3.5 FISHERIES

This section of the DEIS describes the existing fisheries conditions in the site vicinity (including the area associated with the Sequalitchew Creek restoration). Potential impacts associated with the EIS Alternatives are evaluated and mitigation measures identified. This section is based on the *Fisheries Technical Report* (February 2023) prepared by Anchor QEA and peer review by Raedeke Associates (see **Appendix G**).

3.5.1 Affected Environment

There are no fisheries resources on the site. Accordingly, the affected environment discussion for fisheries is focused on the lower 1.4 miles of Sequalitchew Creek, and the estuary and brackish marsh near the mouth of the creek. Other affected environments addressed in this analysis include the Puget Sound nearshore north of the Nisqually flats to Tatsolo Point and potential fish habitat in the Edmond Marsh complex. These areas are all outside the site but are subject to potential indirect effects from Proposed Action-related changes to the Vashon Aquifer and the off-site Sequalitchew Creek Restoration Plan.

Sequalitchew Creek

A description of the Sequalitchew Creek watershed and the fisheries habitat characteristics of Sequalitchew Creek is presented below. Refer to Section 3.3, **Groundwater**, and Section 3.4 **Surface Water**, for additional detail on Sequalitchew Creek physical habitat characteristics.

In general, Sequalitchew Creek has undergone a series of alterations over the last approximately 180 years from urban, military, and private development that has reduced fish access and habitat conditions.

Sequalitchew Creek Watershed

Sequalitchew Creek (Water Resource Inventory Area 12-0019) drains a watershed covering approximately 38.4 square miles that discharges into Puget Sound. **Figure 3.5-1** illustrates the characteristics of the Sequalitchew Creek drainage basin (see **Appendix G** for detail on the Sequalitchew Creek basin).

Physical Habitat of Upper Sequalitchew Creek

Upper Sequalitchew Creek is largely an artificial channel from its source at the Lake Sequalitchew weir to the west end of West Edmond Marsh. This channel is excavated within the existing wetland complex and has extremely low velocity where it flows in a culvert under DuPont Steilacoom Road. Except under extreme high flow conditions, all flow that

Source: Anchor QEA, 2022.

EA Engineering, Science, and Technology, Inc., PBC

Figure 3.5-1

Existing Aquatic Resources

passes through that culvert either infiltrates or evaporates within the Edmond Marsh Complex (see **Appendix G**, Plants and Animals Technical Report for additional detail).

Physical Habitat of Lower Sequalitchew Creek

Sequalitchew Creek above river mile 1.0 and below Edmond Marsh is typically dry. Only rarely is there a surface water connection between Edmond Marsh and lower Sequalitchew Creek. Most instances of surface water connection appear related to storm events, but some are from humans removing or altering the beaver dam at the west end of Edmond Marsh. The source of water in the lower mile of the creek is groundwater discharged from the Vashon Aquifer as springs in the Sequalitchew Creek ravine. In general, water flows in Sequalitchew Creek are not sufficient to allow fish use throughout much of the year (see **Appendix G** for detail on the physical characteristics of Sequalitchew Creek and fish use).

Biological Habitat of Sequalitchew Creek

The Sequalitchew Creek drainage basin contains both anadromous and resident fish that occur at different times of the year and use different portions of the creek. Documented anadromous fish use is reported for Sequalitchew Creek in the site vicinity, including by coho salmon (*Oncorhynchus kisutch*), chum salmon (*O. keta*), and cutthroat trout (*O. clarkii*) (see Figure 4 of **Appendix G**). The U.S. Fish and Wildlife Service also identifies bull trout (*Salvelinus confluentus*), a threatened species, as occurring in the site vicinity. Native bull trout populations are known to be present in the Nisqually River, whose mouth is located approximately one mile south of Sequalitchew Creek. Although suitable habitat for bull trout does not exist within Lower Sequalitchew Creek, it is likely that this species is present in the nearshore habitat and could enter Lower Sequalitchew Creek estuary to forage during salmon smolt out-migration.

Resident fish reported or expected to occur in Sequalitchew Creek within the site vicinity include cutthroat trout (*O. clarki*), rainbow trout (*O. mykiss*), sculpins (*Cottus* sp.), and western brook lamprey (*Lampetra richardsonii*). Other resident fish reported to occur in the Sequalitchew Creek drainage basin, but outside the site vicinity, include kokanee salmon (*O. nerka*) and spiny ray fish in American Lake and Sequalitchew Lake. Chum salmon have been reported to spawn in the lower 650 feet of Sequalitchew Creek in the past.

Historical Augmentation of the Fishery

WDFW augmented the fishery of Sequalitchew Creek intermittently from 1980 to 2001. Coho salmon smolts were released into Sequalitchew Creek from 1980 to 1994 and again in 2001. The annual number of coho salmon smolts (young salmon that are moving from freshwater to the ocean) released ranged from 2,280 to 987,480 with an average annual release of 238,477. Fall Chinook salmon (O. *tshawytscha*) smolts were also released into Sequalitchew Creek in 1990 and 1991. The annual number of Chinook smolts release ranged from 19,800 to 42,800 with an average annual release of 27,533. Coho salmon,

chum salmon, and cutthroat trout are currently reported to utilize Sequalitchew Creek according to the most recent information from WDFW and the *WRIA 12 Salmonid Habitat Limiting Factors Report*.

Coho salmon spawning survey records for Sequalitchew Creek indicate sporadic observations have been made by WDFW in 1962, and between 1982 and 1985. These surveys conducted in the winter (November 6 to December 27) extended from the mouth to RM 1.6. These data indicate that the annual number of adult coho salmon observed ranged from 0 to 145 with an annual average of 22. These surveys occurred during the period when smolts were released in the watershed, and flows were maintained by cutting a channel through Edmond Marsh.

The time of year when anadromous fish are reported to occur in Sequalitchew Creek within the site vicinity is as follows: Coho salmon smolts out-migrate from March to May, while returning adults spawn from late November to early January. Chum salmon spawn between December and February, and the fry (the stage where they begin the process of adapting to salt water) out-migrate immediately after emerging from the gravels, which is usually between March and June. Resident and sea-run cutthroat trout reside in Sequalitchew Creek throughout the entire year. Adults typically spawn in the spring and summer (February to August) and the fry emerge in late summer. Adult bull trout can potentially be present in the lowest portions of Sequalitchew Creek at any time of the year but are most likely to enter the stream to forage on out-migrating salmon smolts between March and June. Bull trout are not expected to use Sequalitchew Creek for spawning purposes due to the limited known distribution in the vicinity and the lack of spawning conditions that bull trout require.

Fish Habitat under Existing Flows

The analysis of salmonid spawning and passage in Sequalitchew Creek prepared for this EIS is based on water depth and flow, and considers conditions for coho salmon, chum salmon, and cutthroat trout (see **Appendix G** for detail on the methodology utilized for water depth and flow).

The analysis indicates that optimal flows for both spawning and rearing in Sequalitchew Creek are higher than provided by current flows in Sequalitchew Creek; i.e. existing low flows in the creek are not considered suitable for spawning and rearing of coho and chum salmon. Cutthroat trout habitat is also severely limited due to low flows, especially during drier-than-average years. Also note that a 2013 study found that "adult capacity and abundance in Sequalitchew Creek is essentially zero" (see to **Appendix G** for additional detail).

Marine Shoreline

Fish habitat along the marine shoreline at the mouth of Sequalitchew Creek and the barge-loading facility is described below.

Physical Habitat Characteristics of the Marine Shoreline

Mouth of Sequalitchew Creek

The Puget Sound shoreline at the mouth of Sequalitchew Creek is characterized by an armored slope above a gravel beach with minimal estuarine habitat. Farther offshore, a shallow soft sediment bench extends from the Nisqually River delta to just north of the mouth of Sequalitchew Creek. The BNSF railroad tracks paralleling the shoreline in this area are perched on a steep riprap berm. On the Nisqually Reach side of the railroad there are gravel deposits on either side of the mouth of Sequalitchew Creek that extend above the high tide line. These create more complete nearshore habitats, with beach grasses, drift logs, and low angle beaches extending into the subtidal zone. The railroad berm bisects the mouth of Sequalitchew Creek and influences tidal currents, wave action, and sediment deposition along the marine shoreline. There is a brackish marsh associated with Sequalitchew Creek on the upstream side of the railroad berm. Wind waves and tidal flows in the marsh are limited by a culvert under the railroad berm. The culvert draining Sequalitchew Creek through this railroad berm influences tidal exchanges, deltaic sediment deposition, and fish passage. There is limited rearing habitat in the brackish marsh on the upstream side of the railroad berm because this berm does not allow the channel to meander and otherwise naturally braid into multiple tidal channels. The loss of these natural processes limits the quantity and quality of fish habitat in this estuary.

Marine Shoreline West of the Existing Mine

The shoreline on the Puget Sound side of the railroad berm also has limited fish habitat due to steep slope influences on wave action, sediment deposition, and estuarine vegetation. Waves formed by the predominant wind direction (from the southwest) break on the riprap-lined slope during high tides and do not allow for the deposition of fine-grained substrate in most areas. Substrate along the shoreline that is influenced by high-energy waves and wave reflection scouring is dominated by cobbles and gravel. In addition, the steep riprap embankment does not allow estuarine vegetation to grow above the high tide line. This limits the organic export of nutrients and benthic invertebrates (small bottom-dwelling aquatic animals with no backbone) that juvenile salmonids need during their acclimation to estuarine conditions. Within approximately 0.25 mile on either side of the mouth of Sequalitchew Creek, there is a sand bar at the shoreline. This sandbar reduces wave energy and scour. The sandier substrate off shore of the bar supports patches of eelgrass. The bottom substrate farther offshore that is not influenced by wave scouring consists of fine-grained sediment overlying cobbles.

Barge Loading Facility

The Puget Sound shoreline at the Pioneer Aggregates barge loading facility near Tatsolo Point is located where the BNSF railroad tracks also parallel the shoreline. The railroad tracks are perched on a steep berm composed of riprap that occupies the intertidal zone to

nearly mean lower low water (MLLW), meaning there is little intertidal beach present. This railroad berm influences tidal currents, wave action, and sediment deposition along the marine shoreline. Although there is a gravel beach adjacent to the railroad berm approximately 200 feet north of the dock, the area has minimal nearshore habitat value. The shoreline on the Puget Sound side of the railroad berm has limited fish habitat because the steep slope influences wave action, sediment deposition, and estuarine vegetation. Waves formed by the predominant wind direction (from the southwest) break on the riprap-lined slope and do not allow for the deposition or effective transport of fine-grained substrate (see **Appendix G** for additional detail)

Biological Habitat Characteristics of the Marine Shoreline

The Nisqually Reach west of the existing mine and the nearshore from the mouth of Sequalitchew Creek provide habitat for numerous species of fish and marine invertebrates. WDFW Priority Habitats and Species mapping documents the presence of key habitats for cutthroat trout, coho salmon, and chum salmon migration and rearing; and Pacific sand lance (*Ammodytes hexapterus*) and surf smelt (*Hypomesus pretiosus*) breeding. The reach is used by Dungeness crab (*Cancer magister*) and various types of shrimp. Kelp and algae beds are present in the shallow subtidal; there have been limited observations of eelgrass in the vicinity (eelgrass is critical fish habitat).

Mouth of Sequalitchew Creek

Although fish habitat along the marine shoreline at the mouth of Sequalitchew Creek is influenced by the railroad berm, this area is used by a variety of species. These include plants and invertebrates in the intertidal and subtidal zones, as well as the marine and fish species described below.

Prior studies indicate that 75 plant species were found growing on the bottom substrate in the intertidal area (0 to 9 feet above MLLW). Of these intertidal plants, more than half were red algae (Rhodophytes) and green algae (Chlorophytes). The majority of the subtidal plants were found between 0 and -16 feet below MLLW. Small patches of eelgrass in sparse densities were observed near the mouth of Sequalitchew Creek (see **Appendix G** for detail). Prior studies also identified 270 species of invertebrates in the intertidal area, with the majority of these species occurring near 0 feet MLLW. Several species of limpets, barnacles, and periwinkles were the dominant molluscan groups. The most productive area was the lower intertidal area near the mouth of Sequalitchew Creek. Subtidal invertebrates found in this area include snails (gastropods), worms (polychaetes), sea stars, and amphipod crustaceans.

Marine fish observed along the shoreline in this area include 31 species of bottomfish, 26 species of bottom-dwelling fish, and 11 water-column species. The predominant bottomfish include English sole (*Parophrys vetulus*), rock sole (*Lepidosetta bilineata*), and starry flounder (*Platichthys stellatus*). The dominant bottom-dwelling fish include buffalo sculpin

(*Enophrys bison*), Pacific tomcod (*Microgadus proximus*), staghorn sculpin (*Leptocottus armatus*), rockfish species (*Sebastes* spp.), cabezon (*Scorpaenichthys marmoratus*), painted greenling (*Oxylebius pictus*), and pipefish (*Syngnathus griseolineatus*). The water-column fish are represented by shiner perch (*Cymatogaster aggregate*), surfperches (Embiotocidae), and tubesnout (*Aulorhynchus flavidus*).

Salmonid species observed along the marine shoreline include coho, chum, Chinook, and pink salmon. Adult coho salmon were found along the shoreline at the Sequalitchew Creek mouth in September and October, but most of these fish were returning to spawn in the Chambers Creek, McAllister Creek, and Nisqually River watersheds. Returning chum salmon are found along the shoreline at the Sequalitchew Creek mouth in December and January, but most of these fish spawn in the Nisqually River. Chinook and pink salmon observed along the marine shoreline are mainly migrating to the Nisqually River system. Juvenile salmonids are found along the shoreline at the Sequalitchew Creek mouth during the spring out-migration, but many of these fish originate in the Nisqually River. Juvenile coho salmon are typically found between May and June. The peak migration of juvenile chum salmon occurred between mid-February and late July. Juvenile Chinook salmon were observed migrating from late May to July.

As noted previously, a native population of bull trout is known to inhabit the Nisqually River system. Fish from this population may utilize the nearshore environment near the mouth of Sequalitchew Creek and may also enter the lowest portion of the creek to forage on juvenile salmonids.

Barge Loading Facility

Similar to the area described at the mouth of Sequalitchew Creek, the barge loading area is influenced by the railroad berm. However, the barge loading dock area has less diversity than the mouth of Sequalitchew Creek. The following summarizes the plants and invertebrates in the intertidal and subtidal zones; marine fish; and salmonids found in this area.

An intertidal flora and fauna survey conducted approximately 200 yards south of the barge loading dock in 1978 found little macroalgae above +6 feet MLLW. Only rockweed (*Fucus gardneri*) was present at +6 feet MLLW. At lower elevations, several species of red and green algae were common, and at 0 feet MLLW, several species of kelp dominated. Subtidal plants are distributed at various depths and include macroalgae and kelp at around -8 feet MLLW. A narrow band of bull kelp (*Nereocystis leutkeana*) extends along the shoreline in both directions from the barge loading dock. Algae species are restricted to the area above -20 to -30 feet MLLW, and the most prevalent algae species was sea lettuce (*Ulva lactuca*). Ribbon kelp (*Laminaria saccharina*) was the second most common algae in this area. A variety of filamentous and foliose red algae species are present; the most common is *Sarcodiotheca gaucichaudii*. The cumulative percent cover of these algae ranged

from 100% in the shallow subtidal zone to less than 5% at -20 to -30 feet MLLW. No eelgrass beds were observed in the vicinity of the dock.

Subtidal animals living within (infauna) and on top (epifauna) of the sea bed are present at various depths. The most common infauna group is polychaete worms, while the epifauna is dominated by shrimp and crab species. Larger animals included cockles (*Clinocardium nuttallii*), sea cucumbers (*Parastichopus californicus*), several species of sea stars, Dungeness crab (*Cancer magister*), rock crab (*Cancer productus*), and geoducks (*Panope abrupta*).

Marine fish observed along the shoreline in this area include shiner perch, Pacific herring (*Clupea harengus pallasi*), sand dab (*Citharichthys sordidus*), English sole, and starry flounder. Four salmon species (coho, chum, chinook, and pink) are expected to occur in this area. However, this area is less productive for juvenile salmon rearing and adult migration than the mouth of Sequalitchew Creek due to its greater distance from the Nisqually River. As noted previously, a native population of bull trout is known to inhabit the Nisqually River system. Fish from this population may utilize the nearshore environment in the vicinity of Sequalitchew Creek, including the barge loading facility.

3.5.2 Impacts of the Alternatives

This section identifies and analyzes the potential for impacts to fisheries in the vicinity of the site under the EIS Alternatives.

As described in **Chapter 2** of this DEIS, the 2011 Settlement Agreement indicates that any approval of proposed mining under the Pioneer Aggregates South Parcel Project (Proposed Action) shall not be effective until permits and approvals needed for implementation of the Sequalitchew Creek Restoration Plan (Restoration Plan)[1], as a separate but related action. The Restoration Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine by sequentially restoring diverted flows back to the creek, improving the sustainability of flows through the system, and restoring aquatic habitat.

Consistent with the 2011 Settlement Agreement, this DEIS assumes that mining and reclamation activities under the Proposed Action would require implementation of the Restoration Plan. It is assumed that CalPortland funding/implementation of projects associated with the Restoration Plan would be mitigation for certain environmental impacts identified in this DEIS and would be a condition of any City of DuPont approval of the Proposed Action. However, because the Restoration Plan is considered a separate project that could be funded and implemented independent of the Proposed Action, the general discussion in the Environmental Impacts sub-section of Fisheries only addresses the impacts

[1] *The Sequalitchew Creek Restoration Plan is sponsored and developed by CalPortland, the Environmental Caucus and the South Puget Sound Salmon Enhancement Group (SPSSEG).*

of the proposed mining/reclamation and does not include implementation of the Restoration Plan. This is intended to help the reader understand the impacts of the proposed mining/reclamation, and the need for the Restoration Plan with the proposed project. Proposed mining/reclamation in combination with the Restoration Plan is specifically discussed under Cumulative Impacts.

ALTERNATIVE 1 – PROPOSED ACTION

Direct Impacts

Potential fisheries impacts to the marine shoreline include direct and indirect effects from the spillage of sand and gravel from the conveyor, overturning of barges during loading, accidental spills of pollutants, shading, and lighting, and are summarized as follows:

- Sand and gravel, if spilled in sufficient quantities, could smother the benthic community where the spill occurs.
- Accidental spills of petroleum products (diesel) and other pollutants (hydraulic oil) could potentially occur during barge loading and maintenance activities.
- Extending the life of the conveyor and barge loading dock by about 14 years would extend any impacts to areas directly beneath the dock by shading the shallow water, as well as impacts associated with dock lighting. These impacts would occur until the dock is eventually removed.

As indicated in Sub-section 3.4.1, periodic surveys to date have not detected substantial material spills. Also, Ecology maintains a record of all reported oil spills of 1 gallon or more since 2015; there were no recorded spills in the vicinity during that time.

Indirect Impacts

The Proposed Action would not directly affect Sequalitchew Creek, but the drawdown of the Vashon Aquifer would indirectly reduce flow in Lower Sequalitchew Creek. Lower Sequalitchew Creek is entirely spring fed. Groundwater discharge to Sequalitchew Creek during active dewatering under the Proposed Action is predicted to be 79% less than baseline conditions, on average, resulting in a decrease in average flow in Sequalitchew Creek from 1.6 cfs to 0.34 cfs at the mid-ravine gage. The greatest decrease would occur during the wet season.

Without the Sequalitchew Creek Restoration, these indirect impacts would reduce flows during the spawning life stage of chum salmon and the spawning and rearing life stages of coho salmon and cutthroat trout. Impacts during the spawning season would limit the amount of habitat for resident cutthroat trout and eliminate spawning habitat for anadromous species. This would reduce the spatial extent of habitat available and reduce the portion of the year when fish habitat is accessible.

CUMULATIVE IMPACTS WITH PROPOSED ACTION AND SEQUALITCHEW CREEK RESTORATION PLAN

Introduction

As indicated in **Chapter 2** (Description of proposed Action and Alternatives) of this EIS, the 2011 Settlement Agreement indicates that any approval for mining under the Pioneer Aggregates South Parcel Project shall not be effective until permits and approvals needed for implementation of the Sequalitchew Creek Restoration Plan developed by CalPortland and the Environmental Caucus are in place. The Restoration Plan will be evaluated as a separate but related action. The Sequalitchew Creek Restoration Plan seeks to restore and enhance streamflow and ecological functions from Sequalitchew Lake through Edmond Marsh into Sequalitchew Creek ravine. Restoration of Sequalitchew Creek seeks to address almost two centuries of human manipulation. The principal goals of the Restoration Plan are to restore flows in Sequalitchew Creek, portions of which are now dry. This goal will be achieved by implementing a series of actions in a coordinated and adaptively managed project. The Restoration Plan is intended to sequentially restore diverted flows back to the creek, improve the sustainability of flows through the system, and restore aquatic habitat by removing flow-related fish passage barriers and increasing the habitat available to aquatic species.

The Sequalitchew Creek Restoration Project would also restore fish passage from Sequalitchew Creek to East and West Edmond Marshes. Two fish barrier culverts would be replaced by fish-passable structures, which in combination with increased flows would allow migratory access above the ravine springs and into Edmond Marsh. Restoration would affect the conditions sufficiently to allow establishment of emergent vegetation in the western extent of the complex where inundation would persist through more of the growing season, providing excellent rearing habitat for juvenile coho salmon and cutthroat trout. These effects would increase the size, diversity, and complexity of available fish habitat types.

The increased flow through Edmond Marsh would also improve water quality conditions by increasing dissolved oxygen concentrations and diluting and flushing an area of elevated iron concentrations in the center of the marsh. Improved water quality would improve fish habitat.

Cumulative Conditions

The combined impacts of mining under the Proposed Action together with implementation of the Sequalitchew Creek Restoration (the ‘cumulative condition’) on stream habitat would include a re-establishment of flow from Sequalitchew Lake to flow through the marshes and into Sequalitchew Creek ravine, and re-establishing ecosystem processes, specifically, the movement of water, sediment, nutrients, biota, and dissolved gases through the watershed

from the headwater springs on Sequalitchew Lake to Puget Sound. The increase in hydrology and stream energy would increase aquatic ecosystem productivity and create and maintain habitat diversity, particularly for target species such as chum salmon and cutthroat trout in the system, as described below (see **Appendix G** for details).

Water Quality

The mining under the Proposed Action and Sequalitchew Creek Restoration Plan projects would introduce surface water from the upper watershed to Sequalitchew Creek. Water currently passing through Edmond Marsh has low levels of turbidity and pollutants. The cumulative condition would impact stream temperature in the Sequalitchew Creek ravine by restoring the flow of surface water in the system at a different temperature. The effects would vary seasonally as the volume of water from Sequalitchew Lake and its associated temperature vary. In summer, the outflow from Sequalitchew Lake is warmer than Sequalitchew Creek; in winter, it is colder.

Sequalitchew Creek would experience warm temperatures in June, July, and August, with temperatures reaching up to 21°C (70°F) and cool temperatures in winter, down to 5°C to 6°C (41°F to 43°F) (see **Appendix G** Figure 6). The predicted stream temperatures would be considerably warmer than the current spring discharge in the creek for most of the year. The surface water quality criterion for temperature applicable to Sequalitchew Creek is 16°C for the 7-day average of daily maximums. This threshold may be exceeded from May to September.

This temperature increase could alter habitat for juvenile fish. Increased stream temperatures have been shown to decrease time to emergence in several salmonid species, including coho salmon. Cutthroat trout, which spawn and rear later in the season, have been shown to hatch earlier as temperatures increase. Although sublethal, this temperature increase could impact growth and survival, with juveniles potentially competing for resources earlier in the year.

The dissolved oxygen levels in Lake Sequalitchew and Lower Sequalitchew Creek are currently high (>9 milligrams per liter [mg/L]). Water quality in the marshes is more typical of stagnant waterbodies exposed to the life cycle of aquatic plants.

Water Quantity

Streamflow was evaluated and streamflows were predicted at two locations under the cumulative condition. These locations are the dry reach near Center Drive, and at the mid-ravine of Sequalitchew Creek.

Flows in the Dry Reach - Under existing conditions, the dry reach experiences no consistent flow passing through the entire reach. The bottom of the dry reach is above the current groundwater levels, so ground infiltration in the dry reach would not be impacted by lowering of groundwater with mining under the Proposed Action.

The cumulative condition is predicted to result in an average flow of 12.9 cfs in the dry reach. The flow would vary seasonally (see Figure 5 of **Appendix G**). Peak flows could be as high as 60 cfs if all water is routed through the wetlands during peak flow events. To avoid flooding during peak flows, the highest flows would be directed to the Diversion Canal or detained in the marshes.

Modeling conducted for this EIS analysis (see **Appendix G**) indicates there would be periods when there would be no outflow from West Edmond Marsh, and thus no flow in the dry reach portion of Sequalitchew Creek in the cumulative condition. The occurrence of dry periods in this reach of Sequalitchew Creek would be reduced or eliminated if beaver management structures are built to store water and release it slowly and consistently during periods when there is no flow from Sequalitchew Lake. Should flow be disrupted, it would temporarily disrupt the habitat and fish migratory functions of the stream reach between the Sequalitchew ravine springs and Edmond Marsh.

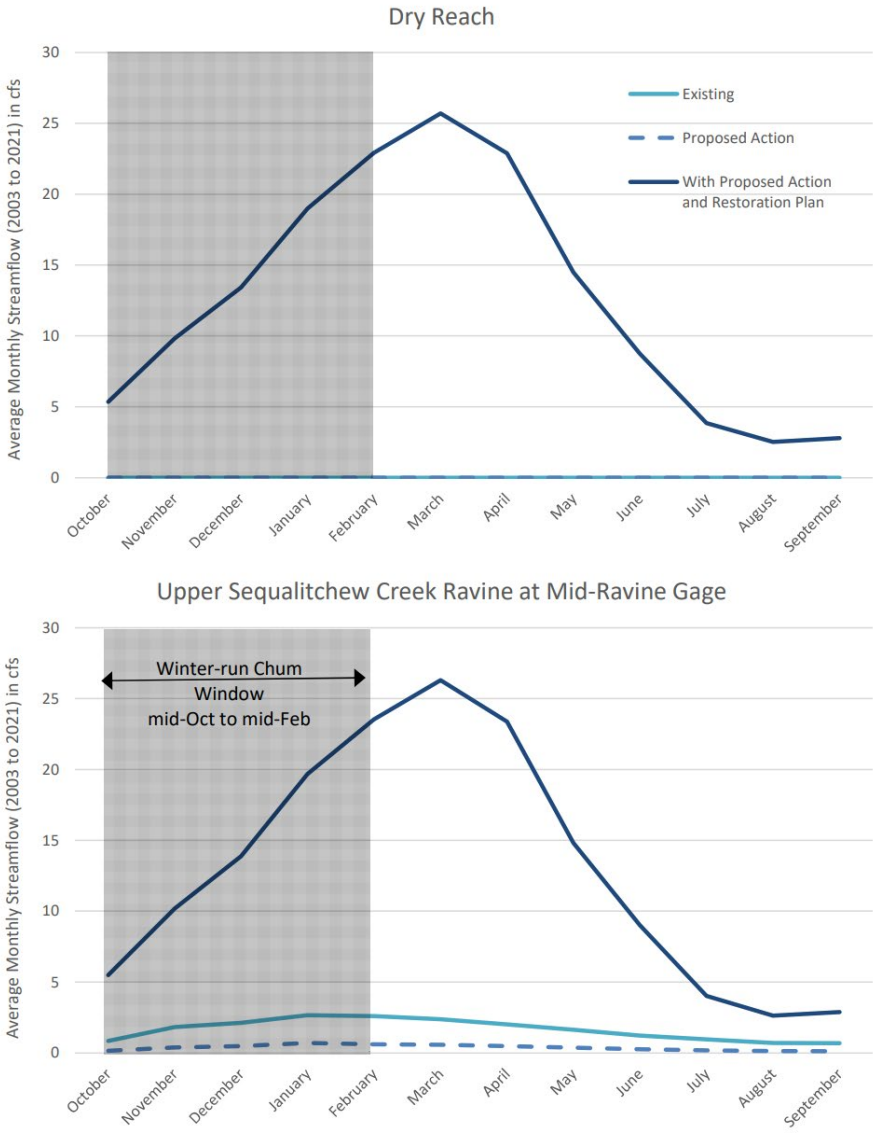
Flows at Mid-Ravine - After passing through the dry reach, streamflows would enter the Sequalitchew Creek ravine under the cumulative condition. The vast majority of flow would originate from Sequalitchew Lake, but there would be contribution from springs within the ravine, although the contribution from these springs with mining under the Proposed Action and Sequalitchew Creek Restoration Plan would be lower than it is under existing conditions.

On average, flow in Sequalitchew Creek at the mid-ravine gage would generally be similar to but slightly higher than the flows in the dry reach (i.e., 0.4 cfs greater), reflecting the input of spring flow. Peak flows would be generally the same magnitude (approximately 60 cfs) as in the dry reach.

There would be periods when the cumulative condition would result in a reduction in flows at the mid-ravine gage compared with the existing condition; flows are anticipated to be lower approximately 10.5% of the time. These effects would be mitigated in part or in whole by implementation of the beaver management actions called for in the Restoration Plan. On an overall basis, implementation of the Sequalitchew Creek Restoration Plan would increase the level of fisheries habitat in Sequalitchew Creek compared to existing conditions.

Low flows are the limiting factor for coho and chum salmon and cutthroat trout spawning and rearing in the ravine. Separate studies (Anchor Environmental 2004, and ICF 2013) show that under flow conditions similar to those predicted with mining and restoration would result in increased capacity of the stream to support spawning and rearing of coho and chum salmon

Flows during the spawning season of winter-run chum (October – February) would be increased providing passage to more of the creek and conditions suitable for spawning in the ravine. Coho salmon spawn in the Nisqually during the earlier part of the same period.



Edmond Marsh

A goal of the Sequalitchew Creek Restoration Plan is to reintroduce a sustainable population of coho salmon. If re-stocking of coho salmon is successful, the aquatic area of West Edmond Marsh would provide rearing habitat for juveniles. Juvenile coho salmon typically stay in freshwater wetlands and small streams for two years or more after spawning.

Nearshore Habitat

Under the cumulative condition, the additional flow in Sequalitchew Creek would transport more nutrients and fine sediment to the nearshore. The mouth of the creek is near the south end of a drift cell[2] with net transport to the north. The additional sediment would benefit the nearshore by replacing some of the sediment that would naturally come from the exposed bluffs above the railroad. Currently this sediment cannot cross the tracks, and the lower shoreline is heavily armored, preventing erosive forces from recruiting sediment below the railroad. Additional nutrients and sediment would also increase biotic productivity on the Puget Sound shoreline at the mouth of the creek, increasing prey resources for fish. Conditions in the brackish marsh are expected to remain stable. Although salinity at the surface could drop, the saltwater that enters the marsh at high tide is anticipated to still cover the entire vegetated surface of the marsh

.

ALTERNATIVE 2 – NO ACTION

The No Action Alternative includes two scenarios: Scenario A – Continuation of Existing Site Conditions; and Scenario B – Site Development under Existing Zoning.

Scenario A

Under No Action Alternative Scenario A, the condition of the Sequalitchew Creek fish populations and fish habitat would remain as under existing conditions. Suitable and accessible habitat for all species of fish currently and historically present would continue to be a fraction of what they were a few decades ago. Surface flows from Edmond Marsh into Lower Sequalitchew Creek would continue to occur during extreme precipitation events and would not contribute meaningfully to habitat. The creek would continue be unused or used very little by chum and coho salmon and cutthroat trout.

No-Action Alternative Scenario A includes the potential for the Sequalitchew Creek Restoration Plan to be implemented without the Proposed Action. Funding for alterations to the diversion system is currently programmed by JBLM. For the portions of the plan outside JBLM, other funding sources (e.g., grants) would be required to implement the plan. These alternate funds may or may not be provided, and if provided may or may not be at the same level of funding and/or on the same timeline as under the Proposed Action.

Scenario B

If the site were to be developed consistent with existing zoning, clearing and grading associated with construction would increase potential for erosion impacts to area fisheries resources; with adherence to applicable regulations during construction, significant impacts to these resources are not anticipated. The increase in impervious surfaces on the site with

[2] *Section of shoreline in which sand and gravel naturally move to create beaches.*

development consistent with existing zoning would increase surface water runoff; with adherence to applicable regulations related to stormwater quantity and quality, significant impacts are not anticipated.

As indicated above, development of the site consistent with existing zoning includes the potential for the Sequalitchew Creek Restoration Plan to be implemented without the Proposed Action. However, there are no known likely funding sources other than CalPortland at this time.

3.5.3 Mitigation Measures

The following mitigation measures have been included in the Proposed Action to reduce fisheries resources impacts, including impacts to on-site resources and indirect impacts to off-site resources due to changes in groundwater hydrology. Note that specific mitigation measures associated with dewatering and other aspects of the mining project are discussed in Section 3.3, **Groundwater**, of this EIS.

Proposed On-Site Mitigation

- Existing mitigation measures at the barge loading facility at Tatsolo Point that minimize the potential for impacts on fisheries resources would continue. These include:
    - The facility is designed in accordance with adopted federal, state, and local regulations and guidelines to reduce the likelihood of spills of lubricants, fuels, and chemicals employed in the processing and manufacturing proposed for the site;
    - The overwater portion of the conveyor is enclosed to prevent spillage of gravel; and
    - The dock is not used for the delivery of supplies, or chemical or other materials by water; a spill plan has been prepared for all elements and operations of the facility (marine and upland). Appropriate oil spill containment equipment is available at the dock site.

- Mining operations would continue to manage fugitive dust, and forested buffers around Sequalitchew Creek would remain to protect water quality and its support of healthy fisheries resources.

- Site water and stormwater would continue to be recycled and/or infiltrated in the mine, eliminating turbid runoff and its potential to impact fisheries resources.

- During construction of the mitigation wetland and other excavation of soils, construction best management practices would be used to prevent erosion of soils and sedimentation of water resources that support fisheries resources.

Proposed Mitigation for Off-Site Resources

- Implementation of the Sequalitchew Creek Restoration Plan would mitigate for potential impacts to aquatic resources and vegetation resulting from changes to groundwater levels. The Sequalitchew Restoration Plan will be permitted and implemented contemporaneously with mining of the South Parcel. Among other things, the Restoration Plan would mitigate for the impacts of the mine. Monitoring and mitigation measures, including specific timeframes for monitoring and mitigation efforts, are defined in the Restoration Plan. The goal of the Restoration Plan is to offset potential impacts to aquatic resources within the area subject to changes in groundwater level.

- The Sequalitchew Creek Restoration Plan and proposed mining both include monitoring and adaptive management programs aimed at ensuring the projects achieve their objectives (e.g., to maintain and enhance fisheries resources). A main purpose of ongoing monitoring and adaptive management is to look for detrimental cumulative effects and, if identified, adaptively respond to minimize them.

Other Possible Contingency Mitigation Measures

- As an element of the approval conditions for the Proposed Action, the City of DuPont could require a Monitoring and Response Plan. The Monitoring and Response Plan could include, among other things, definition of monitoring methodology, establishment of performance thresholds, and identification of contingency response measures to the considered for implementation if monitoring indicates exceedance of a performance threshold. The Monitoring and Response Plan could incorporate elements of the adaptive management processes proposed to be established for the Proposed Action and the Sequalitchew Creek Restoration Plan.

  The Sequalitchew Creek Restoration Plan is a separate but related action that is intended to be implemented in parallel with the Proposed Action. The mine and the stream restoration project each have their own adaptive management process tailored to achieving the goals and objectives of each specific project. The interaction between the two adaptive management processes could include: 1) project schedules that encourage restoration in advance of the potential impacts from mining; 2) development of performance thresholds for mining that support restoration and 3) coordinated monitoring and open sharing of information. The City, as the permitting authority for both projects would have a key role in assuring consistency between the two adaptive management plans. The adaptive management process included in the Monitoring Plan (Aspect Consulting, 2017) includes, but is not limited to, the following potential mitigation actions if the impacts of dewatering on groundwater levels are greater than anticipated including: Installing additional monitoring locations; modifying the dewatering system or approach; revising the mining plan; and providing additional

mitigation to impacted surface waters.

Other groundwater contingency mitigation measures that could be implemented as part of the adaptive management process include:

- Groundwater captured from the mine could be conveyed to the Sequalitchew Creek ravine (either by open channel or micro-tunneling). This approach could provide mitigation for decreased seep discharge within the ravine if the conveyance outfall (or confluence) is located in the vicinity where groundwater discharge currently occurs. However, this previously considered mitigation measure would require revisiting conflicting provisions in the 2011 Settlement Agreement and would not augment streamflow between Sequalitchew Lake and the ravine.

- Groundwater captured from the mine could be pumped into Edmond Marsh rather than into the Sequalitchew Creek ravine. Benefits of this mitigation approach would be that cool groundwater (which has a low summer water temperature relative to surface water) would enter the marsh and could enhance Sequalitchew Creek surface water flow and fish habitat. A potential drawback of this mitigation action is that it is, at best, a temporary action because pumping in perpetuity is not feasible, and groundwater discharge/infiltration to the comingled Vashon-Sea Level Aquifer would substantially decrease. In addition, it likely would over-mitigate expected dewatering impacts to Sequalitchew Creek if active year-round (as opposed to only during certain dry or low-flow conditions).

- Water could be actively conveyed to Edmond Marsh during dry periods, while during all other periods captured groundwater from the South Parcel could be conveyed to the lower mine area for infiltration (as is planned in the Proposed Action). This could serve as a contingent measure for consideration and/or further study to supplement Sequalitchew Creek flows during dry periods when no outflow from Sequalitchew Lake occurs or if the Restoration Plan provides less environmental benefit than currently expected. However, this mitigation measure is also likely at best, a temporary action because pumping in perpetuity is not feasible.

3.5.4 Significant Unavoidable Adverse Impacts

The cumulative impacts of the Proposed Action and Sequalitchew Creek Restoration Plan (the cumulative condition) would generally improve all aspects of the freshwater fish habitat in the Sequalitchew Creek watershed compared to current conditions.
The existing low flows do not currently support a fish population. The flows in the ravine section of Sequalitchew Creek under the Proposed Action would likely be lower than under

existing conditions an estimated 10% of the time (during drought years) with the reduction in groundwater discharge to the creek.

Increased water temperature in the Sequalitchew Creek system is anticipated to occur in late summer when only resident fish are present. Fish movement and growth could be limited during the period when water temperature peaks in late summer until temperatures reduce in fall.

Considering the overall increase in freshwater fish habitat conditions in the cumulative condition, in combination with the proposed and potential measures identified in Section 3.5.3, significant unavoidable adverse impacts are not anticipated.