

Technical Memorandum

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Re: Port of Portland West Hayden Island Development Scenario: Potential Natural and Cultural Resources Impact and Mitigation Evaluation

Introduction

SWCA Environmental Consultants has been asked by the Port of Portland to evaluate the environmental consequences (for natural and cultural resources) related to environmental permitting for one development footprint on the Port's West Hayden Island (WHI) Columbia River property. For the purpose of this evaluation, the development footprint has the following description:

A marine terminal development, with the assumption that there will be a network of facilities handling autos, bulks, or breakbulk, on fill covering approximately 450 acres. The facility's most significant characteristic will be a network of rail infrastructure necessary to serve the probable uses. The footprint assumes that the approximately 450 acres will be completely filled to an elevation one foot above the 100-year flood elevation at WHI. The scenario also assumes that the portion of WHI left unfilled will be retained as fish and wildlife habitat and for impact mitigation. There is a range of possible dock configurations that could be placed along the WHI waterfront depending on operational needs. The dock type and size are subject to change over time based on site conditions and changes in design configurations and usage demands. The dock types could include a cellular bulkhead; a pile supported structure connected to the uplands with fill; a bulkhead or pile structure that uses a trestle or bridge structure to minimize shallow water impacts; and/or a floating dock that might service light roll-on roll-off cargo such as automobiles.

This memorandum provides information on 1) existing natural and cultural resources; 2) resource permitting framework for WHI development; 3) potential impacts resulting from the development footprint; and 4) assumed mitigation needs and potential for mitigation on WHI.

This memorandum provides a best-guess evaluation of permitting issues, resource impacts, and mitigation requirements for some future, generalized development at WHI. We have had to make a number of assumptions based on past and present regulatory requirements (City of Portland, Oregon Department of State Lands [DSL], U.S. Army Corps of Engineers [USACE], etc.). Acreages were based on two data sets including the Port of Portland's (2007) Natural Resource Inventory (NRI), which mapped cover types based on aerial photo interpretation with field assessment, and the Port's 1999 wetland delineation, which was mapped based on topography. We calculated wetland and upland wildlife habitat impacts by combining these data sets. The results

are best guess estimates provided only for the purposes of planning and decision-making by Port staff. For other potential impacts that cannot be calculated (e.g., impacts on endangered species, cultural resources), we have included potential evaluation, permitting, and mitigation measures that would have to be conducted once impacts are ultimately determined by NMFS, the Corp and DSL.

Existing Environment

WHI is an approximately 820-acre property bounded on the north, west, and south by the Columbia River (as Oregon Slough on the south) and by the BNSF Railroad fill on the east. Portions of the property have been used for dredged material placement by and under authorization of USACE. Major past land uses have included agriculture, septic waste injection, and a training school for heavy equipment operators.

WHI is part of the Columbia River floodplain ecosystem. Its location near the confluence of the Willamette and Columbia rivers is near the intersection of two major wildlife corridors. Fish and wildlife habitat values are related to this landscape’s ecological context. The bottomland forest, wetlands, and shorelines provide potential food and cover resources for a variety of migrant and resident species. The connectivity of the island to a larger resource network up and down the river increases wildlife opportunities for finding food resources, refuge, and dispersal.

Wetlands were delineated on the island over 10 years ago (Fishman Environmental Services 1995, FES 1997). Although the delineation is no longer current enough to be acceptable to regulatory agencies, it received the concurrence of DSL and USACE at that time. Twelve wildlife habitat cover types were mapped by the Port’s NRI in 2002, which was updated in 2007 (Table 1).

Table 1. West Hayden Island Cover Types

Cover Type	Acreage
Wetland Forest	12
Wetland Shrub	<1
Wetland Herbaceous	25
Pond	5
Upland Forest	415
Upland Shrub	1
Blackberry	77
Upland Herbaceous	141
Upland Barren/Weedy/Fill	101
Natural River Beach	35
Modified River Beach	<1
Developed/Non-habitat	6
Total	820

WHI also supports aquatic (riverine) habitats along approximately 5.7 miles of shoreline. The waters around the island, and possibly some wetland areas that are seasonally connected to the river, are designated critical habitat for 11 Evolutionarily Significant Units (ESUs) of anadromous salmonid fish species listed as threatened or endangered under the federal Endangered Species Act

(ESA). Critical habitat for endangered Snake River sockeye and threatened Snake River fall Chinook salmon includes a riparian zone defined by the National Marine Fisheries Service (NMFS) as extending 300 feet from the “normal line of high water” (58 FR 68543). On October 9, 2009, NMFS released the Final Critical Habitat Designation for the Southern Distinct Population Segment (DPS) of the American green sturgeon, which excluded “the lower Columbia River from river kilometer (RKM) 74 to the Bonneville Dam” for economic reasons (50 CFR Part 226, Vol. 74, No. 195). Individuals from this DPS may however be present in the project action area, in which case ESA take prohibitions will still apply. Steller sea lions, listed as threatened under the ESA, are also found in the lower Columbia River. Pacific smelt have been petitioned for listing under the ESA and are currently undergoing status review by NMFS. A determination on whether the petitioned action is warranted is expected by November 8, 2008. No federally listed terrestrial wildlife or plant species occur on the island, although federal species of concern and/or state sensitive species have been observed, including bald eagle, painted turtle, pileated woodpecker, and little willow flycatcher (Smyth 1998). Pacific lamprey and river lamprey, both U.S. Fish and Wildlife Service (USFWS) species of concern, are also present in the Columbia River.

Vegetation communities on the site are either relics of historic conditions or communities that have developed under conditions that do not match the pre-European condition. Island topography has changed over the past 70+ years as a result of placement of dredged material (primarily sand) and the construction of large groins along the south shore. Columbia River hydrology is regulated by upstream dam operations, and the hydrograph is altered from historic conditions in ways that affect vegetation community location, stability, and succession. The existing forests of black cottonwood are primarily larger, older trees that became established prior to the construction of dams and subsequent river regulation. Conditions on the island are no longer generally favorable for successful recruitment of cottonwood and possibly other species (SWCA Environmental Consultants 2007). Non-native invasive species, such as reed canarygrass and Himalayan blackberry, have become the dominant species on parts of the island.

Archaeological research has indicated that settlement in the Portland Basin extends back at least 3,000 years and possibly as far back as 6,000 to 9,000 years. Many of the islands of the Columbia River were important settlement areas, but there has been no evidence that Hayden Island was settled prehistorically. Ethnohistoric information suggests that the Hayden Island area was occupied by Chinookan groups but only has brief references to actual native use of the island. Ellis (1986) reported that the western portion of Hayden Island was used by the Hudson’s Bay Company for dairy production as well as a historical homestead for the Hayden family.

Several environmental and cultural concerns are associated with permitting for the development footprint, including impacts to:

1. wildlife habitat,
2. regulated wetlands and waters (federal and state),
3. sensitive and listed fish and wildlife species,
4. aquatic habitat (e.g., shallow water habitat),
5. surface water quality from storm water outfalls or other sources, and
6. cultural and historic resources.

Permitting Framework

Local Zoning

WHI is presently outside the City of Portland but inside the Portland Urban Growth Boundary, and therefore zoned by Multnomah County. The Multnomah County zoning code covering WHI is administered by the City of Portland Bureau of Development Services. In 1982 Multnomah County adopted ordinances that changed the Comprehensive Plan designation of WHI from Natural Resource, Multiple Use Forest to “Urban” but retained the Rural Residential (MUF-19) zoning designation. In 1996, under the Urban Planning Area Agreement between the City of Portland and Multnomah County, land use planning authority for WHI was formally transferred to the City. Upon future annexation, WHI will become a part of the City, and the City’s comprehensive plan and zoning designations will regulate future development. The County MUF-19 zone, with a SEC (Significant Environmental Concern) overlay, would convert to Residential Farm/Forest (RF) with an EP (protection) or EC (conservation) environmental overlay unless a special study, area plan, or plan district precedes the conversion. A draft WHI Area Plan was produced in April 1999.

Both Multnomah County and Metro have adopted language suggesting that the WHI property would be developed for industrial purposes. As part of previous planning processes between the Port and City, it was also suggested that the proposed development footprint on WHI could be exempt from environmental overlay zones. In this memorandum, however, we are assuming that WHI is a Habitat Conservation Area and that natural resources, especially upland resources, will be regulated under a District Plan that will implement the Metro “Nature in Neighborhoods” Goal 5 program. Development impacts to habitat patch size, interior habitat, connectivity of the habitat to water, and connectivity of the habitat to other habitat areas would need to be evaluated under Goal 5. Specific mitigation requirements for upland habitat could include 1:1 replacement based on the impact area, tree planting to replace impacted trees relative to the size of the impacted trees, and/or discretionary offsite mitigation.

Federal and State Regulation of Wetlands and Waters (Clean Water Act, Rivers and Harbors Act, Sec. 404, Oregon State Removal Fill Law)

Proposed impacts to jurisdictional waters, including wetlands on WHI will be regulated under federal and state regulations. The USACE interprets and implements federal regulations under the Clean Water Act (CWA) and the Rivers and Harbors Act. The Oregon DSL interprets and implements the Removal and Fill Law.

The USACE exercises jurisdiction under two separate statutory schemes, which may have an effect on development permitting at West Hayden Island. The first and likely most important is Section 404 of the CWA, which applies to discharges of fill material into the “waters of the United States,” including wetlands. Under this provision, permittees are typically required to mitigate the adverse natural resource impacts associated with their construction activities. The second statutory scheme is Section 10 of the Rivers and Harbors Act, which applies to fill material placed in “navigable waters.” Natural resource mitigation is not typically required (though protection of navigation is a concern) under Section 10. The USACE’s jurisdiction under both statutes is limited to areas below the ordinary high water mark (OHWM). With respect to Section 404, the OHWM may change over time due to anthropogenic modifications of the river. By contrast, anthropogenic changes do not alter the OHWM for Section 10 (navigation) purposes (33 CFR sec. 322). Through

a series of surveys over the years, the USACE has modified the Section 404 OHWM. The USACE Portland District recently determined that the elevation of the OHWM for the Columbia River at West Hayden Island is 15.0 feet National Geodetic Vertical Datum (NGVD) 1929 (Permit No. 2001-00062) for Section 404 CWA jurisdiction, which replaced the earlier elevations, which ranged from 16.7 feet at the western tip of the island to 17.3 feet at the eastern extent of the project area near the existing railroad bridge, as reported in earlier documentation (USACE 1997).

Since the earlier wetland delineation concurrence for WHI was obtained (USACE 1997), several federal court cases (*SWANCC*, *Rapanos*, *Carabell*) have changed how USACE interprets and implements Section 404 of the CWA regarding isolated or adjacent wetlands. A formal request to the USACE for an approved Jurisdictional Determination will need to be made. The USACE may determine that wetlands on WHI are considered adjacent to the Columbia River or in some way significantly connected to the river, and therefore jurisdictional under the CWA.

Several notes about the 1929 datum are included in the glossary of the 2004 USACE's Portland-Vancouver Harbor Information Package, Second Edition, and are included here for reference.

- Columbia River Datum (CRD): Plane of reference from which river stage is measured on the Columbia River from the lower Columbia River up to the Bonneville Dam, and on the Willamette River up to Willamette Falls. CRD equals 1.82 feet above mean sea level (equivalent to NGVD) at Vancouver, Washington.
- Portland River Datum (PRD): Plane of reference from which river stage is measured on the Willamette River at Portland. PRD equals 1.55 feet above mean sea level (equivalent to NGVD) at the Morrison Street Bridge, Portland gauge.
- National Geodetic Vertical Datum (NGVD) of 1929: Replaced mean sea level.

The USACE wetland mitigation rules have changed, and now mitigation banks are prioritized over onsite applicant-responsible wetland mitigation. The DSL now favors wetland mitigation banks over the other state accepted options of in-lieu fee mitigation, advance mitigation, permittee responsible mitigation, and payment in-lieu mitigation.

Proposed wetland and water mitigation plans are subject to approval by DSL and USACE, and impacted jurisdictional wetlands and waters will require wetland mitigation on a functional replacement basis.

The CWA also gives the Oregon Department of Environmental Quality (DEQ), as delegated by the U.S. Environmental Protection Agency, the authority to regulate point source discharges, including stormwater through the National Pollutant Discharge Elimination System. Stormwater from newly paved areas and rooftops will also need to be routed through detention, treatment, and outfall infrastructure designed to specifications approved by the NMFS through a consultation process prescribed by the CWA. The NMFS Standard Local Operating Procedures (SLOPES IV-Transportation) for the USACE's nationwide permit may be used as guidance in designing stormwater to reduce impacts to endangered species and other beneficial uses of receiving waters.

The DSL Removal/Fill (R/F) Law requires a permit from the DSL for placement of fill in, or removal of material from, jurisdictional wetlands. An R/F permit will require wetland mitigation to replace unavoidable losses to wetland resources, using replacement ratios specified in the DSL Oregon Administrative Rules:

Restoration 1:1

Creation 1.5:1

Enhancement 3:1

Impacts to Mitigation Wetlands: All above ratios are doubled

Federal Endangered Species Act (Salmonids)

Development at WHI would likely result in impacts to a variety of aquatic habitat functions and alter the structure and dynamics of the local shoreline and river bottom. When water-related structures are added to the development footprint, they will trigger an evaluation of impacts to federally listed salmonids in the form of a biological assessment. Under the ESA, consultation with federal services is required whenever a federal nexus (i.e., actions such as funding or issuing permits) is encountered.¹ A parallel “conference” process may also need to be conducted for species proposed for listing such as eulachon (also known as smelt). It is also important to note that USACE will not issue a fill permit for projects that are “likely to adversely effect” ESA-listed species without a biological opinion from NMFS that states that take of the species is incidental and will not result in jeopardy to the continued existence of the species or adversely modify critical habitat.

The specific permits required to develop the site will depend on the technical details of the development design. Pre-application meetings with relevant regulatory agencies will help identify areas where specific design modifications can result in simplified permitting. Details of the following seven design topics will likely be of interest to agency staff.

- Stormwater routing, treatment, detention, and discharge
- In-water structures
- Overwater structures
- Riverbank/riparian vegetation impacts
- Waters and wetland impacts
- Riverbank and river bottom modifications, especially shallow water,² beaches, and side channel habitats.
- Cumulative, interdependent, and interrelated effects of site development

Regulatory agencies are likely to express concern and request detailed analyses of the long-term effects of marine terminal development on habitats and habitat-forming processes in the river. Quantitative analysis of the hydrogeomorphic effects of dredging, shoreline modifications, and terminal structures on local and downstream areas may be requested. Recent research by the

¹ Section 7 of the ESA requires all federal agencies to consult with the USFWS and the NMFS on the effects of their actions. In this case, the federal action would likely be the issuance of a CWA permit for discharge or fill below OHWM. The DEQ’s issuance of a Section 401 WQ Certification is also dependent on the results of the consultation.

² In recent consultations, NMFS has defined shallow water habitat for salmonids as areas between ordinary low water (OLW) and 25 feet below OLW. For this memorandum, shallow water habitat calculations are based on –25 feet CRD.

Oregon Department of Fish and Wildlife on salmonid habitat use in the lower Willamette River has prompted NMFS to state that sand beaches and side channels are of special importance to rearing and migrating juvenile salmonids year-round and should be protected from development. If NMFS extrapolates these findings to the Columbia River, they may make similar claims about Hayden Island beaches and the southern shores of the island along Oregon Slough.

Federal Bald and Golden Eagle Protection Act

The bald eagle (*Haliaeetus leucocephalus*) is protected by the Bald and Golden Eagle Protection Act (16 USC 668-668c). The Act prohibits anyone without a permit issued by the USFWS from “taking” bald eagles, which includes killing, wounding, collecting, molesting, and/or disturbances that reduce nest productivity or cause nest abandonment. The impact of human actions on bald eagles is variable and depends on nest visibility, duration of disturbance, noise level, extent of area affected, and the tolerance and experience of the nesting pair.

When the bald eagle was ESA-listed as threatened and protected, project activities within ¼ mile of a concealed nest or ½ mile of an “open” nest (with line-of-sight to activity) could be considered disturbance to nesting eagles (USFWS 2007). Activities that occurred in these areas typically required Eagle Management Plans to mitigate potential adverse effects. Plans often included: activity restrictions within ¼ mile of any occupied nest during the breeding season (February–July), implementation of a monitoring program to determine potential disturbance to eagles (including temporary disturbances), and implementation of adaptive management strategies based on the tolerance levels of specific eagle pairs.

Bald eagles are nesting on WHI in a large black cottonwood tree located immediately adjacent or within the middle of the panhandle on the western end of the proposed impact area (Carrie Butler, Port of Portland, personal communication). Since bald eagles have high nest site fidelity and return to the same breeding territory year after year, they will most likely continue to use this nest or an alternate nest nearby. Therefore, the Port will need to obtain a permit from the USFWS for the proposed development.

Federal Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 USC 703–712) makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nest, or eggs of such a bird except under the terms of a valid permit issued by USFWS. A variety of migratory birds, such as bald eagle and songbirds, nest in the project area. Impacts to bald eagles and related permit requirements are discussed above. Potential impacts to migratory songbirds that nest in trees or shrubs can be avoided if trees and shrubs are removed in the winter when these species are not nesting.

Marine Mammal Protection Act

Harbor seals, California sea lions, and Steller sea lions in the Columbia River are protected from harassment and harm by the Marine Mammal Protection Act. Construction noise from activities such as pile driving may require applying for an incidental harassment authorization (IHA) through NMFS. This process involves notices published in the Federal Register and can add approximately six months to permitting timelines. The need for an IHA may be eliminated if con-

crete piles, vibratory pile driving, and noise attenuation measures such as bubble curtains are used; however, these methods may not be feasible or effective with metal pilings, in fast water, or with sheet pile.

National Historic Preservation Act

The National Historic Preservation Act (NHPA) requires a cultural resource assessment for development projects with a federal nexus. This assessment includes a cultural resource inventory in compliance with Section 106 (36 CFR 800) of NHPA, the National Environmental Policy Act, the Oregon State Historic Preservation Office (SHPO), and the appropriate federally recognized Tribes. Based on the cultural history of the WHI area, there is a possibility of discovering significant historic and cultural resources in the exposed native soils on Hayden Island. However, geotechnical coring indicates that many of the shoreline areas were filled with dredged material to a depth of roughly 18 feet, and it is unlikely that construction in these areas will disturb cultural resources. Also, it is unlikely that any structural remains from early Euro-American settlements exist due to historical annual flooding (Ellis 1986). In the event that cultural resources are encountered during the project, construction activities in the vicinity of the find would need to be temporarily suspended in accordance with Oregon state law (ORS 97.745 and 358.920), and SHPO and the affected tribes would need to be contacted immediately to evaluate the discovery and recommend subsequent courses of action.

Assessment of Potential Impacts

Potential impacts to wetland resources and upland forest habitat were calculated based on the 2007 Port NRI survey update and the wetland delineation concurred by DSL and the USACE (Table 2). An assessment of impacts will need to be updated at the time a specific plan is proposed.

Table 2. Development Footprint Impacts to Wetlands and Upland Forest Resources

Regulatory Agency	Habitat	Total Acreage	Impact Acreage	No Impact
DSL / USACE (Sec 404)	Wetland Forest	11.9	2.5	9.4
	Wetland Scrub-shrub	0.6	0.2	0.4
	Wetland Herbaceous	24.7	17.3	7.4
	Pond	4.6	0.6	4.0
City of Portland / Metro	Upland Forest	415.4	211.0	204.4

Aquatic Habitat Impacts

Potential development scenarios at WHI would likely result in impacts to a variety of aquatic habitat functions. Development scenarios may include a container terminal with a dock face for two berths at a total length of 3,000 to 4,000 feet of shoreline, an offshore bulk facility, and two offshore automotive carrier berths located outside the shallow water habitat area. The container facility would be located either adjacent to shore (bulkhead), which would require significant berth dredging; extension of shore (bulkhead), which would require significant fill behind a sheet pile wall; or placed offshore (pile-supported), with two 30-foot-wide ramps, bridges or trestles leading to a paved handling facility. Several elements of these designs have the potential to impact the structure and dynamics of the local shoreline and river bottom (Table 3).

Table 3. Summary of Potential Aquatic Habitat Impact Types

Actions	Potential Impacts						
	Shallow water habitat loss	Bulkhead	Riprap	Pilings	Overwater structure	Dredging	Stormwater discharge
Bulk dock	Y: Rail loop side fill above FEMA 100-year floodplain (extent of toe), perhaps including Benson Pond		Y: Rail loop side slope armor	Y	Y	?	Y
Auto docks	Only ramp support pilings	N	Limited armoring for ramps	Y	Y: 1.2–1.4 acres per dock	?	Y
Container (bulkhead or stick pile dock)	Up to 2.75 acres, depending on placement	3,000–4,000 linear feet; 30 feet wide	N	?	N		Y
Container (pile-supported offshore dock with ramps)	Only ramp support pilings (if dock is placed below –25 CRD)	N	Limited armoring for ramps?	Y: Dense array under dock	Y	?	Y

Placing docks in water deeper than 25 feet below CRD with ramps (grated and narrow, if practicable) that span beach and shallow water habitat would reduce agency concerns and mitigation needs.

Mitigation Needs and Opportunities for Wetland, Upland, and Aquatic Resources

Wetland Mitigation

The proposed development footprint will impact approximately 20.65 acres of wetlands including 2.22 acres of existing wetland mitigation. The replacement ratios of 1:1 (restoration), 1.5:1 (creation), and 3:1 (enhancement) apply, and in fact must be doubled for the existing wetland mitigation. Therefore, the total acreage needed for the development footprint discussed in this memorandum ranges from a minimum of 22.86 acres (for restoration) to 34.29 acres (for creation) to a maximum of 68.58 acres (for enhancement of existing degraded wetlands),

Based on SWCA site knowledge and review of the site conditions, SWCA would propose conceptual onsite wetland mitigation based on grading selected areas of the periphery of the island to a lower elevation that will allow annual inundation during normal seasonal high water in the Columbia River. This pattern of inundation will mimic historic hydrologic conditions of the lower Columbia River ecosystem. The resulting habitat will have greatly increased benefits for fish, wildlife, and native vegetation, compared to existing conditions. The proposed mitigation concept areas could potentially provide 74 acres of mitigation credit. However, mitigation credit depends on regulatory agency approval, and these agencies might not approve of an impact on 44 acres of forest habitat in order to compensate for wetland impacts.

Table 4. Summary of Potential Wetland and Forest Mitigation on WHI

Land area outside development area	371 acres
Land area included in wetland mitigation concept areas	84.45 acres
Total mitigation credit potentially available in concept areas	74 acres*
Range of wetland mitigation area needed	22.86 (restoration) to 68.58 acres (enhancement)
Land area in wetland mitigation concept area not used for Development Footprint	5.4 to 51.14 acres
Land area outside wetland mitigation concept area	286.55 acres (including approximately 162 acres of upland forest)
Unforested areas outside wetland mitigation concept area appropriate for forest mitigation	36 acres Himalayan blackberry 69 acres herbaceous
Created hillslopes in wetland mitigation concept area appropriate for forest mitigation	10.5 acres

* Total mitigation credit is less than the total mitigation concept area due to construction of slopes and buffers.

Upland Mitigation

Upland mitigation standards have not been established at this time and could potentially range from 1:1 forest habitat acreage replacement to a number of trees based on the diameters of each impacted tree. The proposed development footprint will impact approximately 211 acres of upland forest habitat. If the conceptual mitigation mentioned above is constructed, an additional 42 acres of upland forest would be impacted. A portion of mitigation for upland forest impacts could be accomplished at West Hayden Island in Himalayan blackberry and herbaceous habitat located outside of the development and on the created hillslopes in the wetland mitigation concept area. The estimated total acreage appropriate for planting upland trees is approximately 125 acres. Most likely, additional mitigation would be required offsite. The exact amount of mitigation cannot be determined at this time due to the lack of clarity of Goal 5 mitigation requirements.

Aquatic Mitigation

Mitigation requirements for aquatic habitat impacts are not determined by fixed statutory ratios but are subject to negotiation. Regulatory agencies will likely expect a mitigation plan that provides net benefits to each type of aquatic habitat function lost to construction and is integrated with wetland mitigation design. NMFS typically prefers to see impacts avoided and minimized rather than mitigated for, and mitigation to avoid an “adverse modification of critical habitat” determination. The mitigation ratio is negotiable based on perceived habitat functions and quality.

Replacement or enhancement of the following aquatic and riparian functions and habitats will likely be required:

- Shallow water/tidal beach (river’s edge)
- Off-channel refuge (pond): emergent fringe and open water
- Mature riparian/floodplain forest
- Floodplain

Onsite mitigation opportunities may be limited by the footprint of proposed development. Offsite options could include the creation and/or enhancement of shallow water habitat on other lower Columbia River islands.

The use of appropriate conservation measures and best management practices may eliminate or reduce many short-term construction-related impacts. These measures will be developed based on design details and proposed construction methods during the permitting process.

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