Technical Memorandum

Date	Thursday, February 18, 2021
Project:	Chehalis River Basin Flood Damage Reduction Project
To:	Chehalis Basin Flood Control Zone District
From:	Brian McIlraith and Jacob Venard, HDR
Subject:	Task 2: Short Term Aquatic Species Benefits

1.0 Introduction

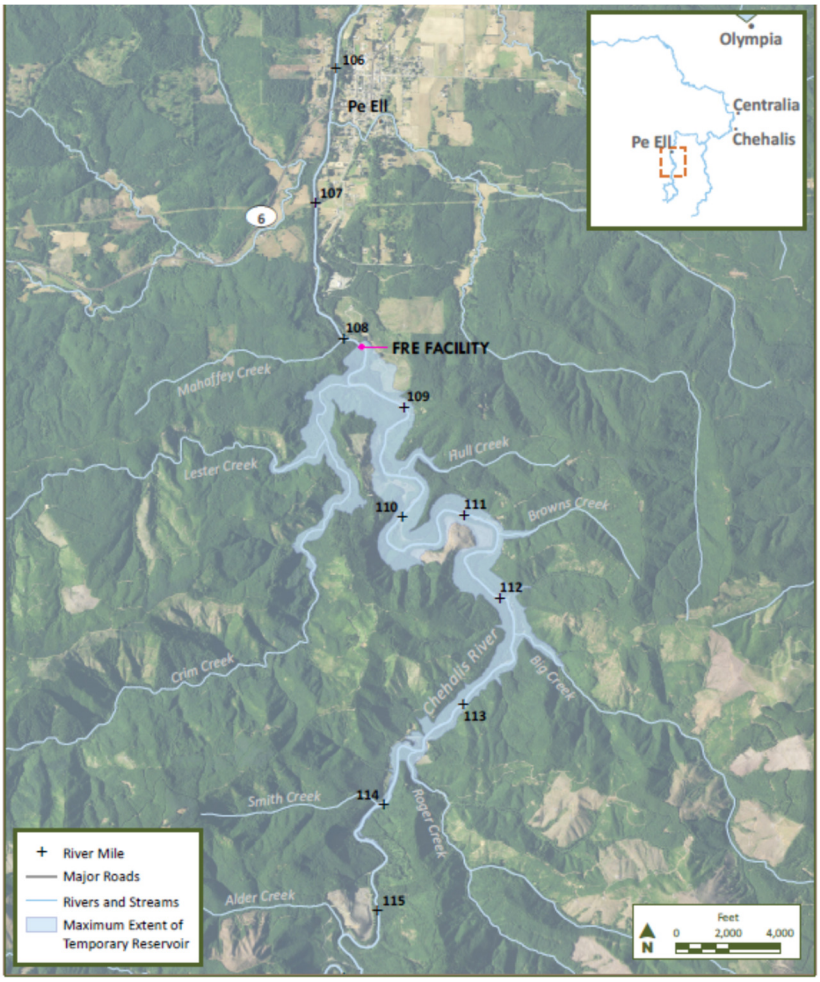
The Chehalis River Basin Flood Control Zone District (FCZD) is participating in a basin-wide planning effort referred to as the Chehalis Basin Strategy (Strategy). The proposed Chehalis River Basin Flood Damage Reduction Project (Project) has been developed through the Strategy and addresses the flood damage reduction purpose of the Strategy. It includes construction of a new flood retention structure (Flood Retention Expandable [FRE] facility) near the town of Pe Ell, Washington and levee improvements around the Chehalis-Centralia Airport in Chehalis, Washington. The proposed FRE facility would retain major floods, during which a temporary reservoir would form upstream of the FRE facility. Fill, retention, and evacuation of the reservoir could last up to 34 days. The U.S. Army Corps of Engineers (USACE) and the Washington Department of Ecology (Ecology) have prepared Environmental Impact Statements (EISs) under the National Environmental Policy Act (NEPA) and the Washington State Environmental Policy Act (SEPA), respectively, to evaluate potential environmental impacts of the Project (USACE 2020b; Ecology 2020).

The purpose of this technical memorandum (TM) is to summarize the potential viability of implementing short-term measures to increase salmonid species abundance over several reproductive cycles, and whether such measures could potentially stabilize populations of anadromous salmonids in the most affected reaches when implemented in conjunction with habitat mitigation. The affected reaches within the Chehalis River subbasin examined in this TM include the mainstem Chehalis River from river mile (RM) 108 to approximately RM 114 and its tributaries that would be inundated during temporary reservoir formation (USACE 2020b). Impacts to abundance downstream of the FRE structure are not considered in this TM. The target species for this evaluation include spring-run and fall-run Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*O. kisutch*), and steelhead (*O. mykiss*). Opportunities for habitat improvement throughout the Chehalis River subbasin are being developed separately from this TM (Kleinschmidt Associates 2020).

2.0 Background

The purpose of the Project is to reduce flood damage in the basin by temporarily storing flood waters from the Willapa Hills (USACE 2020a). The proposed temporary reservoir area includes priority habitat managed by the Washington Department of Fish and Wildlife (WDFW) and Pacific Salmon Essential Fish Habitat (EFH) for Chinook and Coho Salmon (Figure 1).

Figure 1. Proposed location of the FRE facility on the upper Chehalis River showing maximum extent of the temporary reservoir created during major flood retention. Figure modified from Ecology (2020).



The area upstream of the proposed FRE site contains migration, spawning, and rearing habitat for spring-run and fall-run Chinook Salmon, Coho Salmon, and steelhead trout (hereafter referred to as upper Chehalis salmonid species). Currently, returns of some upper Chehalis River salmonid populations are a fraction of what they were historically (Hiss and Knudsen 1993; Ecology 2020). Recent research indicates that salmonid species actively spawn at varying levels upstream and downstream of the area impacted by the proposed FRE facility (Ronne et al. 2020). Although abundance is lower than other anadromous salmonids in the study area (RM 108-114), spring-run Chinook Salmon show a preference to spawn in the mainstem Chehalis River more than other salmonid species (Ronne et al. 2020). There are no

hatchery releases in the upper Chehalis subbasin. Fish production in the upper subbasin is due primarily to natural production. Hatchery origin salmonids are rare to absent in this area (Ronne et al. 2020).

Table 1. Current upper Chehalis adult salmonid species abundance estimates and the modeled decrease in abundance by the end of century due to FRE construction and operation (USACE 2020b; Ecology 2020). The analysis of salmonid abundance within the SEPA EIS (Ecology 2020) includes the effects of climate change.

Species	Current Abundance Estimates (NEPA[1])	Current Abundance Estimates (SEPA[2])	Percent (%) Decrease in Abundance (NEPA[1])	Percent (%) Decrease in Abundance (SEPA[2])
Spring-run Chinook	70-75	23	100	100
Fall-run Chinook	180-195	320	45	93
Coho	810-870	858	17	62
Steelhead	820-935	1283	5	52

[1] USACE 2020b; Appendix K, Table 6.4-11
[2] Ecology 2020; Appendix E, Figures E-13, E-16, E-19, and E-22

Construction and operation of the FRE facility would negatively impact salmonid spawning and rearing habitat in the study area (USACE 2020b; Ecology 2020). Mainstem and tributaries upstream from the proposed FRE facility footprint will be influenced by clearing of riparian areas and periodic inundation during high flow events while the mainstem river downstream of the proposed FRE site will be influenced by changes in bed-load movement, scouring, reduced input of large wood, and substrate size caused by regulated flows (Ecology 2020). Spawning habitat downstream of the study area also will be subject to hydrologic changes during flood retention, and geomorphologic changes during drawdown of the temporary reservoir (Ecology 2020). Modeled abundance of spring-run Chinook Salmon, fall-run Chinook Salmon, Coho Salmon, and steelhead for populations upstream of the FRE project site (RM 108-114) are estimated to decrease by 100 percent, 45-93 percent, 17-62 percent, and 5-52 percent (Table 1), respectively, by the end of the century (USACE 2020b; Ecology 2020). These impacts are described in more detail in the SEPA and NEPA EISs (USACE 2020b; Ecology 2020).

3.0 Hatchery Supplementation

Temporary supplemental hatchery fish production was examined as a potential measure to prevent potential long term decline in salmonid species populations due to the Project. In order to mitigate for the loss of habitat and fish, measures to increase salmonid abundance via hatchery production would need to consider (1) the expected short-term and long-term loss of salmonid abundance, (2) proportions of wild/natural returns, and (3) the genetic makeup of existing upper Chehalis salmonid species. Consultation with WDFW and state fisheries co-managers would be anticipated as part of the development of hatchery supplementation program. Options for hatchery production are discussed in the following sections.

Production at Existing Facilities

Existing hatcheries may be used to increase salmonid abundance and supplement upper Chehalis salmonid populations in the study area. Currently, five hatcheries operate within the Chehalis River subbasin, located primarily in the lower Chehalis River and within 50 miles of the FRE site (Table 2). Three additional hatcheries are located within 30 miles of the FRE project site, but outside the Chehalis River subbasin (Table 2).

Table 2. Hatchery facilities within and outside of the Chehalis River subbasin.

Hatchery	Manager	River Basin	Distance to Proposed FRE Site (Miles)
Chehalis Tribal Hatchery	Chehalis Tribe	Chehalis	20
Skookumchuck	WDFW	Chehalis	32
Lake Aberdeen	WDFW	Chehalis	36
Satsop Springs	Private	Chehalis	39
Bingham Creek	WDFW	Chehalis	42
Forks Creek	WDFW	Willapa	14
Cowlitz Trout	WDFW	Cowlitz	28
Cowlitz Salmon	WDFW	Cowlitz	32

These hatcheries may be able to support the additional juvenile production needed for the supplementation program since the number of fish that would need to be produced is relatively low compared to their production capacity. Supplementation may be achieved by using one or multiple facilities, depending on capacity, available space, and other factors. It may be possible to use additional temporary, semi-temporary, or permanent infrastructure at the various hatchery sites to support production as well. Additional study of these existing hatcheries and dialog with the managing entities is necessary to compare the potential feasibility and preference of each site.

Production at existing facilities would also likely include the development and use of juvenile acclimation facilities at various locations in the upper Chehalis basin near the study area. Acclimation facilities are used to hold juveniles for a period where they imprint on a stream prior to release. This ultimately causes the fish to return as adults to the imprinted stream to spawn. Acclimation facilities could be temporary, mobile (“pop-up”) facilities or permanent installations. This is a common hatchery practice that is used when hatcheries are not located at the desired place of adult return.

Increasing hatchery production at existing facilities would include a variety of environmental, legal, financial, and engineering considerations including, production co-management, Endangered Species Act (ESA) requirements, genetic integrity, and water/quality concerns. Since the fish currently produced at the existing hatcheries are not from the upper Chehalis River, fisheries managers may not allow additional fish raised at their hatchery to be released in the upper Chehalis River due to the genetic concerns described below.

Production at New Permanent Facilities

A new hatchery could be constructed for the supplementation program. However, the cost of a new hatchery may not be warranted for the relatively low number of fish that would need to be produced for a supplementation program to replace fish lost due to the Project. Hatchery facilities are typically developed to propagate substantially larger numbers of fish than those that would be produced for this potential supplementation effort. Therefore, it is anticipated that a new permanent facility likely would not be a preferred hatchery supplementation measure.

Hatchery Supplementation Considerations

Presented below are additional considerations for the implementation of a supplemental hatchery program as part of mitigation for the proposed Project.

Hatchery Operational Timeline

Hatchery operations would likely need to be long-term, continuous operations as the Project effects on the fish populations are long-term. For example, each operation of the reservoir is anticipated to bury redds. Intermittent hatchery supplementation – hatchery production that only begins following an inundation event – is not anticipated to be feasible. Flooding events cannot be predicted far enough in advance. Supplemental juveniles must be available and ready to release immediately following an inundation event to avoid generational losses.

Hatchery Genetic Effects

Existing information indicates that hatchery fish are rare or absent from the upper Chehalis River, suggesting that there is little hatchery influence on these populations. Therefore, fisheries regulatory agencies, such as NMFS, USFWS, and WDFW, may consider the preservation of the wild population genetic diversity and integrity as important factor for managing these populations. Therefore, the fisheries agencies may be resistant to potential hatchery supplementation due to the potential the effects on the genetic integrity of the populations. In addition, if hatchery supplementation were to occur it is anticipated that genetic considerations will be an important factor for fisheries management and regulatory agencies for new production proposals.

Broodstock Collection

In addition to the ability of existing facilities to accommodate additional production, consideration also must be given to production scenarios given the distinct genetic differences of wild/naturally-occurring salmonid species in the upper Chehalis River (Section 2; Ronne et al. 2020). It is anticipated that broodstock (adults used for breeding) from the upper Chehalis populations would be required for maintaining the genetic composition of the populations. Use of broodstock from other areas of the Chehalis River basin is not anticipated to acceptable to fisheries agencies due to the potential hatchery effects of the existing wild (non-hatchery influenced) populations and known deleterious effects of hatchery production on wild populations. Therefore, it is anticipated that broodstock would need to be collected at or near the FRE structure to ensure fish returning to the affected area are used as the production

source. The facilities and methods for collection are anticipated to require feasibility and alternatives analyses conducted in coordination with WDFW and hatchery co-managers.

5.0 Summary

The construction and operation of the FRE facility is expected to have short-term and long-term, negative impacts on the abundance of upper Chehalis salmonid species. These effects will be predominately focused on wild/naturally returning stocks, particularly spring-run Chinook Salmon. Overall, long-term salmonid abundances are predicted to decline due to indirect impacts from habitat loss and impairment during operation of the FRE facility and other factors (e.g., climate change).

Hatchery supplementation could be considered for upper Chehalis River salmonids as an option for replacing lost fish production due to the FRE using one or multiple existing hatchery facilities. A supplementation program would also likely require adult collection of broodstock at or near the FRE to maintain the genetic integrity of the upper Chehalis salmonid populations. Supplementation production efforts may be prioritized based on relative predicted population impacts (e.g. spring-run Chinook Salmon) and respective production availability at the facilities. Further assessment of the existing facilities could determine the actual feasibility and strategies for such a program.

Any mitigation related to hatchery supplementation program would need to account for (1) the expected short-term and long-term loss of salmonid abundance, (2) potential effects on wild/natural populations and their genetics, and (3) additional logistical and infrastructure needs for implementing the program. Given the long-term effects of the Project, a hatchery program would need to be conducted on a permanent and continuous basis and could not be conducted over a limited timeframe of several reproductive cycles then ceased once a population is considered stable or an abundance target is achieved since the short-term benefits would not continue once the supplementation ceased. Supplemental hatchery production could be combined with other potential mitigation measures currently being identified and evaluated through other efforts (e.g., Kleinschmidt Associates 2020). Additional research is needed to determine the extent of the need for supplemental hatchery production once it is factored into an overall mitigation approach.

6.0 References

Ecology (Washington Department of Ecology). 2020. Proposed Chehalis River Basin Flood Damage Reduction Project February 2020 SEPA Draft Environmental Impact Statement Appendix E.

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Ronne L., N. VanBuskirk, and M. Litz. 2020. Spawner Abundance and Distribution of Salmon and Steelhead in the Upper Chehalis River, 2019 and Synthesis of 2013-2019, FPT 20-06 Washington Department of Fish and Wildlife, Olympia, Washington.

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US Army Corps of Engineers (USACE). 2020b. Appendix K Discipline Report for Aquatic Species and Habitats. September 2020. Chehalis River Basin Flood Damage Reduction Project NEPA Environmental Impact Statement.