Analysis of Effects to Puget Sound Steelhead (*Oncorhynchus mykiss*) Resulting from Transport of Dredged Material and Disposal at Puget Sound Dredged Disposal Analysis (PSDDA) Open-water Disposal Sites

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1. Introduction.

This analysis is intended to supplement the 2005 biological evaluation (BE) written to analyze effects of the transport of dredged material to open-water disposal sites in Puget Sound, and subsequent disposal at those sites (as described in the Puget Sound Dredged Disposal Analysis (PSDDA)), on Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), Hood Canal summer-run chum salmon (*O. keta*), Steller's sea lion (*Eumetopias jubatus*), and several other species listed under the Endangered Species Act (ESA). Puget Sound steelhead had not been proposed at the time the BE was prepared, and was not addressed. This supplement addresses effects of the use of PSDDA sites on Puget Sound steelhead.

2. Steelhead Biology.

The present distribution of steelhead extends from Kamchatka in Asia, east to Alaska, and extending south along the Pacific Coast to the U.S./Mexico border (Busby et al., 1996). Steelhead that are anadromous can spend up to seven years in freshwater prior to smoltification and then three years in salt water prior to first spawning (though the majority of Puget Sound steelhead remain in the river for two years, and in the ocean for two years (Puget Sound Steelhead Biological Review Team, 2005)). Steelhead are iteroparous (spawn more than once) whereas other Pacific salmon (Chinook, for example) are semelparous (spawn once and die).

Steelhead can be divided into two basic reproductive ecotypes, based on the state of sexual maturity at the time of river entry and duration of spawning migration (Burgner et al., 1992). The summer "stream maturing" type enters fresh water in a sexually immature state between May and October and requires several months to mature and spawn. The winter or "ocean maturing" type enters fresh water in a mature state and ready to spawn between November and April.

The inshore migration pattern of steelhead in Puget Sound is not well understood; it is generally thought that steelhead smolts move quickly offshore (Hartt and Dell 1986—*fide* Puget Sound Steelhead Biological Review Team, 2005). Both Welch (2004) and Goetz (2007) confirm this rapid migration to the ocean once the smolts enter marine waters. Both Welch and Goetz found steelhead migration covering as much as 25 km/day. Welch found that wild steelhead enter the ocean in about 2.3 days, while Goetz's data indicate residence times of 7 to 26 days, with a rough average of about 15 days. However, as Welch points out, older kelts (3 yrs of age) may tend to linger (Ruggerone, et al, 1990, *fide* Welch, 2004), and demonstrate a "milling" pattern of movement. One, perhaps significant, difference between Welch's and Goetz' studies is a fundamental difference between the study areas: Queen Charlotte Strait is not a true estuary,

and is essentially a fast-moving marine river. Puget Sound (including Hood Canal) is an inland estuary with relatively slow-moving water more influenced by tides than currents. Thus it may be in part at least, that the fish in Welch's study are aided in their migration by currents. With regard to whether juvenile steelhead stay close to the nearshore or move offshore when moving through Puget Sound or Queen Charlotte Strait (Goetz, 2007; Welch, 2004), hard data is lacking but studies that are underway suggest to Goetz that juvenile steelhead use both inshore and offshore areas (Goetz, 2007).

3. Effects Analysis.

The lack of data indicating juvenile steelhead behavior while in Puget Sound makes it somewhat problematic to assess impacts of transport and dredged material disposal activities. At the present time, it makes sense to use juvenile Chinook salmon behavior as a surrogate for juvenile steelhead. This seems to be a favorable comparison for at least two reasons: 1) juvenile Chinook salmon are smaller than juvenile steelhead when migrating through Puget Sound, potentially making them more vulnerable to effects, and 2) juvenile Chinook salmon demonstrate slightly longer residence times in Puget Sound than do juvenile steelhead, again making them more likely to encounter suspended dredged material following disposal operations. The possible exception to this is that juvenile Chinook salmon are known to remain inshore during their outward migration, and we don't know to what extent juvenile steelhead remain inshore. The following discussion is excerpted from the 2005 BE for PSDDA:

> "Potential effects to Chinook salmon due to continued operations of the PSDDA dispersive and non-dispersive, unconfined, open-water disposal sites are insignificant. This determination is supported by numerous factors.
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> First, Chinook salmon may occur in areas of disposal activities however, their presence would be minimal and coincidental because there are no features at the sites that would cause Chinook salmon to congregate.
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> Second, should a Chinook salmon coincidentally be present in the disposal area during a discharge event, it could experience a short period of non-lethal discomfort due to high suspended sediments in the water column. The period during which sediments in the water column are elevated is relatively short (approximately 10 minutes in midwater areas studied by Truitt [1986a, 1986b]) and localized. Fish would migrate from the area affected by the discharge and recover relatively quickly from the discomfort.

Third, the potential for toxic effects of contaminants released from discharged sediments is minimal. Sediments are determined to be suitable for discharge through a series of physical, chemical and biological testing procedures that have been subject to thorough review by the regulating agencies and the public.

Fourth, adult and sub-adult Chinook salmon primarily feed on pelagic organisms and do not typically feed at depths where benthic habitats are altered by dredged material disposal. Thus, foraging habitat for this species would not be directly affected.

Fifth, adult and sub-adult Chinook salmon typically feed on pelagic organisms, where their primary foods are forage fish (herring and sandlance). Herring and sandlance are also pelagic, and their forage base would not be significantly affected by disposal activities. Sandlance can be demersal at times because they have no swim bladder, and sometimes rest in or on the bottom, but typically in less than 100 meters (328 feet) of water. Spawning areas for both species are in intertidal and shallow subtidal areas which are unaffected by disposal activities. Thus, continued disposal activities would not affect the prey base of adult and sub-adult Chinook salmon.

Sixth, juvenile Chinook salmon migrate from rivers to the Sound in the spring. Dredging activities and associated disposal activities are regulated to avoid outmigrating juveniles. During the early phases of estuarine/Puget Sound residence, juveniles reside in nearshore waters (typically no deeper than 30 to 70 meters [98 to 230 feet]) feeding on epibenthic and pelagic organisms, and would be unaffected by disposal activities. In addition, most juveniles would continue to occupy the nearshore environment during their migration to the Pacific Ocean, although they could (as noted with adult/sub-adult Chinook salmon) coincidentally occur in the dredged disposal areas. Effects of elevated water column suspended sediments would be short in duration and localized (as noted above), and are not expected to be lethal or significantly affect migrating juvenile salmon."

4. Marine Habitat.

NMFS has not designated critical habitat for Puget Sound steelhead. The following are habitat features in Puget Sound identified by NMFS as important for steelhead (FR Vol. 70, No. 64, pp. 17223-17227), April 5, 2005:

"Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and

maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation."

The continued use of PSDDA disposal sites and transport of dredged material to these sites will have discountable effects on these habitat features.

5. Bioaccumulation Concerns.

The Corps prepared a white paper analyzing the potential effects of bioaccumulation of chemicals in Puget Sound Chinook salmon and Southern resident killer whales (USACE, 2006). Again, we believe this analysis also applies to Puget Sound steelhead, and we believe the potential effects of bioaccumulation on Puget Sound steelhead are discountable.

6. Determination of Effect.

In conclusion, and as stated in the 2005 BE for PSDDA for Chinook salmon, due to the wide distribution of these species within the action area; the relatively small area of pelagic habitat affected by disposal events; the low probability of the species coming in contact with the areas affected by a disposal activity; the infrequent and short-lived nature of disposal events; and the ability of these mobile species to quickly leave the affected area, the overall effects of disposal activities on Puget Sound steelhead would be insignificant and discountable. **The Corps has determined that the proposed action is not likely to adversely affect Puget Sound steelhead.**

7. References.

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