DRAFT BIOLOGICAL EVALUATION

For Sensitive Fish and Wildlife Species at the Proposed Beach Project at Lake Sammamish State Park, Issaquah, WA: NWS-2014-___

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BIOLOGICAL EVALUATION

SECTION 7, ENDANGERED SPECIES ACT

Applicant: Washington State Parks and Recreation Commission, c/o Robert Droll
Corps Reference #: NWS-2014-____-__

1 PROJECT OVERVIEW

1.1 Project Location

The proposed project is located at Sunset Beach in Lake Sammamish State Park, on the southern shoreline of Lake Sammamish in Water Resource Inventory Area 8 (WRIA 8). The park is located at 5000 NW Sammamish Road, King County, WA 98027 (in Section 20, Township 24 North, Range 6 East; 47.55936 N Latitude, -122.06532 W Longitude; Figure 1). Tax parcel numbers: 2024069002 and 1724069005. Sunset Beach is bordered to the north and west by Lake Sammamish and to the south and east by the 512-acre Lake Sammamish State Park.

Figure 1. Vicinity map [from Bing.com].

1.2 General Description

The Washington State Parks and Recreation Commission (State Parks) proposes park improvements to enhance recreational opportunities, safety, and access at Sunset Beach in Lake Sammamish State Park. The project will improve swimmer safety by increasing in-water visibility in the existing swimming area, which will improve the ability to detect and rescue distressed swimmers, and through sediment removal and replacement fill, the project will remove existing soft spots or "sink holes," which could pose a risk to inexperienced swimmers. The project will improve beach access by installing a concrete ramp into the water that is compliant with Americans with Disabilities Act (ADA) standards. The project will also replace the upland beach substrate and install a subsurface drainage system.

Proposed work is described for the following areas, below:

- Manual removal of milfoil throughout the aquatic project area.
- From the OHWM (32.07 feet NAVD88) to 29 feet NAVD88 (Zone 2 on Sheet 3 in Appendix A):
    - Excavation of native beach soil to a depth of 36-inches (1,300 cubic yards).
    - Backfill with 12 inches of 4- to 8-inch compact quarry spall, (600 cubic yards), topped with 6 inches of permeable ballast (300 cubic yards), followed by 18 inches of granolithic (700 cubic yards) aggregate (1/10" to 1/4").
- From the 29 feet to 25 feet NAVD88 (Zone 1 on Sheet 3 in Appendix A):
    - Fill of approximately 1,000 cubic yards of imported granolithic aggregate (1/10" to 1/4").
- Construction of an 80-foot-long by 5-foot-wide concrete ramp using pre-cast concrete planks secured over two steel I-beams. The proposed ramp will begin at approximately 33 feet NAVD88 and extend 60 feet waterward of the OHWM to elevation 28.80 feet NAVD88. Above the OHWM, the ramp will be made with cast-in-place concrete.
- Above the OHWM (Zones 3 and 4 on Sheet 3 in Appendix A)
    - Excavation of the top 12 inches of native beach soil and backfill with 12 inches of beach sand or topsoil over approximately 1.76 acres (including 0.49 acres of Category II lake-fringe wetland).
    - Placement of boulders and large woody debris within the upland beach area.
    - Creation of 12,458 square feet (0.29 acres) of lake-fringe wetland northeast of the beach area. Creation of 9,121 square feet (0.21 acres) of depressional wetland west of the beach area. A total of 1.99 acres of

wetland enhancement, including the lake-fringe wetland immediately west of the project area and surrounding depressional wetlands to the south and west.

1.3 Construction Sequence

Construction activities would occur in the following sequence (provided by Robert Droll Landscape Architects and modified by The Watershed Company).

1) Identify and mark sensitive areas.

2) Install temporary erosion and sediment control (TESC) measures and turbidity curtain per project plans and specifications.

In-Water Work

3) Remove all fish from within the work area using electrofishing equipment.

4) Divers to manually remove milfoil and dispose at an upland site where it will not have the potential to be transported to nearby waterbodies.

5) Excavate and remove beach material below the OWHM using a land-based excavator.

6) Place quarry spalls and permeable ballast using land-based equipment. Place granolithic material below the OHWM using a telescopic belt conveyor.

7) Install pre-cast concrete planks for ADA access ramp.

8) Install approximately 15 logs anchored by chains to concrete blocks around the perimeter of the swim area to function as a floating breakwater.

Wetland Mitigation

9) Excavate and grade proposed wetland creation area.

10) Install wetland mitigation mulch.

11) Place large woody debris (LWD) and plantings in wetland mitigation area.

Upland Work

12) Install upland portion of cast-in-place ADA access ramp.

13) Excavate and remove beach materials above the OHWM.

14) Install beach subsurface drainage system.

15) Place imported beach sand material.

16) Install concrete paving, landscape boulders, woody debris and concrete barrier curb.

17) Import topsoil for seeding of small lawn area.

1.4 Impact Minimization Measures

1) Wetland Impacts: The proposed project used mitigation sequencing to avoid, minimize, and mitigate impacts to wetlands, as follows.

   a. Given the extent of lake-fringe wetlands in the Sunset Beach area and the in-water restoration goals, a complete avoidance approach is not feasible for this project. The existing sandy beach area which provides access to the lake is approximately 800 feet long. The proposed swim beach improvements will be approximately 530 feet long. The majority of the beach restoration area is sited outside of the nearest lake-fringe wetland. Relocating the swimming beach to the north was not deemed feasible from a public access or safety perspective.

   b. In general, proposed Sunset Beach area improvements minimize wetland, buffer, and lakeshore impacts by utilizing existing structural footprints and heavily trafficked recreation areas. By focusing improvements on an existing active use area, the project avoids impacts to any shrubs or trees or areas of undisturbed vegetation.

   a. The project mitigates for unavoidable impacts to a degraded lake-fringe wetland area through a combination of wetland creation and enhancement. The proposed mitigation draws upon and compliments the ongoing Lake Sammamish State Park restoration and master planning efforts. Wetland creation will include creation of a 0.29-acre lake-fringe wetland northeast of and adjacent to the beach area, and through creation of .a 0.21-acre depressional wetland west of the beach area. Additionally, wetland enhancement will occur over a total of 1.99 acres, including in the remaining lake-fringe wetland immediately west of the project area and in surrounding depressional wetlands to the south and west.

2) Monitoring: The applicant agrees to monitor planted vegetation and log structures twice a year for 3 years following project implementation. Maintenance of the terrestrial and emergent plants during the 3-year monitoring period will be conducted by the applicant or his/her authorized agents to ensure achievement of the specified survival standards.

3) Milfoil removal. Milfoil removal will follow King County Noxious Weed Control Best Management Practices (electronic reference) for milfoil removal, including annual follow-up milfoil removal. All milfoil removed will be properly disposed of at an upland site, where it will not be able to reenter a waterbody.

4) Timing Restriction: For the protection of aquatic life, all in-water activities would take place during the approved work windows for in-water construction. No in-water work would occur from 1 January through 15 July nor from 1 August to 15 November, per the combined fish protection policies of NOAA Fisheries and USFWS in Lake Sammamish to protect bull trout (*Salvelinus confluentus*), steelhead (*Oncorhynchus mykiss*), and Chinook salmon (*Oncorhynchus tshawytscha*) (Table 1). The proposed project is also located within a WDFW-indexed sockeye salmon (*O. nerka*) spawning area, so additional timing restrictions may apply.

Table 1. Applicable work windows.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Federal fish protection periods				No in-water work					No in-water work			

Construction activities that can be performed landward of the OHWM may take place at any time. Construction activities that can be performed above the OHWM include excavation and backfill of the upland beach, revision of the concrete walkway and construction of the upland portion of the concrete ramp, planting, and placement of large woody debris and boulders.

5) Water Quality: The proposed project involves substantial excavation and fill. These activities have the potential to cause elevated turbidity levels within the action area. The following minimization measures will be implemented to limit project effects from turbidity.

a. The Contractor will develop and implement a Temporary Erosion and Sediment Control (TESC) plan.

b. A sediment curtain will be installed and maintained around the in-water portion of the proposed work area for the duration of in-water work;

c. A silt fence will be installed and maintained around the project area for the duration of work.

d. A construction staging area will be established in the existing parking area, well away from the water's edge.

e. The contractor will stockpile excavated material at an upland site pending off-site disposal;

f. All sediment will be properly disposed of either on land or at an approved dredge disposal site in such a manner that it cannot enter into the waterway except at the approved disposal site or cause water quality degradation (Section 13, Rivers and Harbors Act).

1.5 Action Area

"Action area" is defined as "all areas to be affected directly or indirectly by the proposed action and not merely the immediate area involved in the action." Based on the analysis below, the disturbance effects of this project on Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), steelhead (*O. mykiss*), and bull trout (*Salvelinus confluentus*) would be realized at the shoreline project area itself, and turbidity caused by project activities would be limited to a 100-foot radius from any substrate-disturbing activities (Figure 2). Underwater sound generated by project activities is not expected to be significant enough to expand the project area. The action area includes wetland creation and enhancement areas to the north, southeast, and southwest of the beach area and a construction staging area in the parking lot east of the project area. No other areas would be affected directly or indirectly.

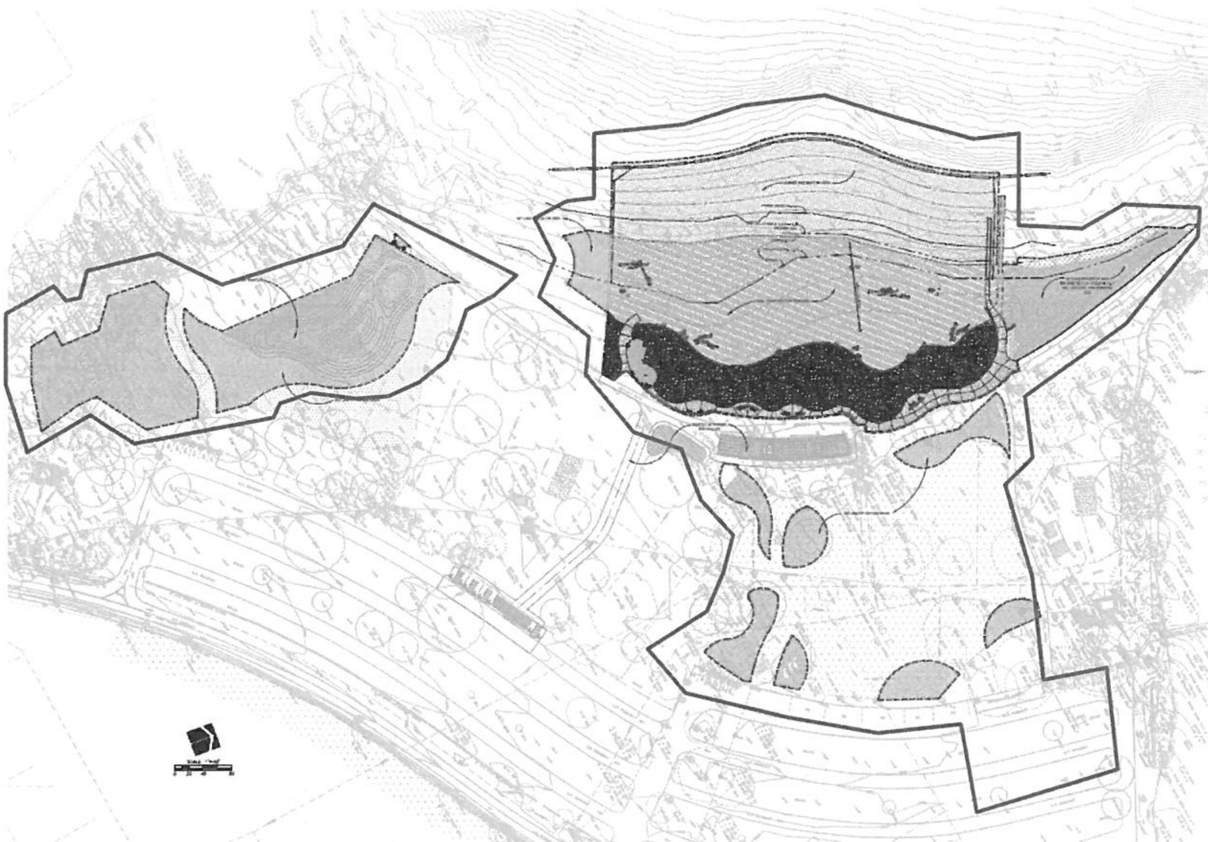

Figure 2. Figure depicting proposed Action Area outlined in red.

2. LISTED SPECIES

The action area is located along the shoreline of Lake Sammamish, which lies within the geographic range of three federally listed species of salmonids: 1) Chinook salmon of the Puget Sound Evolutionary Significant Unit (ESU) (Reaffirmed as Threatened, Federal Register, 28 June 2005), 2) bull trout of the Coastal-Puget Sound Distinct Population Segment (DPS) (Threatened, Federal Register, 1 November 1999), and 3) steelhead of the Puget Sound DPS (Threatened, Federal Register, 11 May 2007). Coho salmon of the Puget Sound-Strait of Georgia ESU are also present in the watershed and are currently considered a Species of Concern (Federal Register, 15 April 2004), indicating that they are under less active consideration for formal listing. An ESU of Pacific salmon is considered to be a DPS and thus a "species" under the Endangered Species Act. Although critical habitat has been designated for Puget Sound Chinook salmon and Coastal-Puget Sound bull trout, Lake Sammamish was excluded and does not contain designated critical habitat for either of these fish species. Critical habitat was recently proposed for Puget Sound steelhead trout, but the proposed listing also excludes Lake Sammamish (Federal Register, 14 January 2013). All of these species may be present in the action area during a portion of their life cycle.

Lake Sammamish kokanee were recently considered for listing, but were not listed (Federal Register, 4 October 2011); therefore, they will not be addressed further in this document.

Table 2. Listed species that may use the project area (NMFS/USFWS as of July 11, 2013).

Species	Federal Status	ESU/DPS/Region	Critical Habitat in Action Area
Chinook salmon *Oncorhynchus tshawytscha*	Threatened, August 1999[1] Reaffirmed, June 2005[2]	Puget Sound DPS	No[6]
Bull trout *Salvelinus confluentus*	Threatened, November 1999[3]	Coastal-Puget Sound DPS	No[7]
Steelhead *Oncorhynchus mykiss*	Threatened, May 2007[4]	Puget Sound DPS	No[8]
Coho salmon *Oncorhynchus kisutch*	Species of Concern, April 2004[5]	Puget Sound-Strait of Georgia ESU	NA

[1] Federal Register, 2 August 1999.
[2] Federal Register, 28 June 2005.
[3] Federal Register, 1 November 1999.
[4] Federal Register, 11 May 2007.
[5] Federal Register, 15 April 2004.
[6] Federal Register, 2 September 2005.
[7] Federal Register, 26 September 2005.
[8] Federal Register, 14 January 2013.

3. DESCRIPTION OF PROJECT AREA AND BASELINE CONDITIONS

The baseline conditions that Chinook and coho salmon, bull trout, and steelhead presently face in the Lake Washington/Lake Sammamish watershed are described in the *Salmon and Steelhead Habitat Limiting Factors Report for WRIA 8 (Kerwin 2001)* and the *Lake Washington/ Cedar/Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan (WRIA 8 2005)*. This discussion describes the relevant site-specific baseline conditions within the action area, in particular focusing on those items that are different in condition than the watershed as a whole. The conditions for Lake Sammamish and the action area are summarized in Table 1 below.

Sarah Spilseth Sandstrom, Fisheries Biologist of The Watershed Company, conducted a site visit on January 18, 2013. The following description of existing conditions is based upon observations from this site visit, and from materials supplied by the applicant. The elevation of Lake Sammamish at the USGS gauge near Redmond was 30.88 feet (NAVD88) at the time of the site visit.

Existing site conditions are characterized by an open, gradually sloping sandy beach, with spike rush and herbaceous ground cover. A wetland delineation report identified three wetlands around the project area, one of which falls partially within the proposed project area (The Watershed Company 2009). The proposed work area is surrounded by active recreational uses, as well as some passive use areas. Existing recreational use facilities include a concession stand, picnic tables, restrooms, and concrete pathways. The existing swim area is marked by swim buoys, and covers an area approximately 3-4 times the in-water area of proposed work. The park sees significant use by swimmers and beach-goers during the summer months, and the lake gets heavy powerboat and jet-ski traffic. The park provides habitat for a variety of waterfowl as well as great blue herons, raptors, and other birds.

Aquatic vegetation within the proposed project area includes water milfoil (*Myriophyllum* sp.) and *Elodia* sp. Eurasian water milfoil is mapped to occur at Lake Sammamish State Park in King County's Aquatic Plant Survey Maps (electronic reference). According to this report, King County METRO treated areas of Lake Sammamish around the State Park using aquatic weed harvesters in the 1980s. The shoreline substrate was characterized by a mix of sand and gravel. A dive survey conducted by K. Johnston on June 15, 2012 within the project area noted that the bottom composition is sand, organic sediment and clay (KJ Design 2012). The average slope of the lake bottom is approximately 10 percent.

Figure 3. View of project area looking south.

Figure 4. View of project area looking north.

Figure 5. View of southwest side of project area looking east from water's edge.

4. Species Information and Site Use

General and site-specific information about each species is presented below. General and lake-specific life history information related to temperature, diet, and migration is also contained in the Federal Register listings cited in Table 1.

4.1 Chinook Salmon

One demographically independent population of Chinook salmon is recognized in the Sammamish River watershed (NMFS 2006). A portion of this population spawns in tributaries of the Sammamish River (e.g., North Creek, Bear Creek, and Little Bear Creek), and another portion migrates through Lake Sammamish en-route to the Issaquah Creek Hatchery or spawning grounds in lower Issaquah Creek. Individual Chinook salmon have also been observed in Laughing Jacobs Creek (approximately one half mile east of the project area) and Lewis Creek (approximately 1.5 miles northwest of the project) (WRIA 8 electronic reference). Natural spawning predominantly takes place in Issaquah Creek and its East Fork. Adult Chinook salmon begin migrating into freshwater in August, and most spawning in the Sammamish River watershed occurs from late September through October (Meyers et al 1998; WDFW 2002).

Progeny of naturally spawning Chinook salmon from Issaquah Creek may enter the lake as fry in early January. Parr are released from the Issaquah Hatchery in May and early June, and they enter Lake Sammamish shortly thereafter. The majority of the juvenile Chinook salmon in the Lake Washington watershed migrate from the system by mid-summer, and the remaining juveniles migrate out of the watershed by September.

The early-entering fry are closely associated with the shoreline, while parr entering in May are less closely associated with shallow-water shoreline habitats (Tabor et al. 2004, 2006). Densities of juvenile Chinook salmon captured in the southern Lake Sammamish lakeshore and small creek deltas from March to June were among the highest of 13 sites sampled in Lake Washington and Lake Sammamish in 2002 (average densities ranging from 0.1 to 0.6 fish per square meter) (Tabor et al. 2004). Similarly, bimonthly snorkel surveys in the spring of 2014 have confirmed high densities of Chinook fry using the swim beach at Lake Sammamish State Park (H. Berge, personal communication with Sarah Sandstrom, March 6, 2014).

Summer surface temperatures in Lake Sammamish exceed the thermal preferences of most salmonids, including Chinook salmon. Thermal stratification in Lake Sammamish usually begins in late May and extends until mid-November. Thermal stratification results in elevated epilimnetic (upper layer) temperatures, coinciding with decreasing dissolved oxygen levels throughout the hypolimnetic (lower layer) zone (Kerwin 2001). The reduced oxygen in the hypolimnion combined with relatively warm temperatures in the epilimnion serves to constrict the suitable habitat area available to salmonids during the summer. Thus, neither juveniles nor adults are expected in nearshore waters from June through September.

In conclusion, juvenile Chinook salmon are likely to migrate through or rear in the action area from January through June, and adult Chinook salmon may be in the action area from late August to November. However, neither juvenile nor adult Chinook salmon would not be expected in the vicinity of the project area in either the summer or winter work windows.

4.2 Bull Trout

Native char (either bull trout or Dolly Varden) are rare in Lake Sammamish or its tributaries (U.S. Federal Register, 1 November 1999). No bull trout were observed during a one-year creel survey conducted on Lake Sammamish, and only a single bull trout was recorded during a two-year creel survey on Lake Washington (Pfeiffer and Bradbury 1992). Two bull trout, possibly anadromous fish that had strayed, were observed in the headwaters of Issaquah Creek in 1993 (WDFW 2004). Bull trout are known to exhibit "pioneering" behavior, spawning in areas other than their native stream. Bear Creek, a tributary to the Sammamish River downstream from Lake Sammamish, is listed as "potential" bull trout habitat by the USFWS (Kerwin 2001). However, there is no known resident subpopulation of bull trout in Lake Sammamish or its tributaries.

Due to their narrow thermal-tolerance range, it is likely that any adfluvial or anadromous bull trout in Lake Sammamish would be confined to the hypolimnion from mid- to late-May through mid-October, with some annual variation depending on the weather patterns. Given the anoxic conditions typically present throughout the hypolimnion in Lake Sammamish during this period, benthic foraging would be restricted (Kerwin 2001). Any spawners would begin upstream migrations from April through July, and immature fish would be likely to migrate upstream with the spawners to avoid the high temperatures in Lake Sammamish. In summary, bull trout presence in the action area is highly unlikely anytime during the year, and in particular, bull trout would not be expected to occur in the project vicinity from late spring to fall.

4.3 Steelhead

Steelhead historically occurred throughout the Lake Washington basin, and likely spawned in Lake Sammamish tributaries, primarily Issaquah Creek. The steelhead spawning period throughout the basin extends from mid-December through early June. Two life forms of *O. mykiss* are commonly distinguished based on life history characteristics: anadromous (steelhead) and resident (rainbow trout). Both anadromous steelhead and resident rainbow trout are present in the Lake Washington watershed. Juveniles generally migrate seaward as smolts in March to early June after two years of stream residence, although duration of freshwater rearing can range from 1 to 7 years before juveniles grow large enough (>170 mm) to undergo smoltification. Because steelhead are typically larger and more mobile compared to juvenile Chinook salmon when they enter the lake, they are not dependent on shallow, nearshore habitats for predator refugia.

Within the Lake Washington basin, steelhead are characterized as "winter" run, beginning river entry in December, and spawning from February through May (Kerwin 2001)

Lake Washington winter steelhead are currently present in Lake Sammamish in low numbers and are identified by WDFW (2002) as a discrete stock within the Puget Sound steelhead DPS. They are characterized as a native stock with wild production, and their stock status was adjusted downward from "depressed" to "critical" in 2002 due to chronically low escapements and severe short-term declines in escapement in 2000 and 2001. As of 2004, these escapement numbers had not increased (WDFW 2002), and total escapement estimates for the Lake Washington basin between 2000 and 2004 ranged between 20 and 48 fish. As such, very few of these fish are likely to pass through Lake Sammamish to spawn in its tributaries.

Summer surface temperatures in Lake Sammamish greatly exceed the thermal preferences of most salmonids, including steelhead. Thermal stratification in Lake Sammamish generally extends from late May to mid-November, elevating water temperatures in the epilimnion and decreasing dissolved oxygen levels in the hypolimnion, thereby vertically constricting the zone of suitable habitat available to salmonids in the summer. Thus, neither juvenile nor adult steelhead are expected to occupy nearshore waters from June through September.

In conclusion, juvenile steelhead may be migrating through or rearing in the action area throughout the year, but would not be expected in the nearshore area where construction would occur after summer lake stratification had occurred. Adult steelhead could occur in the vicinity of the action area during the winter work window.

4.4 Coho Salmon

One stock of coho salmon, the Lake Washington/Sammamish Tributaries coho, is currently recognized in the Sammamish River watershed (WDFW 2002). As adults, these coho salmon predominantly migrate through Lake Sammamish to reach the Issaquah hatchery, but also utilize other suitable tributaries for spawning, including Lewis Creek, Laughing Jacobs Creek, and Tibbetts Creek (http://dnr.metrokc.gov/WRIAS/8/fish-maps/coho/xls/data.xls, Kerwin 2001, WDFW 2004). The Lake Washington/Sammamish Tributaries coho is characterized as a mixed stock with composite production. Due to a pattern of chronically low escapements that have persisted since the 1980s, the stock was rated as depressed in 1992 and again in 2002 (WDFW 2002).

Adults begin migrating into fresh water in August, and most spawning activity takes place from late October through December (WDF et al. 1993). Coho salmon typically spend one year rearing in freshwater prior to outmigration. Beak Consultants (1998) reported that the peak smolt migration from the Sammamish River occurred from April through mid-May coinciding with the Issaquah hatchery release. Juvenile coho may avoid the high temperatures in the Lake Sammamish littoral zone during the summer, and are likely to migrate from the lake before temperatures exceed 17°C.

In conclusion, juvenile coho may be migrating through or rearing in the action area from mid-March through June. Adult coho may be in the action area from August to October. Neither juvenile nor adult coho salmon would be expected to occur in the project vicinity during the summer or winter work windows.

5. SPECIES IMPACTS

The proposed project could potentially affect Chinook salmon, bull trout, steelhead, and coho salmon in generally similar manners, except as the most closely associated with shallow, nearshore habitats, lake-rearing Chinook salmon fry are likely to experience the greatest effects of the proposed project. Effects may often occur through impacts to habitat, prey base, or physiological effects to individuals. Unless otherwise noted, there will be no distinction between listed salmonids in the following discussion.

5.1 Direct Effects on Salmonids

A. Water Quality

Uncured concrete can harm aquatic invertebrates and fish by increasing pH of adjacent waters. The project will avoid potential impacts from exposure to uncured concrete by using pre-cast concrete panels to construct the concrete ramp.

Excavation and fill, both in-water and along the shore, have the potential to generate turbidity. To minimize construction impacts associated with increased turbidity and the potential to release toxic chemicals during construction, timing restrictions and erosion and turbidity minimization measures will be implemented, as described in Section 1.4.

Although turbidity can have positive effects on salmon bioenergetics and predator avoidance (Gregory 1994, Mazur and Beauchamp 2003, Mazur and Beauchamp 2006), turbidity is generally considered detrimental because of potential lethal and sub-lethal effects of abrasive suspended sediments (Newcombe and MacDonald 1991).

Considering that the turbidity produced by construction activity would be localized and temporary, the most probable impact on juvenile salmonids would be a behavior modification (avoidance response) rather than injury or reduction in growth potential. The most effective strategy for minimizing or eliminating potential construction-related impacts would be to restrict construction to periods when the presence of Chinook salmon, bull trout, steelhead, coho salmon, and kokanee is improbable. The combined fish-protection prohibitions on in-water construction by NOAA Fisheries, USFWS and WDFW result in an allowable in-water construction window of 16 July through 31 July and 16 November through 31 December. This window is adequate to minimize the probability that Chinook salmon, bull trout, coho salmon, or steelhead would be in the action area during construction. Thus, temporary water-quality impacts associated with the proposed project are unlikely to result in the take of a listed or candidate fish species.

B. Shallow water habitat

Shallow water habitat can provide refuge and foraging habitat for juvenile salmonids and forage fish. Field observations found that during the period from mid-February to mid-April, juvenile Chinook salmon rear along shorelines less than 1.6 ft depth. Juvenile Chinook salmon use progressively deeper water habitats in late-April to May (1.6-6.6 ft) and into June (3.3-13.2 ft) (Tabor et al. 2006). In laboratory experiments, Chinook salmon fry and pre-smolts preferred flat (<5% slope), sandy bottoms, and avoided steeply sloping substrates (Sergeant and Beauchamp 2006). In field observations, juvenile Chinook salmon were observed over a sand/gravel substrate with slopes <20%, and they avoided silty substrates (Tabor et al. 2004, Tabor and Piaskowski 2002). The preferential use of shallow, gradually sloping substrates is likely a reflection of predator avoidance behavior, since large predators are less likely to be found in such habitats. For example, one predator, smallmouth bass, is rarely found along low gradient shorelines without overwater structures or shoreline armoring (Celedonia et al. 2008a).

The proposed project will reduce the shoreline gradient within the area 30 feet from the OHWM from the existing 10 percent slope, to a proposed 5 percent slope, potentially increasing the area of habitat that is preferred by juvenile Chinook salmon. Based on the field preferences noted in Tabor et al. 2004, the shift in substrate from a sand/silt/clay bottom to a sand/gravel bottom would also be expected to expand the area of preferred shallow-water substrate. In summary, by increasing the area of shallow-water habitat, the project is expected to have a beneficial effect on juvenile Chinook salmon.

C. Benthic and Epibenthic Prey

Benthic and epibenthic invertebrates compose a portion of the prey base of juvenile salmonids. In Lake Washington, epibenthic prey (primarily chironomid pupae) accounts for much of juvenile Chinook salmon consumption and growth in the early rearing months (Feb-May), and Chinook salmon diets shift to zooplankton (*Daphnia*) later in the period of lake residency (May-June) (Koehler et al. 2006). Koehler et al. (2006) concluded that because juvenile Chinook salmon in Lake Washington forage near their maximum ration, prey sources are not expected to be a limiting factor there. Given the similar conditions and geography in Lake Sammamish, conditions are expected to be similar.

Information specific to the impacts of in-water sediment removal on benthic macro-invertebrate communities in lakes is somewhat limited; however, many studies have documented benthic impacts in streams, rivers, and estuaries. The effects of sediment removal on benthic invertebrate communities can range from negligible to substantial, and the period of benthic recolonization ranges from less than 30 days (Harvey and Lisle 1998, McCabe 1996), up to 2-3 years in a case where the entire lake bottom was dredged (Carline and Brynildson 1977 in Peterson 1981). In a regional example, McCabe et al. (1996) conducted pre- and post- project benthic invertebrate monitoring of a 200-foot by 800-foot dredge project for the Wahkiakum Ferry in the Columbia River (River Mile 43.2). No significant effects of dredging on abundance or diversity of benthic invertebrates were observed, even in sampling one month after the dredging activity.

In Zone 2, where in-water excavation will be conducted, benthic and epibenthic invertebrates will be removed with the excavated sediment. In Zone 1, where one foot of granolithic aggregate will be deposited, the added material may smother a portion of the benthic and epibenthic invertebrate community. In both Zone 1 and 2, depletion of benthic invertebrates is expected to be temporary, with recruitment expected from adjacent benthic communities and from drifting organisms from lake currents and from Issaquah Creek. Benthic productivity will be permanently eliminated in the in-water area underlying the ADA access ramp.

Sediment removal and placement may cause local reduction or alteration in the benthic or epibenthic prey community at the site during the first outmigration season following construction. However, recovery of the benthic community is expected by the following year, except under the access ramp. Because benthic and epibenthic prey is not expected to be a limiting factor in Lake Sammamish, the net effect on juvenile salmonids from changes in benthic and epibenthic communities resulting from the proposed project is expected to be insignificant.

D. Riparian Vegetation

In Lakes Washington and Sammamish, during the daytime from late-February to late-April, juvenile Chinook salmon are found within 33 feet of shore (Tabor and Piaskowski 2002), and they prefer shallow water habitats with overhanging vegetation (approximately 4.5:1 ratio of fish using overhanging vegetation: fish away from overhanging vegetation) (Tabor et al. 2004, 2006). Riparian vegetation likely provides juvenile Chinook salmon with refuge from predators, shading, and a source of insect prey. By May, juvenile Chinook are rarely associated with overhanging vegetation or woody debris, presumably because as the salmon grow larger, they move into deeper water habitats and away from shoreline vegetation (Tabor et al. 2006).

Existing overhanging vegetation is presently lacking within the project area. The removal of existing sparse, emergent vegetation from 0.49 acres of lake—fringe wetland will have limited effects on potential water quality improvement, shoreline erosion protection, and habitat. The vegetation and structural composition of the wetland is simple with limited detrital input potential, and existing wetland functions are low.

The proposed creation and enhancement of 0.29 and 0.10 acres, respectively, of lake-fringe wetland will include a diverse mix of emergent plantings, densely planted willows and other shrubs, as well as large deciduous and coniferous trees and large woody debris extending into the lake. In summary, the proposed project is expected to improve riparian vegetation and lake-fringe wetland habitats, resulting in a net benefit to lake-rearing salmonid fry.

E. Aquatic Vegetation

The littoral area off of Lake Sammamish State Park has been identified as an area with dense Eurasian water milfoil (King County, electronic resource). Eurasian water milfoil is a Class A noxious weed that locally degrades water quality by reducing dissolved oxygen levels below minimum requirements for salmonids (Kerwin 2001). Tabor et al. (2006) observed that in areas of dense milfoil occurrence, juvenile salmon occur in greater depths, and they occur over the surface of the milfoil. The implications of this behavior on bioenergetics and predation have not been further investigated. Eurasian water milfoil will be manually removed on an annual basis at the site.

By removing milfoil at the site, the proposed project will maintain or improve water quality conditions in Lake Sammamish for juvenile salmonids.

F. Overwater structures

The applicant proposes to install floating breakwaters around the perimeter of the swim area using logs anchored with chain to concrete blocks. Juvenile Chinook salmon in Lake Union and the Lake Washington Ship Canal tend to avoid the area underneath overwater structures (Celedonia 2011). A hydroacoustic tagging study found that Chinook salmon smolts frequently occur within approximately 66 feet of the edges of overwater structures in waters greater than 18 feet (Celedonia et al. 2011). Researchers hypothesized that juvenile Chinook salmon may avoid areas under overwater structures because of lower light levels beneath the structure, the degree of contrast at the light-dark edge, and width and height of the structure (Celedonia et al. 2008). Celedonia et al. (2011) suggested that the extensive use of the edges of overwater structures may increase the predation risk on juvenile Chinook salmon from smallmouth bass (*Micropterus dolomieu*), which are commonly associated with in-water and overwater structures (Fresh et al. 2003). In particular, smallmouth bass are most abundant around large structures with a large number of pilings (Fresh et al. 2003).

The proposed structures will create a narrow band of shading, which is not expected to substantially affect migratory behavior of juvenile salmonids. The concrete blocks used to anchor the logs have the potential to affect the distribution of small mouth bass; however, the in-water portion of the structures will be small. Even if smallmouth bass redistribute in association with anchor placement, the net effect on salmonid predation in Lake Sammamish would not change.

G. Direct Mortality

The potential to kill Chinook or coho salmon, bull trout or steelhead exists as long as they are present in the action area during in-water work. In order to minimize the impacts of construction activity on these salmonids, the above timing restrictions (no in-water construction at a minimum from 1 January through 15 July or 1 August through 15 November) would be followed. Fish removal would also occur prior to in-water work. These restrictions are adequate to minimize the probability that juvenile or adult salmonids would be in the action area during construction activities.

5.2 Indirect Effects on Salmonids

Indirect effects include those impacts that occur later in time and may affect habitat quality and availability and foraging conditions for juvenile salmonids and salmonid prey at the shoreline.

A. Sediment Transport

By altering the substrate composition within the project area, the project is expected to reduce the mobilization of silts in the project vicinity. As noted in Section 5.1.A, turbidity caused by silt mobilization results in ecological and physiological tradeoffs for juvenile salmonids.

The change in surface sediment composition will also likely result in a change in sediment transport processes. If wave activity is sufficient at the site to mobilize the granolithic material within Zone 2, there is the potential that the quarry spall and permeable ballast would become exposed. A steepened edge could also form at the transition between reinforced large substrate to the granolithic material. If this occurred, it would minimize the habitat gain created by regrading the littoral area, but it would be unlikely to result in a long-term loss in habitat functions compared to the existing conditions. Overall, long-term effects of the project on sediment transport are not expected to have significant effects on salmonids.

B. Stormwater Drainage

The proposed project will install a series of subsurface drains under the active beach area. The proposed drainage system will direct water more rapidly from the beach area to the Lake. The stormwater drainage will reduce natural water quality filtration capacity within the beach area. However, because the proposed beach is located amidst a large park area and over 400 feet from the nearest pollutant-generating impervious surface (parking area), it is not anticipated that the area requires significant filtration to maintain water quality conditions.

Additionally, the project includes creation and enhancement of 9,121 and 82,239 square feet, respectively, of depressional wetland. The created and enhanced wetland areas will improve natural water quality filtration capacity within the park area. Therefore, the potential effects of stormwater drainage on water quality are expected to be insignificant.

C. Flood Impacts

The proposed project will result in a net increase of live storage flood capacity (between 29.6 and 37 feet NAVD88) (Northwest Hydraulic Consultants 2014). There will be a net increase in fill volume below the lake outlet elevation, but this will not have a perceptible impact on flood conditions within Lake Sammamish (Northwest Hydraulic Consultants 2012). Therefore the effects of the proposed project on flood levels and conveyance are insignificant.

5.3 Collective Effects

Overall, this project would increase the area of shallow water habitat and improve riparian vegetation. Effects of the project on water quality are insignificant and discountable because of project timing and impact minimization measures that will be implemented. Similarly, the effect of the project on benthic and epibenthic prey sources and behavioral and predatory effects related to overwater structures are insignificant. Indirect effects of the project are also insignificant.

Thus, with the implementation of the proposed standard conservation measures, the proposed project:

- may affect, not likely to adversely affect, Puget Sound Chinook salmon.
- may affect, not likely to adversely affect, Coastal-Puget Sound bull trout.
- may affect, not likely to adversely affect, Puget Sound steelhead.
- would not jeopardize Puget Sound-Strait of Georgia coho salmon.

6. CRITICAL HABITAT

6.1 Chinook Salmon

A final critical habitat designation was formalized for Puget Sound Chinook salmon on 12 August 2005 (Federal Register), specifically including Unit 10, the Lake Washington sub-basin. However, Lake Sammamish and its corresponding watersheds were excluded from this final critical habitat designation. Accordingly, potential effects to the critical habitat for Chinook salmon will not be discussed in this section.

6.2 Bull Trout

Critical habitat was designated for Coastal Puget Sound bull trout on 26 September 2005 (Federal Register), specifically including the Lake Washington Critical Habitat Sub-Unit. However, Lake Sammamish was excluded from this critical habitat designation. Accordingly, potential effects to the critical habitat for bull trout will not be discussed in this section.

6.3 Steelhead

Critical habitat was recently proposed for the Puget Sound steelhead, but the designation has not been finalized (Federal Register, 14 January 2013). The proposed designation excludes the Lake Sammamish watershed. Accordingly, potential effects to the critical habitat for steelhead will not be discussed in this section.

6.4 Coho Salmon

Critical habitat has not been proposed for Puget Sound-Strait of Georgia coho salmon.

7. ESSENTIAL FISH HABITAT

The proposed project area is located within the Lake Washington Hydrologic Unit (USGS Code 17110012), which has Essential Fish Habitat (EFH) designations for Chinook salmon and coho salmon. EFH for the Pacific coast salmon fishery means those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers, and longstanding, naturally-impassable barriers (i.e. natural waterfalls in existence for several hundred years).

Discussions regarding EFH related to Pacific salmon in Lake Sammamish are indirectly included in this Biological Evaluation (BE). The information below identifies where these discussions are located within the BE and concludes with a determination of effect. In accordance with the comments from the Corps and prior concurrence letters from NOAA Fisheries, this discussion should be considered sufficient to make this determination.

Description of the Project / Proposed Activity: The project description and location are described within the first section of the BE. This description gives a thorough explanation of the proposed substrate replacement, wetland creation, beach drainage, and safety/access improvements.

Potential Adverse Effects of the Proposed Project: Potential impacts to Pacific salmon EFH, as described in Sections 5 and 6 of this BE, include a temporary, localized increase in turbidity; an increase in shallow water habitat area; a temporary disturbance and minor long-term reduction in benthic and epibenthic invertebrate prey species; a minor increase in overwater coverage; an increase in overhanging shoreline vegetation and a reduction in non-native invasive aquatic vegetation, and the potential to kill Chinook or coho salmon, if they are present in the action area during project construction. Potential indirect impacts to salmonids from sediment transport, flood impacts, and stormwater water quality are insignificant. These effects were found to be either insignificant or discountable.

Positive impacts for Pacific salmon include an expanded shallow-water gradual gradient and increased cover and diversity of native vegetation along the shoreline.

EFH Conservation Measures: The following impact minimization measures are being incorporated into the proposed project in order to reduce the collective impact.

1) Wetland Impacts: The proposed project avoids wetland areas, where feasible, by locating project activities at an existing swimming beach that lacks significant shoreline vegetation. The project mitigates for impacts to a small, degraded lake-fringe wetland area through mitigation sequencing to avoid, minimize, and compensate for unavoidable impacts.

2) Monitoring: The applicant agrees to monitor planted vegetation and log structures twice a year for 3 years following project implementation.

3) Timing Restriction: For the protection of aquatic life, all in-water activities would take place during the approved work windows for in-water construction. No in-water work would occur from 1 January through 15 July nor from 1 August to 15 November, per the combined fish protection policies of NOAA Fisheries and USFWS in Lake Sammamish.

4) Water Quality: The following minimization measures will be implemented to limit project effects from turbidity.

   a. A sediment curtain will be installed and maintained around the work area for the duration of in-water work;

   b. The contractor will stockpile excavated material at an upland site pending off-site disposal;

   c. All sediment will be properly disposed of either on land or at an approved dredge disposal site in such a manner that it cannot enter into the waterway except at the approved disposal site or cause water quality degradation (Section 13, Rivers and Harbors Act).

   d. All milfoil removed will be properly disposed of at an upland site, where it will not be able to reenter a waterbody.

   e. The Contractor will develop and implement a Temporary Erosion and Sediment Control (TESC) plan.

Conclusion: When all of the proposed project's potential impacts on Pacific salmon EFH are considered collectively, the proposed project may affect, but is not likely to adversely effect, Pacific Chinook salmon or coho salmon EFH.

8. CUMULATIVE IMPACTS

Cumulative impacts were assessed through the review of site plans, an aerial photo, and background information from various sources. The proposed project implements one element of the Lake Sammamish State Park Redevelopment and Restoration Concept Plan (Washington State Parks 2007).

In addition to the proposed project, future improvements identified in the Plan for Sunset Beach include installation of two Y-shaped public piers. The southern third of the existing swim beach is planned for restoration to a natural riparian area. Any in-water work would require a permit from the Corps of Engineers and additional consultation under the Endangered Species Act.

Upland components to the Park Plan for the Sunset Beach area include irrigation improvements for the turf grass, new picnic shelters, new playground equipment, and replacement of the existing boathouse and concession facility with a new building with a green roof. In addition to park improvements at Sunset Beach, the Plan highlights proposed infrastructure and facility improvements throughout the park area.

The Plan highlights how natural features will be protected in each of the park areas, and any park improvements will require permitting from applicable local, State, and Federal agencies. Therefore, cumulative impacts on sensitive fish and wildlife species and their habitats are not considered significant.

9. DETERMINATION OF EFFECT

Determination of effect for all species and their respective assessment areas are listed in Table 3. The proposed project may affect, but is not likely to adversely affect, Puget Sound Chinook salmon, Puget Sound steelhead, and Coastal-Puget Sound bull trout, and the proposed project is not likely to jeopardize Puget Sound-Strait of Georgia coho salmon.

The collective impact of the proposed project may affect, but is not likely to adversely affect, Pacific salmon EFH.

Table 3. Determination of Effect.

Species	Overall Project Effect	Effect on Critical Habitat	Effect on EFH
Puget Sound ESU Chinook Salmon	May affect, not likely to adversely affect	N/A	May affect, not likely to adversely affect
Coastal-Puget Sound DPS Bull Trout	May affect, not likely to adversely affect	N/A	N/A
Puget Sound Steelhead	May affect, not likely to adversely affect	N/A	N/A
Puget Sound-Strait of Georgia Coho Salmon	Not likely to jeopardize	N/A	May affect, not likely to adversely affect

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APPENDIX A

Project Plans