LOW STREAMFLOW ANALYSIS AND SUMMER LOW FLOW IMPACT OFFSET FACILITY PROPOSAL

SEATTLE-TACOMA INTERNATIONAL AIRPORT MASTER PLAN UPDATE IMPROVEMENTS

Prepared for

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EXECUTIVE SUMMARY

This report presents the analyses performed to estimate the timing and volume of discharges to local receiving streams and wetlands during low-flow periods from Seattle-Tacoma International Airport (STIA) considering improvements defined in the Port of Seattle's Master Plan Update. This report also presents a Flow Impact Offset Facility Plan, which is the Port's proposal to offset impacts to flows in the receiving waters during annual low-streamflow periods, typically experienced in late summer/early fall. The plan is based on a detailed evaluation of the hydrologic impacts of the proposed third runway embankment and associated non-hydrologic impacts (cessation of water use and removal of septic tanks on properties purchased by the Port) on streamflow in Miller, Walker, and Des Moines Creeks. This report is submitted in response to condition I.1 of the Water Quality Certification (#1996-4-02325 [Amended – 1]) issued by the Washington State Department of Ecology (Ecology) on September 21, 2001. The report builds upon previous reports by Earth Tech (December 2000), Pacific Groundwater Group (June 2000, August 2001), and Parametrix (December 2000, July 2001). Earth Tech, Pacific Groundwater Group, Aqua Terra, HNTB, Foster Wheeler, and Parametrix prepared analyses presented in this report, and Hydrocomp contributed technical review of modeling analyses. Ecology was consulted during the development of the plan to ensure that agency concerns are addressed in this report.

Impacts to streamflow in the three streams were evaluated using a suite of modeling tools. The Hydrologic Simulation Program – FORTRAN (HSPF) was used to develop overall stormwater models of STIA (existing conditions and proposed conditions), as described in the *Comprehensive Stormwater Management Plan* (SMP) (Parametrix 2000a, 2001a). These models were also used to evaluate stormwater flows and volumes in the low-flow analysis. The hydrologic properties of the proposed third runway embankment were modeled using a combination of Hydrus and a finite-difference Slice model. Hydrus was used to simulate the movement of water between the root zone and water table in the proposed embankment, and the Slice model was used to simulate the movement of water through the saturated portion of the proposed embankment. Results of the Hydrus and Slice modeling were incorporated back into the HSPF model to estimate the post-construction flows. By comparing these results to the pre-project conditions, the impacts of the proposed embankment on streamflows were determined. Non-hydrologic impacts were then included in the impacts analysis. Statistical analyses of model output, precipitation, and streamflow data for the available period of record predicted a net low-flow impact to be mitigated during the low-flow offset period. The flow offset to be provided is 0.11 cubic feet per second (cfs) in Walker Creek and 0.08 cfs in Des Moines Creek. The project impact in Miller Creek was completely offset by seepage from the third runway embankments.

The Port's proposal to offset impacts to low streamflow is to detain excess stormwater runoff during the winter and release it to the streams during the predicted annual low-streamflow periods. Vault sizes for the volume of water required to offset the predicted impacts were determined by calculating the volume necessary to fulfill the required mitigation during the 92-day mitigation period for each year in the period of record (1949 to 1995), and selecting the year requiring the largest vault volume as the "worst case" scenario. The resulting volumes of stormwater (18.5 acre-ft[1] for Walker Creek and 13.5 acre-ft for Des Moines Creek) were incorporated into supplemental

[1] A 19.0 acre-ft vault was used for the concept design.

stormwater vaults in each watershed. These volumes of stormwater will be collected during the rainy season, stored, and discharged during the annual low-flow periods at rates equal to the predicted impact in each stream. Several considerations are proposed to be included in the design of these vaults to allow the management of stormwater discharges to offset the predicted low-flow impacts. Additional considerations in the design and operation of the proposed stormwater vaults to improve the water quality of discharges will also be included. An analysis of the availability of stormwater required to fill the vaults showed that even during the driest years in the period of record, enough water can be collected and stored to offset the impacts to streamflow during the annual low-streamflow period.

Key goals and objectives (performance standards) of the proposed Flow Impact Offset Facility include:

- Provide flow at the rates required to offset the predicted impacts of the proposed embankment for the entire annual low-streamflow period each year (approximately 92 days from late July through the end of October).
- Operate and maintain the facility to maintain water quality during the annual low-streamflow periods.
- Design the facility and its operation, monitoring, and maintenance plan so that an adaptive management strategy can be applied.

As stated in Ecology's *Stormwater Management Manual for Western Washington* (Ecology 2001), the objective of stormwater management is to "control the quantity and quality of stormwater produced by new development and redevelopment such that they comply with water quality standards and contribute to the protection of beneficial uses of the receiving waters." Ecology has determined that stormwater management activities in Washington do not require a water right. Since the Port's proposal to offset flow impacts to the receiving waters consists of stormwater management activities, a water right is not required for the Flow Impact Offset Facility.