UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

May 31, 2001

Lowell H. Johnson
Manager, Airport Division
Federal Aviation Administration
1601 Lind Avenue S.W.
Renton, Washington 98055-4056

Re: Biological Assessment for Master Plan Update Improvements at Seattle-Tacoma International Airport (NMFS No. WSB-00-318) and Essential Fish Habitat consultation

Dear Mr. Johnson:

On June 16, 2000, the National Marine Fisheries Service (NMFS) received a Biological Assessment (BA) from the Federal Aviation Administration (FAA) on behalf of the Port of Seattle (Port). The Port is FAA's designated non-federal representative for this consultation. The BA considered numerous construction projects included in the Master Plan Update Improvements for Seattle-Tacoma International Airport (STIA). FAA requested consultation under the Endangered Species Act (Sec 7(a)(2)) for chinook salmon (*Onchorhynchus tshawytscha*). The Port is the proponent of the STIA projects but FAA provides partial funding for the action, thus creating a Federal nexus and the need for section 7 consultation. This consultation covers federal actions that are required to implement STIA projects including: 1) FAA funding of airport improvements, 2) FAA construction of a control tower and navigational aids, 3) Issuance of a 404 permit by the Corps of Engineers (COE) as required by the Federal Clean Water Act. The BA also addressed the effects of STIA projects on Essential Fish Habitat (EFH) of coastal pelagic species and West Coast groundfish as required by Section 305(b) of the Magnuson-Stevens Act. EFH for Coho salmon (*O. kisutch*), a candidate species in Puget Sound, was not considered in this consultation although an independent assessment of EFH for coho was prepared by the Port and delivered to NMFS on March 27, 2001.

The BA concludes that STIA projects "may affect," but are "not likely to adversely affect" chinook salmon and that construction and operation of the projects "may affect" but is "not likely to destroy or adversely modify" designated critical habitat. The BA also concludes that STIA projects are "not likely to adversely affect" any identified EFH for the coastal pelagic species and West Coast Groundfish.

ENDANGERED SPECIES ACT

This consultation is based upon the BA (June 2000) and supplemental information that was formally transmitted to NMFS by FAA or the Port. These submittals include: Supplement for Property Acquisition and Demolition for 34X Runway Protection Zone (September 11, 2000), Clean Water Act Section 404 Permit Application (October 30, 2000), Supplement to the BA

(December 14, 2000) as well as Sea-Tac Runway Fill Hydrology Studies Report (PGG 2000), Seattle-Tacoma Airport Master Plan Update, Low Streamflow Analysis (Earth Tech, Inc. 2000) and Comprehensive Stormwater Management Plan (Parametrix 2000) submitted in January, 2001. In addition numerous telephone conversations and e-mail messages have transmitted information between NMFS, the Port and Parametrix, the Port's environmental consultant. The final document required to initiate formal consultation, a response to concerns raised by the Fish and Wildlife Service (FWS) about potential contamination in the embankment fill, was submitted on 26 March 2001 and modified on 30 March 2001.

Scientific consultants retained by the Airport Communities Coalition (ACC) also reviewed the above documents and provided extensive comments for NMFS evaluation during the consultation process.

The NMFS concurs with the effects determination of "may affect not likely to adversely affect" freshwater or marine life stages of threatened Puget Sound chinook salmon or designated critical habitat. Additionally, construction and operation of the STIA projects are "not likely to adversely affect" EFH for coastal pelagic species or West Coast Groundfish.

Project Location and Description

Most STIA projects are located within the cities of SeaTac and Des Moines, King County, Washington (Sections 4 and 5, Township 22 North, Range 4 East, and Sections 20, 21, 28, 29, 32, and 33, Township 23 North, Range 4 East, Willamette Meridian). Off-site wetland mitigation will occur in the City of Auburn, King County, Washington (Section 31, Township 22 North, Range 5 East, Willamette Meridian).

STIA projects will develop portions of property located on and near the existing Sea-Tac airport, and provide wetland mitigation near the Green River in the City of Auburn. The principal objectives of these actions are: 1) to provide a new 8,500 foot air carrier runway, 2) to provide a 600 foot extension to an existing runway, 3) to extend runway safety areas to meet existing FAA safety standards, 4) to upgrade existing facilities at SEA-TAC airport. Construction is scheduled for completion in 2010.

STIA projects (Table 1) include: the construction of runways, taxiways, borrow areas and runway safety areas (RSAs); installation of FAA and navigation aids (e.g., the new Airport Traffic Control Tower, airport surveillance radar [ASR], and airport surface detection equipment [ASDE]); improvements to airfield buildings, terminal and air cargo areas, roads, parking, the South Aviation Support Area (SASA), stormwater management facilities and the Industrial Wastewater System (IWS) facilities; and acquisition and demolition of existing structures. Proposed actions also include the relocation of approximately a 980-foot reach of Miller Creek as well as the development of avian habitat at a mitigation site near the Green River in Auburn.

The "action area" for these actions is the locations where STIA project construction will occur and the surrounding vicinity where direct and indirect effects could reasonably be expected to occur. This includes the aquatic habitat of Miller, Walker (a tributary to Miller), Des Moines, and Gilliam creeks downstream of the airport and the associated estuaries of Miller and Des Moines Creeks. The area surrounding the Midway Sewer District outfall in Puget Sound is

considered to be part of the action area because effluent from the Industrial Wastewater System is released to the Midway Sewer District. The Auburn wetland mitigation site and vicinity, where indirect effects could reasonably occur, are also included in the action area.

Status of the Species and Critical Habitat

The NMFS assessment of the effects of an action involves the initial steps of defining the biological requirements and current status of the listed species, and evaluating the relevance of the environmental baseline to the species' current status.

The status review of west coast chinook salmon populations defined 15 Evolutionarily Significant Units (ESUs) in Washington, Oregon, Idaho, and California, including the Puget Sound ESU (Myers et al. 1998). Chinook salmon in the Puget Sound ESU have declined substantially from historic levels due to the effects of hatchery supplementation on genetic fitness of stocks, severely degraded spawning and rearing habitats throughout the area, and harvest exploitation rates exceeding 90 percent for some Puget Sound chinook stocks. Puget Sound chinook were designated as threatened in March 1999 (NMFS 1999a)

Chinook salmon from the Puget Sound region consist largely of summer and fall run stocks, with juveniles that typically migrate to the marine environment during their first year of life (Myers et al. 1998). These "ocean-type" chinook rear in freshwater a few months or less, and most of their rearing occurs in the nearshore marine environment. Generally, ocean-type chinook migrate downstream in the spring, within months after emergence, or during the summer and autumn after a brief period of rearing in fresh water (Healey 1991; Myers et al. 1998). In Puget Sound, subyearling chinook salmon smolts typically migrate near the shoreline then move offshore as they grow in size. Yearling chinook smolts, that are typically produced by spring run adults and are uncommon in the project area, would spend less time near the shoreline of Puget Sound. Chinook juveniles may reside in the Puget Sound region until at least November before migrating to the North Pacific Ocean (Hartt and Dell 1986). Mature chinook salmon return to their natal rivers predominately as three-, four- and five-year-olds.
Juvenile chinook salmon feed opportunistically in Puget Sound. They consume large zooplankton, such as euphausiids and large copepods, amphipods, juvenile shrimp, and larval fishes (e.g., herring and sandlance) (Miller et al. 1977; Fresh et al. 1979, Simenstad et al. 1982). In areas where riparian habitat is abundant near the Sound, terrestrial insects can be an important prey item for juveniles up to 75 mm or so. Larger chinook will typically consume larger prey and the proportion of fish in the diet increases with size.

Chinook salmon that are present in the action area will most likely be from either the Green/Duwamish River (for the off-site mitigation action area and Gilliam creek) or the Puyallup River (for the estuaries of Miller and Des Moines creeks) stocks. The Duwamish/Green stock is considered to be healthy (WDFW 1993). The status of the Puyallup River stock was considered to be uncertain by WDFW (1993). Population trends for each stock is reported (Myers et al 1998) to be increasing gradually (1-5%).

Critical habitat for Puget Sound chinook salmon was designated in February 2000 (NMFS 2000) and includes all Puget Sound waters, estuaries, and freshwater habitats accessible to Puget Sound chinook salmon. Due to the complex life histories of salmonid species, habitats must be available for juvenile rearing, juvenile migration corridors, growth and development to adulthood, adult migration corridors and spawning. Major river basins that support this ESU include the Nooksack, Skagit, Stillaguamish, Snohomish, Green/Duwamish, Puyallup, Nisqually, Skokomish, Dungeness, Cedar, and Elwha Rivers. Critical habitat for threatened Puget Sound chinook salmon in the Duwamish hydrologic units is limited to habitat downstream from the Howard Hansen Dam. Major bays and estuarine/marine areas providing critical habitat to this ESU include the South Sound, Hood Canal, Elliott Bay, Possession Sound, Admiralty Inlet, Saratoga Passage, Rosario Strait, Strait of Georgia, Haro Strait, and the Strait of Juan De Fuca.

No threatened Puget Sound chinook salmon occur in Miller, Walker or Des Moines Creeks. There is no documented historical usage of Miller or Walker Creeks by chinook salmon. Recent surveys confirm that coho and chum salmon spawn in Miller creek but did not observe any chinook salmon. These surveys found a general lack of clean, unembedded gravel of a suitable size for chinook spawning, and a general lack of pools and instream cover for rearing. The specific physical characteristics of the stream do not provide appropriate habitat for spawning or rearing of chinook salmon. Consequently, there is no critical habitat present in Miller or Walker Creeks upstream of the estuary.

Des Moines Creek also lacks suitable habitat for chinook salmon spawning and rearing and was not used historically by chinook. Although nearly 75,000 juvenile chinook were released in Des Moines Creek between 1990 and 1993 (Myers et al 1998), there is no documented return of adults. Because few anadromous fish are able to pass the culvert beneath Marine View Drive, adult spawners would have been concentrated in the creek's lower 0.4 mile and evident to users of Des Moines Beach Park. Coho and chum salmon as well as cutthroat and steelhead trout occur in the lower reaches of Des Moines creek.

Given these considerations, the freshwater portion of Miller and Des Moines Creeks is not critical habitat for chinook salmon. The only critical habitat in either basin is located at the estuarine mouths of each creek. These areas may provide habitat for juvenile and adult migration. During the summer of 2000, the King County Department of Natural Resources conducted a pilot study to evaluate the use of nearshore marine areas by all species of juvenile salmonids. The collected samples between June and August at eight sites including Miller Creek using beach seines. On the nearshore marine beaches near Miller Creek they obtained

approximately 0.5 fish per seine haul, lower population densities than were reported for other sites in their study area. These data suggest that the nearshore area around Miller Creek, and probably at Des Moines Creek, do not provide significant marine rearing habitat for Puget Sound chinook salmon.

The wetland mitigation site and Gilliam Creek are located in the Green/Duwamish River Basin. Development of the 482 mi^2 Green/Duwamish watershed has resulted in a variety of changes to the basin's suitability for salmonids. This development includes the diversion of Black and White rivers during the early 1900s, construction of Howard Hansen Dam (RM 64) that blocks access to significant habitat upstream, diking of the mainstem below RM 38, forest practices, agriculture, urbanization, and industrialization in the lower Duwamish River. Of the original Green/Duwamish estuary, 97 percent has been filled; 70 percent of its original flow has been diverted to other basins, and 90 percent of the original floodplain is no longer flooded on a regular basis (USEPA 2000a). The city of Tacoma diverts flows in the upper watershed for use as a municipal water supply. The middle portion of the basin remains primarily rural; however, agriculture has increased sediments and nutrients in the river, degrading water quality as well as salmon spawning and rearing habitats. The lower reaches are becoming increasingly urbanized. The tidally influenced Duwamish Waterway has been extensively dredged and channelized for maritime use by the Port of Seattle and private industry. Despite these significant anthropogenic alterations, chinook salmon and other anadromous salmonids (coho, chum, steelhead) use the Green/Duwamish for spawning, rearing and migration. The BA indicates that chinook and other salmon spawn in the Green River, within several hundred feet of the wetland mitigation site. Therefore, this portion of the Green River is critical habitat for threatened Puget Sound chinook salmon.

Gilliam Creek is a small creek that is a tributary to the Green River and discharges to the Green River in the vicinity of the city of Tukwila. This creek discharges to that part of the Green River used for migration by returning adults and outmigrating juveniles. Gilliam Creek is used primarily by resident fish because culverts limit adult salmonid access to this tributary. Gilliam creek has been impacted by development; it is extensively culverted and receives stormwater runoff that causes high peak flows and low base flows. The lack of spawning gravel and appropriate flow conditions for chinook makes it very unlikely that adult chinook salmon will use Gilliam Creek for spawning. During the winter and spring months, juvenile salmon could be rearing in the area where Gilliam Creek discharges to the Green River. One juvenile salmon observed in Gilliam creek in February 1997 was recorded s a chinook by Ryan Partee, a fisheries biologist employed by the City of Tukwila. Thamfish apparently entered Gilliam creek because the flap gate located at the confluence of Gilliam creek and the Green River was partially open. The occurrence of chinook salmon in Gilliam Creek is a rare event. Entering Gilliam Creek may impede outmigration of juvenile salmonids and because the flap gate restricts flow and may limit return to the Green River for outmigration. Proposed restoration projects in Gilliam Creek and removal of the flap gate may increase the value of Gilliam Creek for chinook rearing habitat, although the stream will still be impacted by urban development unrelated to STIA.

The IWS outfall is located in Puget Sound 1,800 ft offshore and in 170 ft of water. This area is critical habitat and represents a migration corridor for returning adult chinook salmon. No juvenile chinook will be present at this depth.

Effects Determination

Guidance for making determinations of effects are contained in The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids, (NMFS 1999b). The NMFS' critical habitat analysis considers the extent to which the proposed action impairs the function of essential elements necessary for migration, spawning, incubation and rearing of the listed salmon under the existing environmental baseline.

Not likely to adversely affect (NLAA) is the appropriate conclusion when effects on listed species are expected to be discountable, or insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs (USFWS/NMFS 1998). Discountable effects are those so extremely unlikely to occur that a reasonable person would not be able to meaningfully measure, detect or evaluate it (NMFS 1999b). This level of effect requires informal consultation, which consists of NMFS concurrence with the action agency's determination.

NMFS has related the biological requirements for listed salmonids to a number of habitat attributes, or pathways, in the Matrix of Pathways and Indicators (MPI). These pathways (Water Quality, Habitat Access, Habitat Elements, Channel Condition and Dynamics, Flow/hydrology, Watershed Conditions, Disturbance History, and Riparian Reserves) indirectly measure the baseline biological health of listed salmon populations through the health of their habitat. Specifically, each pathway is made up of a series of individual indicators (e.g. indicators for Water Quality include Temperature, Sediment, and Chemical Contamination.) that are measured or described directly (NMFS 1996). Based on the measurement or description, each indicator is classified within the properly functioning condition (PFC) framework as: 1) properly functioning, 2) at risk, or 3) not properly functioning. Properly functioning condition is defined as "the sustained presence of natural habitat forming processes in a watershed that are necessary for the long-term survival of the species through the full range of environmental variation."

The BA included MPIs for Miller Creek, the Miller Creek estuary, Des Moines Creek, the Des Moines Creek estuary and the Green River near the Auburn mitigation site. The MPI for Gilliam Creek was submitted, in response to a request from NMFS, on 2 November 2000. For Miller, DesMoines and Gilliam creeks nearly all indicators are considered to be "not properly functioning" and none were "properly functioning". Habitat conditions in the estuaries are somewhat better than upstream habitat conditions, generally being classified as "at risk" rather than "not properly functioning". However, the estuaries have been seriously altered by riprap

along the channel and filling of tidelands that limits total benthic production in the estuaries. All habitat conditions in the Green River were classified as "at risk" except for refugia which was considered to be "not properly functioning" because of lack of off channel habitat for rearing juveniles.

STIA projects will have temporary and long-term impacts to the aquatic habitat in Miller, Walker, and Des Moines Creeks. Less substantial impacts are expected to occur in Gilliam Creek, the estuaries of Miller and Des Moines Creeks, the outfall of the Midway Sewer District and in the Green River during construction of the offsite mitigation wetland. Potential impacts include changes in water quality, alterations to hydrologic conditions and alterations to wetland and stream habitats. Numerous conservation measures are proposed to reduce and minimize potential adverse impacts.

Since there are no chinook salmon, or critical habitat for chinook salmon, in Miller, Walker or Des Moines Creeks, STIA projects in these watersheds will have no direct effects to threatened Puget Sound chinook. The only potential indirect effects will occur in the estuaries of Miller and Des Moines Creeks and are expected to be insignificant or discountable. Effects of STIA projects are also insignificant or discountable for Gilliam Creek, the Midway Sewer outfall and the Green River. Consequently, NLAA is the appropriate determination for the project. The NMFS has completed a detailed evaluation of these projects in case reinitiation of consultation will be required in the future.

Water quality: Miller, Walker and Des Moines Creeks could potentially be affected by STIA projects due to construction activities and permanent additions of impervious surface that could lead to additional sediments and contaminants in stormwater runoff. Contaminants include conventional pollutants associated with urban type development, ground and aircraft de-icing activities, and discharge of effluent from the IWS system. There is also concern that contaminants from the embankment fill may leach into downstream wetlands and streams.

In Washington State protection of water quality protection is regulated by the Washington State Department of Ecology (DOE) under the Federal Water Pollution Control Act, also known as the Clean Water Act, and the Washington Water Pollution Control Act. The Clean Water Act is designed to protect the "chemical, physical, and biological integrity of the Nation's waters" and is implemented through Section 401, Section 402 (the National Pollutant Discharge Elimination System [NPDES]) and Section 404 (addressing fill and the waters of the United States). According to DOE, the conditions of the NPDES permit "constitutes compliance with the Federal Water Pollution Control Act.and the Washington Water Pollution Control Act (RCW 90.48)." NMFS has not consulted with EPA on impacts of water quality standards to threatened and endangered species. However, restrictions imposed in the past by the NPDES permits have improved the water quality of stormwater discharged by the Port. Conditions imposed by DOE for the NPDES permit include: 1) Effluent limitations based on the more stringent of either technology- or water quality-based limits; 2) A stormwater pollution prevention plan (SWPPP)

that identifies source control and treatment best management practices (BMPs); 3) Routine water quality and toxicity monitoring for STIA stormwater outfalls and IWS discharge, and reporting of these results to Ecology and; 4) Evaluation of pollution sources and BMP effectiveness via self-inspection and monitoring results.

The Port has proposed numerous BMPs to reduce and minimize water quality effects including pollutant source control, water quality treatment and enhancement of wetland and stream water quality functions. Past monitoring programs identified the need for specific BMPs to reduce or eliminate identified or potential water quality impacts. This adaptive management approach will continue to be used to identify additional BMPs for new, existing, and redeveloped areas at STIA. Thus, the quality of stormwater discharge should improve as new technologies are developed or specific sources of contamination are identified.

Changes on the landscape due to removal of vegetation, excavation and grading during construction could contribute to increased turbidity and sedimentation in the receiving waters. The Port will utilize BMPs (eg. Temporary and permanent cover practices, erosion control and sediment retention) and a stormwater treatment system during construction to reduce potential impacts. Demonstration projects to date indicate that treated discharge water meets applicable water quality criteria and is often less turbid than untreated water in the streams.

Increased sedimentation and turbidity are likely short-term effects due to instream construction in Miller and Des Moines Creeks. Sediment inputs may result from a variety of activities including the initial redirection of the stream, disturbance of the banks by construction, planting activities, and stormwater runoff. Exposed soil is vulnerable to erosion from short-term hydration rainfall or steady rainfall over a longer period of time which saturates the soil. Failure of erosion control measures could result in higher levels of sediment and turbidity in the aquatic system. Since chinook salmon are not found in these streams we do expect any effects to this species from sediment and turbidity changes in these streams. However, resident salmonids and other vertebrate and invertebrate species in the streams may be affected.

Increased turbidity and sedimentation is not expected to occur in Gilliam Creek because the only construction project in this basin, a new water tower, has the same footprint as the existing tower and no new impervious surfaces will be added in the basin.

Sediment may initially enter the Green River due to construction of the alternative mitigation site. The mitigation site will be dewatered during construction and pumped water will be discharged to the Green River. During excavation and until replanted vegetation has formed adequate cover, turbid water may also leave the site via the drain system, which eventually flows into the Green River.

Quantifying the impacts of turbidity to fish species is complicated by several factors (Bisson and Bilby 1985, Spence et al 1996). Turbidity will typically decrease downstream from instream

activity. However, the rate at which turbidity levels attenuate is dependent upon the quantity of materials in suspension (e.g. mass or volume), the particle size of suspended sediments, the amount and velocity of ambient water (dilution factor), and the physical/chemical properties of the sediments. The impact of turbidity on fishes is related not only to the turbidity levels (NTUs), but also the particle size of the suspended sediments. When salmonids are exposed to turbidity, they display a number of behavioral and physiological responses (i.e., gill flaring, coughing, avoidance, increase in blood sugar levels) that indicate some level of stress (Berg and Northcote 1982, Servizi and Martens 1992). The magnitude of these responses is generally higher when turbidity is increased and particle size decreased. However, moderate levels of turbidity (35-150 NTU) may benefit juvenile chinook salmon by increasing foraging rates and growth and reducing vulnerability to predators (Gregory and Northcote 1992). A particularly important impact of fine sediments is to cause embeddedness of spawning and incubation gravel with subsequent reductions in the survival of eggs and embryos.

Several factors contribute to minimize the potential impacts of sediment discharges to chinook in the Green River. Proposed water quality controls will limit the amount of sediment that will be discharged. Distance from the project site to discharge in the Green River will allow for settling of sediments prior to discharge. High turbidity levels in the Green River will cause sediment load in the discharge from the mitigation site to be imperceptible. The timing window will reduce the likelihood of chinook juveniles being present in the river during the construction period. If juvenile chinook are present in the river and turbidity levels are high, the fish are expected to move temporarily to refuges where high turbidity can be avoided, thus preventing injury or death. Because the turbidity caused by this action will be short lived, returning to baseline levels soon after construction is over, long-term impacts (i.e., adverse modification of critical habitat) will not occur. Overall, this project will not increase the existing baseline turbidity level of the Green River.

Operation of the airport after implementation of the STIA projects could impact water quality in Miller and Des Moines creeks and waters of the Puget Sound near the IWS outfall. Water quality impacts to each creek could result from the discharge of pollutants typically present in urban stormwater, as well as the anti-icing and de-icing chemicals used in airport operations. Additional water quality impacts could occur in the water column at the IWS discharge.

Effects of chemicals in stormwater generated by the STIA operations were predicted using measured chemical concentrations in existing discharges and then mathematically modeling exposure concentrations for critical habitats where chinook salmon may be present. The Port has monitored stormwater quality from its outfalls since 1995. Total petroleum hydrocarbon [TPH], fecal coliforms, BOD, TSS, turbidity, total recoverable copper (Cu), lead (Pb), and zinc (Zn), ethylene glycol and propylene glycol are the chemicals that DOE and the Port have considered to be the significant chemicals most likely to be discharged to surface waters by airport activities. Ethylene glycol and propylene glycol, potassium acetate (KA), and calcium magnesium acetate (CMA) are de-icing chemicals used at STIA.

Past data show the efficacy of BMPs implemented by the Port. For example, airport runoff is, for most parameters measured, cleaner than runoff from other urban areas although it may not meet water quality standards for protection of aquatic life. Cu and Zn concentrations have dropped significantly at outfall SDS-1 since new BMPs re-routed runoff from the SDS to the IWS in June 1997. Cu and Zn concentrations at SDN-3 and SDN-4 are high relative to water quality standards but may be reduced with new BMPs imposed with new STIA projects. Although these outfalls discharge into an area where listed chinook salmon do not occur, and where critical habitat does not exist, concentrations of Cu and Zn that exceed the water quality standards may adversely impact resident fish and other aquatic species.

Water in Des Moines Creek and Miller Creek, and discharges from the IWS may exceed chronic toxicity concentrations for Cu and acute toxicity values for Zn. The plume from the IWS outfall diffuser is located 1,800 feet off shore in Puget Sound at a depth of 156 ft to 178 ft. Discharge rates at the IWS will increase as a result of the proposed action and could raise baseline chemical concentrations above ambient in the vicinity of the outfall. Migrating adult chinook may occur within this area, however, they are unlikely to be exposed for long periods of time. Therefore, exposure in the vicinity of the IWS outfall will not significantly affect Puget Sound chinook.

Juvenile chinook salmon may also be exposed to elevated concentrations of Cu and Zn if they migrate through the estuaries at the mouths of Des Moines and Miller creek. Exposure to current concentrations of contaminants does not appear to be detrimental because toxicity testing with 100% stormwater discharge generally does not exhibit toxicity to the cladoceran (*Daphnia pulex*), a species that is very sensitive to trace metal contaminants. In addition, the healthy salmonid populations that occur in these streams would not be expected if the streams were exposed to significant contamination from Cu and Zn for extended periods. If there are no significant effects near the stormwater discharges, it is unlikely that more significant impacts would be observed in the estuary as a result of these discharges. Concentrations of Zn and Cu discharged into Miller and Des Moines creeks will decline as a result of STIA projects because pollution generating impervious surfaces (PGIS) that currently exist at the airport will be retrofit with BMP's or diverted to the IWS to reduce discharges to the streams. Conversion of current residential areas to runways and open space will also reduce heavy metal discharges from these areas.

Application of ground de-icers (potassium acetate. calcium magnesium acetate and sand on road surfaces) is not expected to affect chinook salmon because these chemicals degrade into naturally occurring elements or will be retained by treatment BMPs. Runoff of aircraft anti-icing and de-icing fluids could potentially affect chinook salmon and other aquatic species. The maximum modeled concentrations at the IWS outfall and at the mouths of Miller and Des Moines creeks are a factor of seven lower than the relevant toxicity value. Therefore, anti-icing and de-icing fluids are not expected to negatively impact chinook salmon. In addition, the highest concentrations of de-icing fluids will occur in the winter when chinook salmon are not expected to occur at these sites.

Numerous other actions are proposed by the Port to improve overall water quality in Miller and Des Moines creeks. These include source controls, diversion of contaminated materials to the IWS for treatment, extensive implementation of treatment BMPs, conversion of farmlands and golf course to shrub wetlands, and conversion of residential areas to open lands and streams with more extensive buffers.

There is a potential for contaminated leachate to enter Miller Creek from the embankment. Although the Port is accepting fill material that generally meets the Model Toxics Control Act (MTCA) Method A contaminant levels that have been established by DOE, some fill material has been accepted that contains DDT, PCBs, PAHs, and mercury. Material that is obtained from state-certified commercial borrow pits is generally accepted for airport airfield projects without source-specific environmental certification. The Washington Department of Transportation certifies materials that are geotechnically suitable but does not include testing for contaminants. Some material that does not satisfy MTCA Method A levels of contaminant may be appropriate for placement in a specific project location. The Port will consult with the DOE for approval prior to accepting fill that does not meet the Method A standard. The Port, in consultation with USFWS, has redesigned the embankment to minimize the potential release of contaminants. The Port will also develop a monitoring program to confirm that the concentration of contaminants in seepage water from the embankment are not impacting aquatic life in the streams.

Hydrology: The most important effects of urban and suburban development on salmonid populations results from alterations in stream hydrology. Removal of forests and creation of impervious surfaces prevents infiltration of water into the ground and creates rapid discharge of stormwater over the earth's surface or from stormwater pipes. Significant changes to hydrology include increased peak flows during the winter and lower summer base flows.

The proposed project will create increased impervious surfaces in the Miller Creek (approximately 106 acres), Walker Creek (approximately 6 acres), and Des Moines Creek (approximately 128 acres) watersheds. No increase in impervious surfaces is expected in the Gilliam Creek watershed. To minimize impacts to stream hydrology within these watersheds, stormwater management actions are proposed to reduce peak flow events. Detention facilities will be sized to meet King County Level 2 flow control standards. These standards require that flow duration of post-developed runoff will match the pre-developed flow duration for all flow magnitudes between 50 percent of the 2-year flow event and the 50-year flow event.

To protect Miller and Des Moines creeks from increased stormwater runoff, the Port will design STIA projects and retrofit existing airport areas to match peak flows and control the duration of erosive flow rates in the streams to pre-developed conditions. The Port will construct stormwater conveyance, detention, and treatment facilities to manage runoff from both newly developed project areas and existing airport areas. Projects designed to minimize hydrologic impacts include construction of stormwater detention ponds and wet vaults. Some BMP's employed to minimize the impacts of water quality (eg. Bioswales) and infiltration adjacent to the runways

and in reconstructed areas of Miller Creek should reduce direct runoff compared to current conditions.

The Stormwater Management Plan prepared by the Port suggests that flow controls for the STIA projects will reduce peak flows in Miller, Walker, and Des Moines creeks downstream of the STIA discharges. The target flow regime was selected to achieve the flows required by regulations and to reduce peak flows in the stream channels. Reduced peak flows will reduce bank erosion and potentially reduce sedimentation and turbidity in the creeks and their estuaries. These actions are also predicted to enhance baseline hydrologic conditions in the streams and associated estuaries.

The Comprehensive Stormwater Management Plan that was submitted by the Port is currently being reviewed by King County and the Washington State Department of Ecology. It is uncertain if the detention facilities that are currently proposed are adequate to meet Level 2 flow control standards. If the project as implemented satisfies the Level 2 flow control standard, peak flows in Miller, Walker and Des Moines creeks will be improved and alterations in hydrology will not adversely impact chinook salmon or their critical habitat in the estuaries. However, if peak flows are not reduced, and the peak/base flow indicator may be further degraded. This indicator is currently "not properly functioning" in all three watersheds. Further degradation may adversely impact critical habitat in the Miller and Des Moines creek estuaries and require reinitiation of consultation.

The proposed project may result in reduced baseflows within Miller and Des Moines Creeks, although the BA predicts that post-project hydrology will match or improve on the existing baseline for Miller, Walker, and Des Moines creeks. Current baseflows in Miller and Des Moines Creeks are approximately 1.8 cfs and 2.4 cfs, respectively. A reduction of approximately 4 percent (0.07 cfs) in Miller Creek baseflows and 7 percent (0.17 cfs) in Des Moines Creek baseflows was projected by Pacific Groundwater Group (2000). Streamflow analyses conducted by Earth Tech, Inc. (2000) also predicted reduced streamflows for both Des Moines and Miller Creeks during the low flow periods of August and September. Stream flows for Walker Creek were predicted to increase during August and September, 0.008 cfs and 0.010 cfs, respectively, as a result of recharge from the fill recharge and secondary impervious recharge. No net change in 7-day/2-year low flow is anticipated for Walker Creek. For the 7-day duration/2-year frequency stream discharge, a deficit of 0.10 cfs for Miller Creek at the SR 509 crossing and 0.08 cfs for Des Moines Creek were predicted.

Measures to prevent or mitigate effects on low summer baseflows in Miller and Des Moines Creeks include incorporation of infiltration into stormwater detention facilities, managed release of stormwater from reserved storage and secondary recharge from biofiltration strips on the embankment. According to the low stream flow analysis, average August and September flows are predicted to increase and the 7-day low flows are expected to match pre-project conditions for Miller, Walker and Des Moines creeks. If these flows are met, changes in low flow

hydrology will not adversely affect chinook salmon or their critical habitat. Several assumptions in the low flow analysis have been challenged by the ACC, including the inability to construct acceptable storage vaults, reduced infiltration from the IWS lagoons, unknown infiltration capacity and percolation properties of the embankment, potential subsurface flows in the reconstructed sections of Miller Creek, and loss of discharge and inter-basin transfer of water if IWS discharge is piped to the Renton treatment plant. These concerns suggest that low flow may actually be reduced following STIA actions. If lower flows do occur they may negatively impact resident fish and other aquatic species, but impact to chinook salmon will be discountable because chinook do not occur in these streams.

Wetland and stream habitat: The STIA projects will produce temporary and permanent effects to riparian and wetland habitats. Temporary construction impacts to stream and riparian habitat will be minimized by implementing the BMPs for erosional and sedimentation control.

Direct impacts to stream habitat caused by STIA projects include the filling of approximately 980 ft of Miller Creek. The existing stream channel influences the flow pattern in receiving waters, the amount of aquatic habitat available to macro-invertebrates, and detritus transport to the creek. This section of Miller Creek also supports resident fish including cutthroat trout and threespine stickleback but does not contain critical habitat for any listed species. This affected section of Miller Creek is an artificial (i.e., constructed ditch) stream channel adjacent to the Vacca Farm site that has been modified to support agricultural activities. Existing conditions are degraded because the natural creek was moved to its present location and constructed as a straight channel to improve drainage in the area for farming. The existing channel lacks spatial heterogeneity in streambed substrate, channel configuration, instream fish habitat and riparian vegetation. Ditching of this section of the Miller Creek channel has probably reduced macroinvertebrate habitat, detritus transport, and fish habitat compared to more natural channel reaches located downstream. Direct impacts from filling 980 ft of the stream channel would be a loss of surface water conveyance, and existing macroinvertebrate habitat and fish habitat.

The proposed project will fill 0.26 ac of Wetland 44 but no direct impacts are expected to occur to the Walker Creek channel or fish habitat. A culvert over Des Moines Creek on the Tyee Golf Course will be replaced, but this culvert does not occur in stream habitat used by listed species. No other culverts will be added to Miller, Des Moines, or Walker creeks.

Adverse impacts resulting from the filling of Miller Creek will be reduced through conservation measures designed to improve ecological functions in this reach relative to existing conditions. Conservation measures to minimize impacts include: 1) Relocating Miller Creek in a new channel that has a more natural, complex stream morphology and substrate, and 2) Establishing a native forested riparian zone to provide particulate trapping and sediment retention, optimal buffer stream temperatures, adequate shade for the stream, and a source of detritus and coarse woody debris to the downstream reaches. The net effect of relocating a reach of Miller Creek is expected to be an improvement in water quality and macro-invertebrate and fish habitat in the relocated reach and downstream portions of Miller Creek. Although there will be a temporary

loss of function while the reconstructed stream develops natural functions, these alterations will not adversely impact chinook salmon or their critical habitat because there are no chinook salmon in the stream.

The STIA projects will result in direct permanent impacts (filling) to 18.3 ac of wetlands and temporary construction impacts to 2.2 ac of wetlands. Temporary impacts during construction include removal of wetland vegetation (native and non-native), potential sedimentation, and temporary use of wetland areas for construction stormwater management. Direct impacts to wetland functions due to STIA projects include loss of wildlife habitat and other ecological functions. Wetlands in the project area support native shrub and forest vegetation that provide habitat for songbirds, amphibians, and small mammals. Several wetland areas that are in the riparian zone of Miller Creek or Walker Creek are presumed to support fish habitat in the adjacent streams. These wetlands provide shade, detrital inputs, invertebrates, woody debris, and groundwater discharge to the creeks. The riparian wetlands located on groundwater seeps adjacent to Miller and Des Moines creeks provide base flow support functions and may help maintain stream temperatures during summer months. Many of the wetlands have limited stormwater storage capacity due to their small size, lack of direct connections to the streams, or topographic conditions that limit stormwater detention. The existing groundwater recharge function is also limited because most wetlands appear to be underlain by relatively compact soils that limit groundwater infiltration rates. Wetlands within the project area that occur on relatively flat areas and receive runoff from urban areas do function to improve water quality.

Conservation measures are proposed to avoid and minimize direct impacts to the biological and physical functions of on-site wetlands. These combined conservation measures include restoration and functional enhancement of a total of 19.7 ac of in-basin wetlands, as well as enhancement of 28.4 ac of riparian and wetland buffers. In addition, to mitigate for avian habitat that cannot be replaced in-basin due to wildlife hazards to aircraft operations, a total of 40.6 ac of restored or enhanced wetlands, and 15 ac of buffer enhancement will be created at the Auburn mitigation site. It is difficult to determine if these measures will completely mitigate for lost wetland functions, however, as chinook salmon do not occur in Miller Creek, no direct impacts to the species or their critical habitat will occur from stream relocation or wetland fill. Indirect effects to chinook will be insignificant because of the minimization and conservation measures to be implemented by the applicant.

Potential indirect impacts due to filling of wetlands by the MPU project include changes in hydrology to downslope wetlands and streams, reduction in the amount of wildlife habitat available for wetland species, and changes in water quality through removal of wetland area.

Indirect impacts to hydrology include changed hydrology in wetlands downslope of filled wetlands, as well as impacts to base flow in streams adjacent to filled wetlands. Indirect impacts to the hydrology of wetlands adjacent to the fill are not expected to be significant and will not significantly alter their hydrologic function. It is anticipated, however, that Section 404 permit

conditions will require monitoring the hydrology of downslope wetlands to determine that sufficient hydrology is present to maintain the areas as wetland.

Several STIA projects are designed to avoid and minimize unavoidable impacts to wetlands. In-basin projects are proposed to restore wetland and stream functions, including the establishment of 48.06 ac of wetland enhancement and stream buffering that will be protected in perpetuity from future development. Other actions include grading to establish wetland hydrology, removing invasive non-native species, planting native wetland vegetation, and installing LWD. Mitigation actions also include removing certain existing land use conditions (e.g., paved surfaces, artificial landscaping and attendant nutrient and pesticide inputs, septic systems, and channel riprap) that degrade on-site wetland and aquatic habitat.

The buffer enhancement project will protect about 24 ac of riparian habitat along Miller Creek. Planting along the length of the buffer will vary depending upon the existing buffer condition. In sections of the buffer that are primarily lawn, areas will be planted with native trees and shrubs. Areas that contain some native and some non-native vegetation will be enhanced by either inter-planting native species to produce a continuous tree canopy or underplanting native shrubs beneath an existing canopy that lacks understory vegetation. Some areas that contain invasive species (such as Himalayan blackberry and Japanese knotweed) will be cleared, graded, and also inter-planted with native woody vegetation. The increased riparian buffer is expected to increase habitat quality for resident salmonids and other aquatic organisms in the Miller Creek basin.

To improve water quality and riparian habitat within the Des Moines Creek basin, approximately 4.5 ac of emergent wetland area, located within the existing and active Tyee Valley Golf Course, would be restored to a native shrub vegetation community. The enhancement would convert the existing turf wetland to a native shrub wetland community. Planting a native shrub community on the golf course would reduce chemical runoff reaching aquatic environments and fish populations in Des Moines Creek, increase nutrient removal and recycling in the riparian zone, and decrease wildlife attractants within 10,000 ft of the airfield.

Efforts to restore and enhance aquatic environments have generally been less successful than envisioned by their planners. Even if long term benefits result, there are often short term negative impacts as the new projects develop into natural systems. It seems likely that short term adverse impacts may occur in Miller Creek although the long term effects will probably be beneficial to most aquatic life in this ecosystem.

Chinook salmon will not be adversely affected by wetland and stream habitat projects because all wetland impacts occur in portions of the Miller and Des Moines creek basins that do not contain critical habitat for these species.

Conclusion

Effects of STIA projects were evaluated in terms of water quality, hydrology and habitat alterations for various locations within the action area. At several of these locations, chinook salmon do not occur. At other locations chinook occur seasonally or rarely. Consequently, the

effects determinations are generally insignificant or discountable (Table 2).

TABLE 2. Summary of STIA Project Effects to Puget Sound Chinook Salmon

LOCATION	Fish Present	Water Quality	Hydrology	Habitat Alterations
Miller Creek	NO	Insignificant	Insignificant	Insignificant
Walker Creek	NO	Insignificant	Insignificant	Insignificant
Des Moines Creek	NO	Insignificant	Insignificant	Insignificant
Gilliam Creek	Rarely	Discountable	Discountable	Discountable
Green River (Mitigation site)	YES	Discountable	Discountable	Beneficial
Miller Creek Estuary	Seasonally	Insignificant	Insignificant	Insignificant
Des Moines Creek Estuary	Seasonally	Insignificant	Insignificant	Insignificant
Midway Sewer Outfall	Adults	Insignificant	Discountable	Discountable

After reviewing the current status of the Puget Sound chinook salmon, the environmental baseline for the action area, and the effects of the proposed STIA actions, the NMFS concludes that these actions may affect but are not likely to adversely affect Puget Sound chinook or their designated habitat.

Incidental Take

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity

NMFS does not anticipate the proposed action will incidentally take Puget Sound chinook salmon. Therefore, reasonable and prudent measures are not necessary and appropriate. Furthermore, no terms and conditions are provided as incidental take is not anticipated.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The following conservation recommendations are provided for FAA, the COE and the Port:

1. Monitor fish use, including spawning activities of salmonid species, in Miller and Des Moines Creeks to determine success of habitat enhancement and restoration activities.

2. Monitor macro-invertebrates in Miller and Des Moines Creek to evaluate the effectiveness of restoration activities. Samples should be collected near the restoration sites and near the mouths of the creeks to evaluate if basin-wide impacts are detected.

3. Evaluate the effectiveness of temporary erosion and sediment control measures.

4. Monitor instream flows in Miller, Walker and Des Moines Creeks to confirm that peak flows have been reduced and low flows have been maintained.

5. Where feasible, expand the buffers along Miller Creek to restore natural ecological functions in the riparian zone and at the land-stream ecotone.

6. Implement additional best management practices to reduce concentrations of Cu and Zn below the chronic toxicity levels for aquatic organisms.

7. Monitor storm water drains for Cu and Zn to confirm that the expected reductions actually occur.

8. Use mechanical methods to remove exotic vegetation and reduce pesticide use in riparian zones, golf course and any other areas that drain to the strormwater system or directly to surface streams.

Reinitiation Notice

This concludes informal consultation on the Master Plan Update Improvements Seattle-Tacoma International Airport Project. As provided in 50 C.F.R.§ 402.16 consultation must be reinitiated where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) any take occurs; (2) new information reveals effects of the action that may affect listed species in a way not previously considered; or (3) a new species is listed or critical habitat is designated that may be affected by the action). To reinitiate consultation, the FAA must contact the Habitat Conservation Division (Washington Branch Office) of NMFS.

The WDOE and the Army Corps of Engineers have not completed their review of the project at this time, therefore issuance of the NPDES permit, water quality certification (401), and Clean Water Act Section 404 permit have not occurred. The BA includes a number of best management practices that are proposed to meet state water quality standards. The BA acknowledges that additional measures may be necessary. The NMFS' review of the effects of the proposed action assumes that the criteria in the Washington State surface water quality standards will be met by the project at all times. Any future actions that may be taken to meet State surface water quality standards or Section 404 permit requirements need to be evaluated to determine if reinitiation of this consultation is necessary. The NMFS will consult on future federal actions that are not included in this consultation.

ESSENTIAL FISH HABITAT

Federal agencies are obligated, under Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 USC 1855(b)) and its implementing regulations (50CFR600), to consult with NMFS regarding actions that are authorized, funded, or undertaken by that agency, that may adversely affect Essential Fish Habitat (EFH). The MSA (§3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Furthermore, NMFS is required to provide the Federal agency with conservation recommendations that minimize the adverse effects of the project and conserve EFH. This consultation is based, in part, on information provided by the Federal agency and descriptions of EFH for Pacific coast groundfish, coastal pelagic species, and Pacific salmon contained in the Fishery Management Plans produced by the Pacific Fisheries Management Council.
The proposed action and action area are described in the BA. The action area includes habitats which have been designated as EFH for various life stages of 17 species of groundfish, and 4 coastal pelagic species (Table 2). Information submitted by FAA in the BA is sufficient for NMFS to conclude that the effects of the proposed actions are transient, local, and of low intensity and are not likely to adversely affect EFH in the long-term. NMFS also believes that the conservation measures proposed as an integral part of the actions would avert, minimize, or otherwise offset potential adverse impacts to designated EFH.

EFH Conservation Recommendations: The conservation measures that the FAA included as part of the STIA projects are along with those that NMFS recommends in the ESA Concurrence letter, adequate to minimize the adverse impacts from this project to designated EFH for the species in Table 3. It is NMFS' understanding that the FAA intends to implement the proposed activity with these built-in conservation measures that minimize potential adverse effect to the maximum extent practicable. Consequently, NMFS has no additional conservation recommendations to make at this time.

Please note that the MSA (§305(b)(4)(B)) requires the Federal agency to provide a written response to NMFS' EFH conservation recommendations within 30 days of its receipt of this letter. However, since NMFS did not provide conservation recommendations for this action, a written response to this consultation is not necessary.

This concludes EFH consultation in accordance with the MSA and 50CFR600. The FAA must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920(k)).

Table 3. Species of fishes with designated EFH in the action area.

Groundfish Species	Sablefish *Anoplopoma fimbria*	**Coastal Pelagic Species**
Spiny Dogfish *Squalus acanthias*	Bocaccio *S. paucispinis*	anchovy *Engraulis mordax*
California Skate *R. inornata*	Brown Rockfish *S. auriculatus*	Pacific sardine *Sardinops sagax*
Ratfish *Hydrolagus colliei*	Copper Rockfish *S. caurinus*	Pacific mackerel *Scomber japonicus*
Lingcod *Ophiodon elongatus*	Quillback Rockfish *S. maliger*	market squid *Loligo opalescens*
Cabezon *Scorpaenichthys marmoratus*	English Sole *Parophrys vetulus*	
Kelp Greenling *Hexagrammos decagrammus*	Pacific Sanddab *Citharichthys sordidus*	
Pacific Cod *Gadus macrocephalus*	Rex Sole *Glyptocephalus zachirus*	
Pacific Whiting (Hake) *Merluccius productus*	Starry Flounder *Platichthys stellatus*	

If you have any questions regarding NMFS concurrence on ESA or conservation measures for EFH, please contact Tom Sibley at the Washington State Habitat Office (206) 526-4446.

Sincerely,

Donna Darm
Acting Regional Administrator

cc: Muffy Walker, ACOE
Nancy Brennen-DubbsFWS
A. Kenny, WDOE
E. Leavitt, Port of Seattle

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Table 1. Proposed Master Plan Update improvement projects at Sea-Tac Airport.

Project	Description
Runway and Taxiway Projects	
Property Acquisition, Street and Utility Vacation	Includes purchasing property and demolishing existing structures between existing Sea-Tac boundary west to Des Moines Memorial Drive and State Route (SR) 509. Required for third runway embankment fill and construction impact mitigation. Acquisition and demolition is also required for the south runway protection zone (RPZ).
Embankment Fill	Embankment for third runway, constructed using imported fill. Approximately 16.5 million cubic yards (cy) will be placed over a 5- to 7-year period. Existing roads and streets under the embankment footprint will be removed.
Interconnecting Taxiways	New connecting taxiways between existing runway and third runway. Project is located on existing airfield, requiring only minimal grading.
Runway 16X/34X	Paving of third runway after completion of embankment fill.
Extension of Runway 34R by 600 feet (ft)	Extend runway by 600 ft for improved warm weather and large aircraft operations. Project is located at the southern end of the east runway.
Additional Taxiway Exits on 16L/34R	Construction of new ramps to the existing terminal apron.
Dual Taxiway 34R	Improvements to taxiways serving the South Aviation Support Area (SASA) and south apron.
Runway Safety Areas (RSAs)	
Runway 34R Safety Fill	Extend runway safety fill to meet FAA standards.
RSAs 16R/16L	Extend safety fills by 1,000 ft to meet FAA standards.
Relocation of Displaced Threshold on Runway 16L	Airfield taxiway improvements. The runway threshold (i.e., the emergency landing pad at end of runway pavement) to be relocated onto new RSA.
Miller Creek Sewer Relocation	Relocate sewer for third runway embankment and runway safety fills. New sewer to run along alignment of new 154th/156th Street.

Project	Description
Borrow Sites	
Borrow Sites	Sources of fill for third runway embankment, located on Sea-Tac property south of the airport. Approximately 6.7 million cy[1] of material to be excavated from three sites and transported across airport property to the embankment.
FAA Navigation Aids (NAVAIDS)	
New Airport Traffic Control Tower	New air traffic control tower to be located in existing developed area near terminal.
Relocate Airport Surveillance Radar, Airport Surface Detection Equipment, NAVAIDS	Existing radar and navigation equipment will be relocated to allow construction of third runway.
Airfield Building Improvements	
New Snow Equipment Storage	New building to house snow removal equipment.
Weyerhaeuser Hangar Relocation	Relocate existing hangar on west side of airfield to allow construction of third runway. New hangar will be located near south end of third runway.
Terminal/Air Cargo Area Improvements	
Relocation of Airborne Cargo	Relocate existing cargo building from air traffic control tower site to north cargo area. Located in existing developed area near terminal.
Central Terminal Expansion	Passenger terminal remodel. Located in existing developed area at terminal.
South Terminal Expansion Project (STEP)	Passenger terminal remodel. Located in existing developed area to the south of the main passenger terminal.
Northwest Hangar Relocation	Relocate Northwest hangar to site now occupied by Delta hangar. Located in existing developed area.
Satellite Transit Shuttle System Rehabilitation	Remodel and upgrade underground transit system linking terminal to satellites.
Redevelopment of North Air Cargo	New or expanded air cargo facilities along Air Cargo Road at north end of airport.

Relocation of Airborne Cargo	Relocate existing cargo building from air traffic control tower site to north cargo area. Located in existing developed area near terminal.
Expansion of North Unit Terminal (North Pier)	Addition to new passenger terminal located north of existing terminal. Located in existing developed area (Doug Fox parking lot and airport access freeway).

Project	Description
New Airport Rescue and Fire Fighting Facility	Replaces facility displaced by new North Terminal. The new facility will be located to the north of the North Terminal.
Cargo Warehouse at 24th Avenue South	New air cargo facility located north of SR 518 on 24th Avenue South.
Westin Hotel	New hotel located immediately north of main passenger terminal. Located in existing developed area at terminal.
New Water Tower	Construct new water tower and piping in engineering yard south of South 160th Street in subbasins (Gilliam Creek watershed) served by stormwater outfalls 012 and 013.

Roads[2]	
Temporary SR 518 and SR 509 Interchanges	Temporary access ramps to serve construction of third runway embankment and runway safety fill; to be removed after project completion.
154th/156th Street Relocation	Relocate public roadway to allow construction of third runway embankment and runway safety fills. Existing road to be demolished.
154th/156th Street Bridge Replacement	Relocate existing South 156th Street bridge over Miller Creek to accommodate the third runway footprint and South 154th/156th Street relocation. In-water work associated with this project is limited to the removal of the existing bridge and bank restoration.
Improvements to Main Terminal Roads	Transportation circulation, seismic and other improvements to roadway systems serving terminal.
Improved Access and Circulation Roadway Improvements	Improvements to existing roadway system serving passenger terminal, garage, and air cargo facilities.
North Unit Terminal Roadways	Improvements to existing roadway system to serve the new North Terminal and garage.
Improvements to South Access Connector Roadway (South Link)	Improvements to existing roadway system serving passenger terminal, garage, and air cargo facilities. Will connect terminal and garage area to South Access roadway and SR 509 extension south of airport.

Project	Description
Parking	
Main Parking Garage Expansion	Expand parking facility at main passenger terminal on north and south sides (existing developed areas), and add floors to portions of existing garage.
The North Employees Parking Lot (NEPL), Phase 1	New parking facility for employees, located north of SR 518.
North Unit Parking Structure	Construction of new garage serving new North Terminal facility. Facility will be located at existing Doug Fox parking lot.
The South Aviation Support Area	
The SASA and Access Taxiways	New airport support facility for cargo and/or maintenance, located at the south end of the airport south of the Olympic Tank Farm and South 188th Street. Airplane access will be by new parallel taxiway constructed along Runway 34R.
Relocation of Existing Facilities to the SASA	Airport operation support facilities will be relocated to the SASA once SASA site development is completed. Many of these facilities must be relocated from their present locations due to main terminal expansion (i.e., STEP and North Terminal), including Northwest hangar, ground support equipment, ground and corporate aviation facilities, new airport maintenance building, and United maintenance complex.
Stormwater Facilities[1]	
Miller Creek Detention Facility Expansion	Expand the Miller Creek Detention Facility by 16.4 acre-ft to provide flow control retrofitting for existing Sea-Tac discharges to Miller Creek. All construction would take place in uplands, and would create free-draining detention volume.
SASA Detention Pond	Create regional stormwater detention pond for the SASA project and other sites. Pond is 33.4 acre-ft and discharges to Des Moines Creek.
NEPL Vault	A 13.9 acre-ft vault to retrofit the NEPL; discharges to Miller Creek via Lake Reba.
Third Runway Vaults and Ponds	Stormwater detention vaults and ponds at the north, west, and south sides of the airport, discharging to Miller, Walker, and Des Moines Creeks.

Third Runway Vaults and Ponds	Stormwater detention vaults and ponds at the north, west, and south sides of the airport, discharging to Miller, Walker, and Des Moines Creeks.
Sea-Tac Retrofit Facilities	Detention vaults or ponds to provide flow control retrofitting for existing Sea-Tac discharges to Des Moines Creek. Vaults to be constructed in combination with third runway facilities when possible.
Cargo Vault	Detention vault for North Cargo Facility (4.5 acre-ft discharging to Miller Creek via Lake Reba).

Natural Resources	
Miller Creek Relocation	Approximately 980 ft of Miller Creek immediately downstream of the Miller Creek Detention Facility will be relocated to accommodate third runway embankment and runway safety fill.
Miller Creek Buffer and Wetland Enhancement	Establish a 100-ft buffer (average) along approximately 6,500 linear ft of Miller Creek and riparian wetlands associated with Miller Creek within the acquisition area. Enhance approximately 7.4 acres of existing wetlands along the stream.
Miller Creek Floodplain and Wetland Restoration	Excavate approximately 9,600 cy from the Vacca Farm site adjacent to Miller Creek to compensate for approximately 8,500 cy of floodplain fill for third runway embankment and north safety fill. Restore and enhance approximately 17 acres of stream habitat, floodplain wetlands, aquatic habitat in Lora Lake, and buffers at Vacca Farm.

Miller Creek Relocation	Approximately 980 ft of Miller Creek immediately downstream of the Miller Creek Detention Facility will be relocated to accommodate third runway embankment and runway safety fill.
Miller Creek Instream Habitat Enhancement	Project 1: South of the Vacca Farm site, approximately 650 ft of channel. Remove rock riprap, footbridges, and trash. Place large woody debris (LWD) throughout this section of the stream. Plant riparian areas along the stream with native wetland and upland plant species. Project 2: Approximately 150 ft upstream of South 160th Street, approximately 235 ft[1] of channel. Install LWD in the stream channel, grade a small section of the west bank of the stream to create a gravel bench in the floodplain, remove two rock weirs to improve fish passage, and plant the upland area with native trees and shrubs. Project 3: Immediately downstream of South 160th Street, approximately 380 ft[1] of channel. Grade a section of the east bank, remove a rubber-tire bulkhead and install LWD in the stream and on its banks. Plant buffer areas with native trees and shrubs. Project 4: Miller Creek immediately upstream of 8th Avenue South, approximately 820 ft[4] of channel. Grade portions of both banks. Remove footbridges and portions of concrete block walls. Install LWD in the stream and on its banks. Plant buffer areas with native trees and shrubs. In addition to these specific enhancements, debris such as tires, garbage, and fences will be removed throughout the entire stretch of Miller Creek from the Vacca Farm site south to Des Moines Memorial Drive. In areas where access is readily available, LWD will be selectively placed throughout the stream to improve instream habitat conditions.
Drainage Channels Relocation	Relocate a minimum of 1,290 linear ft of drainage channels to accommodate the third runway embankment. Plant buffers along the drainage channels with native grass and shrubs.

Miller Creek Relocation	Approximately 980 ft of Miller Creek immediately downstream of the Miller Creek Detention Facility will be relocated to accommodate third runway embankment and runway safety fill.
Restoration of Temporarily Impacted Wetlands	Approximately 2.05 acres of wetland located west of the third runway embankment, north of relocated South 154th Street, and west of the Miller Creek relocation project, will be temporarily filled or disturbed during embankment construction. When construction activities are completed, remove fill material, restore pre-disturbance topography, and plant wetlands with native shrub vegetation.
Tyee Valley Golf Course Wetlands Enhancement and Des Moines Creek Buffer Enhancement	Restore approximately 4.5 acres of emergent wetland area and approximately 1.6 acres of buffer located within Tyee Valley Golf Course to a native shrub vegetation community. The enhancement actions would be integrated into plans to construct a Regional Detention Facility on the golf course[2] (King County Capital Improvement Project Design Team 1999). The enhancement would convert the existing turf wetland to native shrub wetland community. Enhance approximately 3.4 acres (average 100 ft wide) of buffer and 1.0 acre of existing wetland along Des Moines Creek.
Wetland Habitat (including Avian Habitat) near the Green River in Auburn	Restore wetland functions to a 67-acre parcel near the Green River in the City of Auburn. Create and/or restore approximately 17.2 acres of forest, 6.0 acres of shrub, 6.2 acres of emergent, and 0.60 acre of open-water wetland. Enhance protective buffers totaling about 15.90 acres.

1 Size modified from that originally stated in BA.

2 Temporary roads used to haul fill material from three on-site borrow areas to construction sites are included in the analysis of the borrow areas and are not listed here.

3 Des Moines Creek Basin Plan Committee may construct a Regional Detention Facility on Tyee Golf Course to provide regional flow control. This project would eliminate the need for Sea-Tac retrofit facilities described above. As this is a cumulative action subject to future federal action, it is not a Master Plan Update improvement.

4 Project length includes approximately 12 ft of instream work as part of driveway demolition, and 400 ft of riparian enhancement.