain contours and gradient to the extent possible.
    ii. When obliterating or removing segments immediately adjacent to a stream, use sediment control barriers between the project and stream.

[19] http://www.habitat.noaa.gov/pdf/salmon_passage_facility_design.pdf

iii. Dispose of slide and waste material in stable sites out of the flood-prone area. Native material may be used to restore natural or near-natural contours.
iv. Drainage features used for stormproofing and treatment projects should be spaced as to hydrologically disconnect road surface runoff from stream channels. If grading and resurfacing is required, use gravel, bark, or other permeable materials for resurfacing.
v. Minimize disturbance of existing vegetation in ditches and at stream crossings.
vi. Conduct activities during dry-field conditions (generally May 15 to October 15) when the soil is more resistant to compaction and soil moisture is low.
vii. When removing a culvert from a first or second order, non-fishing bearing stream, project specialists shall determine if culvert removal should include stream isolation and rerouting in project design. Culvert removal on fish bearing streams shall adhere to the measures described in Fish Passage Restoration (PDC 33).
viii. For culvert removal projects, restore natural drainage patterns and channel morphology. Evaluate channel incision risk and construct in-channel grade control structures when necessary.

b. Road relocation
   i. When a road is decommissioned in a floodplain and future vehicle access through the area is still required, relocate the road as far as practical away from the stream or in a location that minimizes impacts to the stream.
   ii. Road relocation must be constructed in a manner that will not increase the drainage network. Project must be constructed to hydrologically disconnect road from the stream network to the extent practical. New cross drains shall discharge to stable areas where the outflow will quickly infiltrate the soil and not develop a channel to a stream.
   iii. This consultation does not cover new road construction (not associated with road relocation) or routine maintenance within riparian areas.

46. Juniper Removal

This restoration action will be conducted in riparian areas and adjoining uplands to help restore plant species composition and structure that would occur under natural fire regimes. Juniper removal will occur in those areas where juniper have encroached into riparian areas as a result of fire exclusion, thereby replacing more desired riparian plant species such as willow, cottonwood, aspen, alder, sedge, and rush. Guidelines on management of western juniper can be found at: http://www.oregon.gov/OWEB/MONITOR/docs/westernjunipermanagementfieldguide.pdf. The following measures will apply:

a. Remove juniper to natural stocking levels where juniper trees are expanding into neighboring plant communities to the detriment of other native riparian vegetation, soils, or streamflow.
b. Do not cut old-growth juniper, which typically has several of the following features: sparse limbs, dead limbed or spiked-tops, deeply furrowed and fibrous bark, branches covered with bright-green arboreal lichens, noticeable decay of

cambium layer at base of tree, and limited terminal leader growth in upper branches.

c. Felled trees may be left in place, lower limbs may be cut and scattered, or all or part of the trees may be used for streambank or wetland restoration (e.g., manipulated as necessary to protect riparian or wetland shrubs from grazing by livestock or wildlife or otherwise restore ecological function in floodplain, riparian, and wetland habitats).
d. Where appropriate, cut juniper may be placed into stream channels and floodplains to provide aquatic benefits. Juniper can be felled or placed into the stream to promote channel aggradation as long as such actions do not obstruct fish movement and use of spawning gravels or increase width to depth ratios.
e. On steep or south-facing slopes, where ground vegetation is sparse, leave felled juniper in sufficient quantities to promote reestablishment of vegetation and prevent erosion.
f. If seeding is a part of the action, consider whether seeding will be most appropriate before or after juniper treatment.
g. When using feller-buncher and slash-buster equipment, operate equipment in a manner that minimizes soil compaction and disturbance to soils and native vegetation to the extent possible. Equipment exclusion areas (buffer area along stream channels) should be as wide as the feller-buncher or slash-buster arm.

47. Native Fish Protection

Typical projects include the removal of brook trout or other non-native fish species via electrofishing or other manual means to reduce competition or hybridization with bull trout.

a. The measures specified in this PDC are designed to protect ESA-listed species under USFWS's jurisdiction. This BA does not authorize incidental take for bull trout.
b. For brook trout or other non-native fish species removal, staff experienced in the specific removal method shall be involved in project design and implementation.
c. When using electrofishing for removal of brook trout or other non-native fish species, use the following guidelines:
    i. Electrofishing shall be conducted using the methods outlined in the NMFS's guidelines (NMFS 2000).
    ii. Electrofishing equipment shall be operated at the lowest possible effective settings to minimize injury or mortality to bull trout.
    iii. To reduce adverse effects to bull trout, electrofishing shall only occur from May 1 (or after emergence occurs) to July 31 in known bull trout spawning areas. No electrofishing will occur in any bull trout habitat after August 15.
    iv. Electrofishing shall not be conducted when the water conditions are turbid and visibility is poor. This condition may be experienced when the sampler cannot see the stream bottom in 1 foot of water.
    v. Electrofishing will not be conducted within core areas that contain 100 or fewer adult bull trout.
d. Other removal methods, such as dip netting, spearing, and other means can be used.

48. Beaver Habitat Restoration

This restoration action includes installation of in-channel structures to encourage beavers to build dams in incised channels and across potential floodplain surfaces.

a. In-channel structures
   i. Consist of porous channel-spanning structures comprised of biodegradable vertical posts (beaver dam support structures) approximately 0.5 to 1 meter apart and at a height intended to act as the crest elevation of an active beaver dam. Variation of this restoration treatment may include post lines only, post lines with wicker weaves, construction of starter dams, reinforcement of existing active beaver dams, and reinforcement of abandoned beaver dams as described by Pollock et al. (2013 (In prep.); 2012a).
   ii. Place beaver dam support structures in areas conducive to dam construction as determined by stream gradient or historical beaver use.
   iii. Place in areas with sufficient deciduous shrub and trees to promote sustained beaver occupancy.
b. Habitat Restoration
   i. Beaver restoration activities may include planting riparian hardwoods (species such as willow, red osier dogwood, and alder) and building exclosures (such as temporary fences) to protect and enhance existing or planted riparian hardwoods until they are established as described by the Malheur National Forest and the Keystone Project (2007)20.
   ii. Maintain or develop grazing plans that will ensure the success of beaver habitat restoration objectives.

49. Wetland Restoration

Typical projects restore degraded wetlands by (a) excavation and removal of fill materials; (b) contouring to reestablish more natural topography; (c) setting back existing dikes, berms and levees; (d) reconnecting or re-creating historical tidal and fluvial channels; (e) planting native wetland species; or (f) a combination of the above methods. This action does not include installation of water control structures or fish passage structures.

a. Include applicable General Construction Measures (PDC 13-32) and PDC for specific types of actions as applicable (e.g., Off- and Side-Channel Habitat Restoration (PDC 37); Set-Back or Removal of Existing Berms, Dikes, and Levees for Wetland and Estuary Restoration (PDC 39); and Dam and Legacy Structure Removal (PDC 35)) to ensure that all adverse effects to fish and their designated critical habitats are within the range of effects considered in this opinion.

50. Tide/Flood Gate Removal, Replacement, or Retrofit

Typical projects may include the removal, replacement, or the upgrade of existing tide and flood gates by modifying gate components and mechanisms in tidal stream systems where full tidal exchange is incompatible with current land use or where backwater effects are of concern. Projects will be implemented to reconnect stream/slough corridors, floodplains, estuaries and nearshore habitats, reestablish wetlands, improve

[20] http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_033699.pdf

aquatic organism passage, and restore more natural channel and flow conditions. Tide/flood gate replacement or retrofit may include, but is not limited to, excavation of existing channels, adjacent floodplains, flood channels, and wetlands, and may include structural elements such as streambank restoration and hydraulic roughness elements. Placement of new gates where they did not previously exist is not covered in this BA, except where an existing tidegate is being replaced with one upstream in the same drainage as part of a levee setback project.

a. USFWS review and approval. USFWS in consultation with NMFS engineering will review tide/flood gate removal, replacement, and retrofit projects for consistency with Anadromous Salmonid Passage Facility Design (NMFS 2011).
b. For removal projects, if a culvert or bridge will be constructed at the location of a removed tide gate, the structure will be large enough to allow for a full tidal exchange.
c. Follow PDC for Staging, Storage, and Stockpile Areas (#16), Hazardous Material Spill Prevention and Control (#18), Equipment, Vehicles, and Power Tools (#19), Surface Water Withdrawal and Construction Discharge Water (#23), Work Area Isolation (#27), Timing of In-Water Work (# 25), Fish Capture and Release (# 28); Site Restoration (#31), and Revegetation (#32). Excavation below the ordinary high water (OHW) line shall be conducted to the maximum extent possible during low tide cycles or low flow cycles in the downstream watercourse.
d. Overall design goals. Tide/flood gate replacement or retrofit design data will demonstrate:
    i. A clear linkage to limiting factors identified within an appropriate sub-basin plan or recovery plan, or based on recommendations by a technical oversight and steering committee within a localized region.
    ii. The identification and, to the extent possible, the correction of the degraded baseline condition.
    iii. The use of analytical approaches for determination of the tidal prism and exchange.
    iv. Appropriate self-sustaining hydrologic design that includes climate change to reduce maintenance.
e. General project design criteria
    i. Site specific project design criteria will be set based on tidal restoration, fish passage, climate change and flood protection needs as determined and set forth by the RRT. At a minimum, the RRT will assess the following design options after determining necessity of the project.
    ii. Tide/Flood Gate Replacement or Retrofit Options in order of preference
        1. Dike removal
        2. Dike breach
        3. Dike setback (With the existing tide gate, or a replacement with an upgraded tidegate as described below)
        4. Bridge
        5. Non-gated pipe (NGP) or "bare" culvert
            a. Existing pipe minus the tide gate (removed)
            b. Installation of new pipe minus a tide gate

iii. Tide Gate
    1. Fiberglass or aluminum gate
    2. Side hinged gate
    3. Self-regulating tide gate (SRT)
        a. Tension (cable) operated
        b. Float (cam) operated

iv. Hybrid (such as SRT coupled with NGP)

v. Other design options as recommended by the RRT

vi. Design actions to restore tidal exchange characteristics—elevation, cross-sectional area, timing—in a manner that closely mimics, to the greatest degree possible, those that would naturally occur at that stream type.

f. Design report & associated documentation. Tide/flood gate replacement and retrofit design and adaptive management documentation shall include:

i. Background and Problem Statement
    1. Site history
    2. Environmental baseline
    3. Problem description
    4. Cause of problem

ii. Project Description
    1. Goals/objectives
    2. Project elements
    3. Sequencing, implementation
        a. Place cofferdam upstream of the culvert to prevent drainage water from entering the work area. A downstream cofferdam will also be installed to isolate the work area from the watercourse.
        b. The existing culvert requiring replacement is then excavated with equipment staged on the dike or shoreline above OHW.
        c. Excavated material is stockpiled upland for replacement in the dike once the new culvert is in-place.
        d. Waste water removed from within the cofferdam work area shall be discharged to a location landward of OHW line in a manner that allows removal of fine sediments prior to the discharged water returning to the watercourses.
        e. Upon completion of the tide gate/flood gate repairs and/or replacement, all material used to construct the cofferdams shall be removed from the watercourses and the project site returned to pre-project or improved conditions.
        f. Restore LW features to redeveloping tidal channels.
        g. Drainage ditches will be filled to become part of the surrounding contiguous tidal marsh or will be modified to become part of the tidal channel network.
    4. Proposed work window
    5. Recovery trajectory: Describe how the new stream/tidal channel will develop and evolve.

iii. Design Analysis, including technical analyses, computations relating design to analysis, and references. Analyses shall be appropriate to the level of project complexity. At a minimum, analyses will include the following:
    1. Hydraulic Analysis
        a. Model conditions, duration, boundary conditions, inputs, and outputs will be collaboratively developed by RRT and modeler.
    2. Sediment Assessment
    3. Risk Analysis
iv. Detailed construction drawings
v. Other regulatory jurisdictions for tide and floodgate repair and replacement will also be addressed: i.e., ACOE, River and Harbors Act §10, Clean Water Act §404, CZMA, ODFW Fish Passage OAR; ODEQ & WDOE §401, WDFW Hydraulic Project Approval, Washington Environmental Policy Act evaluation, Washington Shoreline Management Act
vi. River Restoration Tool. Review by the RRT will also include an evaluation using the River Restoration Analysis Tool (www.restorationreview.com), and therefore the following questions will be addressed in the project documentation:
    1. Problem Identification
        a. Is the problem identified?
        b. Are causes identified at appropriate scales?
    2. Project Context
        a. Is the project identified as part of a plan, such as a watershed action plan or recovery plan?
        b. Does the project consider ecological, geomorphic, and socioeconomic context?
    3. Goals & Objectives
        a. Do goals and objectives address problem, causes, and context?
        b. Are objectives measurable?
    4. Alternatives Evaluation
        a. Were alternative considered?
        b. Are uncertainties and risk associated with selected alternative acceptable?
    5. Project Design
        a. Do project elements collectively support project objectives?
        b. Are design criteria defined for all project elements?
        c. Do project elements work with stream processes to create and maintain habitat?
        d. Is the technical basis of design sound for each project element?
    6. Implementation

a. Are plans and specifications sufficient in scope and detail to execute the project?
b. Does plan address potential implementation impacts and risks?

7. Monitoring and Management
    a. Does monitoring plan address project compliance?
    b. Does monitoring plan directly measure project effectiveness?
    c. Does the maintenance plan include replacement for components that corrode over time?

g. Monitoring and adaptive management. Develop a monitoring and adaptive management plan that has been reviewed and approved by the RRT, that includes the following:
    i. Introduction
    ii. Existing monitoring protocols
    iii. Project effectiveness monitoring plan
    iv. Project review team triggering conditions
    v. Monitoring frequency, timing, and duration
    vi. Monitoring technique protocols
    vii. Data storage and analysis
    viii. Monitoring quality assurance plan
    ix. Literature cited
    x.

51. Native Vegetation Restoration

This restoration action will be conducted in upland areas, including coastal and nearshore habitat, and prairies, to help restore plant species composition and structure that would occur under natural disturbances regimes, such as flooding, fire, or tidal and wave action. Restoration of these upland communities encompasses the direct manipulation of plants, soils, and sand to alter existing or competing plant communities to recover or maintain select native plant communities. This is achieved by the use of mechanical, physical, burn, grazing, or chemical techniques to eradicate or control undesirable vegetation and alter vegetation and soil properties.

Native vegetation restoration will also include plant population enhancement (propagule collection, propagation, population augmentation and reintroduction) of Kincaid's lupine, Willamette daisy, Nelson's checker-mallow, Bradshaw's lomatium, and golden paintbrush. Activities can occur in prairie, oak woodland and savanna, and coastal habitats. These treatments are described in the Programmatic Consultation for Western Oregon Prairie Restoration Activities, 2008, and Programmatic Biological Assessment for Habitat Restoration Activities, Western Washington Version, 2006, and are incorporated by reference.

A short summary of activities that may occur are:

a. Site Preparation
    i. Determine if you have any listed or proposed species in the vicinity of the project. If listed or proposed species may be present, you must follow the species specific conservation measures.
    ii. Prepare planting sites as appropriate by cutting, digging, grubbing roots, scalping sod, decompacting soil, shade/cover, burning, grazing, mowing, girdling, and spraying to remove invasive vegetation.
        1. Use of herbicide will follow PCD 29 in this programmatic consultation.
        2. When using fire, the project will be in compliance with National Wildfire Coordinating Group Wildland and Prescribed Fire Qualifications System Guide, PMS 310-1, (available at http://www.nwcg.gov/pms/docs/docs.htm) unless local agreements and/or contracts specify otherwise. The project will also comply with Service and regional policies regarding prescribed burning. A written prescribed fire plan must be prepared, reviewed, and approved according to USFWS and regional agencies.
        3. Livestock may be used to maintain vegetation or for reducing undesirable vegetation prior to planting.
    iii. Mow, disc, or level soil at the site when necessary
    iv. Place woody debris, wood chips, compost, mulch, or soil at select locations to alter microsites

b. Plant and Maintain Vegetation
    i. Plant vegetation or seed in prepared site if needed.
    ii. Collect, propagate, augment, or reintroduce native threatened or endangered plants to native or restored habitats.
    iii. Fertilize, and /or mulch, and wrap stems as needed to protect from rodent girdling, cap buds to protect from herbivory, and transplant from nearby established plant sources.
    iv. Cut, remove, or graze competing herbaceous or woody vegetation during routine maintenance work.
        1. Planting sites will be monitored for survival and success by trained and qualified personnel post-project for three years.
        2. Projects will attempt to achieve 80% survival of target species within three years.

52. Silvicultural Treatments (upland only)

This restoration action will be used to alter the structure and plant species composition of forest. Forest road decommissioning and stormproofing or elimination of roads and trails is addressed in PDC 45. Activities can include restorative thinning, understory management, downed wood & snag creation, oak release, prairie and oak savanna restoration, and planting of native species. Work may entail use of power tools and/or hand crews.

a. Forest thinning will occur in overstocked areas or conifer release areas, as prescribed in a management plan for the site.

b. Thinning, or single tree removal will be restricted to areas above the slope break on steep slopes and highly erodible soils to prevent accelerated soil erosion and increased sedimentation rates.
c. Trees will be thinned manually, by cutting or girdling.
d. Felled trees will be left onsite if appropriate for nutrient cycling, cover, and to reduce elk/deer browse on seedlings.
e. Where trees are removed to restore prairie, savanna, or coastal bog habitats, felled trees will be removed from the site and/or limbed, chipped or burned to allow for restoration of desired habitat.
f. Manual pruning of limbs is allowed to attain attributes of growth, structure, or form.
g. Planting of native species can occur on the project site using PDC 32.
h. Control of invasive species may occur on the project site using PDC 29.