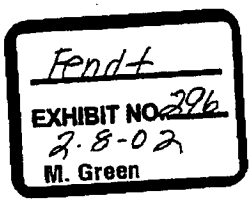

POLLUTION CONTROL HEARINGS BOARD
FOR THE STATE OF WASHINGTON

AIRPORT COMMUNITIES COALITION, Appellant, v. DEPARTMENT OF ECOLOGY and THE PORT OF SEATTLE, Respondents.	No. PCHB 01-133 DECLARATION OF PAUL S. FENDT

Paul S. Fendt declares as follows:

1. I am over the age of eighteen, have personal knowledge of the facts stated in this declaration and would be competent to testify to them if necessary.

2. I have more than 18 years of stormwater engineering and planning experience, encompassing a broad range of stormwater and surface water projects. I have significant experience working with hydrologic and hydraulic modeling (HEC-1, WaterWorks, HEC-2, HEC-RAS), NPDES stormwater permits, erosion control on creeks and lake shores, comprehensive storm and surface water plans, preparation of drainage ordinances and environmental impact statements. I have worked extensively with the Department of Ecology's Stormwater Manuals and with King County's Surface Water Design Manual.

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3. I have been the project manager for stormwater management and low flow mitigation for the Port of Seattle's Master Plan Update (MPU) projects for the past four years. I was the principal author of the Port of Seattle's Comprehensive Stormwater Management Plan and a principal author of the Low Flow Analysis - Flow Impact Offset Facility Proposal ("Low Flow Analysis"). I graduated from the University of North Dakota with a degree in Geological Engineering in 1981. I was licensed as a Professional Engineer (Civil) by the State of Washington in January 1991 and the State of Florida in February 1990. I have been employed by Parametrix, Inc. for the past 11 years. A copy of my current curriculum vitae is attached to this declaration as Exhibit A.

4. Sea-Tac International Airport (STIA) lies along the drainage divide between the Miller Creek and Des Moines Creek watersheds (See Figure 6.1-1 in the Port's Natural Resources Mitigation Plan). The Miller Creek watershed covers approximately 8.1 square miles of predominantly urban area lying mostly within the cities of Burien and SeaTac, plus a small portion of Normandy Park and King County. Currently, about 23 percent of the total surface area in the Miller Creek watershed is impervious. Miller Creek drains a relatively small portion of STIA, including the north end of the runways and the air cargo areas north of the terminal. The STIA stormwater drainage system will cover about 9 percent of the Miller Creek watershed (including newly acquired property for the MPU). Walker Creek is a tributary to Miller Creek.

5. The Des Moines Creek watershed covers 5.9 square miles of predominantly urban area lying mostly within the cities of SeaTac and Des Moines, plus a small area of unincorporated King County. This creek drains most of STIA, the City of SeaTac commercial area along International Boulevard (Highway 99), and residential areas in the remainder of the basin. Currently, about 32 percent of the total surface area in the Des Moines Creek watershed is impervious. The STIA stormwater drainage system will cover about 23 percent of the Des Moines Creek watershed.

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6. New impervious surface construction for MPU projects will change the hydrology and stormwater runoff patterns of land draining from STIA. During rain storms, increased volumes of stormwater will drain to Miller, Walker and Des Moines Creeks that, if unmitigated, will cause peak flows in the stream to increase. Higher peak flows are a problem because they can damage the stream channel, cause significant erosion and damage aquatic habitat. Stream flows in the summertime during periods of low rainfall will also be impacted. In the predeveloped condition, precipitation that falls on pervious areas infiltrates into the soil. Some of this infiltrated precipitation seeps slowly downward and laterally through the soil, eventually reemerging as seepage from slopes or in streams. This gradual seepage water is a source of summer low flow water in the area streams. Thus, adding impervious surfaces may not only increase high flows, but it may also reduce low summer flows.

7. A total of approximately 106, 6, and 128 acres of new impervious area are proposed to drain to Miller, Walker, and Des Moines Creek respectively. In addition, 67 acres of new impervious surface will be constructed at STIA that would drain to the Industrial Wastewater System (IWS) and discharge directly (after treatment) to Puget Sound. Peak flow impacts will be mitigated by capturing all stormwater runoff and detaining it in 344.1 acre-feet of new stormwater detention storage. Low flow impacts will be mitigated by retaining a small portion of the detained stormwater and releasing it to area streams during low flow periods. The Port will detain excess stormwater runoff from new impervious areas in underground vaults and release the detained water continuously into the affected streams during the normal low stream flow period for each of the streams. The amount of low flow releases will be determined based on site specific hydrologic modeling, which predicts the impact on area streams from the construction of the MPU improvements. Low flow impacts will also be mitigated for by seepage from the new embankment, which will partially offset low flow impacts from new impervious surfaces.

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8. **HSPF Modeling Used To Model Existing and Future Hydrologic Conditions.** The Hydrologic Simulation Program – Fortran ("HSPF") model was one of the most important tools used to determine existing and future hydrologic conditions at STIA. It was also critical to identifying how those conditions will change as result of the construction of the Port's MPU projects. The HSPF model allows continuous simulation of stormwater runoff at STIA, both as currently configured and as it will be configured when the MPU projects are complete. The model is appropriate for western Washington, where stream flow is dominated by runoff from sequential storms rather than single, large storms. This modeling method is recommended by local agencies for modeling large drainage areas and evaluating runoff impacts on stream systems.

9. A description of how the HSPF model was used to evaluate stormwater runoff from the Port's planned MPU projects and to evaluate how these projects would affect stream flow in Miller, Walker, and Des Moines Creeks is included in the Comprehensive Stormwater Management Plan ("SMP") at Section 3.3, pp. 3-7a to 3-8; Sec. 6.2, pp. 6-3-6-11; and Vol. 2, Appendix A. A copy of the SMP is attached to this declaration as Exhibit B.

10. King County's Stormwater Management Department was hired by Ecology to act as one of its experts on the hydrologic modeling, and on the adequacy of the Low Flow Analysis and the SMP. A copy of the Low Flow Analysis is attached to this declaration as Exhibit C. The approach described in the Low Flow Analysis was discussed with both the Department of Ecology and King County and was accepted as an appropriate approach to evaluating, quantifying, and mitigating impacts. Contrary to the assertion of Dr. Willing and Mr. Rozeboom in their declarations (Willing ¶¶ 8-9; Rozeboom, ¶ 6), the Port had been focused on the plan of detaining and releasing stormwater as a means of mitigating low flows since December 2000 as reported in the Low Stream Flow Analysis (Earth Tech, Inc., 2000). Mr. Kelly Whiting, who worked on this project for King County, has reviewed and approved the SMP, which includes the HSPF modeling. A copy of King County's letter approving the SMP is attached to this declaration as Exhibit D.

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11. The primary purpose of the SMP was to quantify peak flow impacts. The primary purpose of the Low Flow Analysis was to quantify low flow impacts. Together, the SMP and Low Flow Analysis ensure that streamflow impacts are understood and mitigated for.

12. **Calculation of Summer Low Flow Impacts.** Summer low flow impacts in Miller, Des Moines and Walker Creeks were calculated using methods described in the Low Flow Analysis. Following is a short description of the approach used to quantify predicted reductions in low summer flows:

13. The first step in the process was identifying current stream flow levels, focusing on low flow periods of the year. The HSPF model of current conditions (pre-MPU project development) provides daily average flows in each of the streams for 47 years of precipitation record (1949-1995). The daily average flow was grouped and averaged in seven-day increments. The lowest seven-day flow in each year of the record (a total of 47 values) was selected and ranked in order of smallest to largest seven-day low flow. The 24th value in the ranking statistically has a 50 percent chance of being equaled or exceeded in any year (also referred to as the 2-year, 7-day low flow). Attached to this declaration as Exhibit E are the figures used to document the selection of appropriate stream flows.

14. The 2-year, 7-day low flow was selected as the flow value for impact and mitigation evaluation. The 2-year flow is protective, since the magnitude (flow rate) of more extreme low flows is lower than the 2-year flow, so the subsequent impact would be a lower flow rate. Therefore, impacts from more extreme droughts would be mitigated with this standard. As is explained more fully in the Declaration of Donald Weitkamp, more frequent low flows (i.e. those occurring more frequently, on average, than every other year) are not limiting factors in stream production.

15. The time of year that low flows typically occur and the amount of low stream flow impact were determined in order to quantify the amount of stormwater to be reserved for release during the low flow period. The 47 years of record for each stream were plotted to determine when

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seven day low flows have historically occurred. In Miller Creek, 44 of the 47 seven-day annual low flows occurred between August 7 and November 1. In Walker Creek, 44 of the 47 low flows occurred between August 7 and November 9. The three remaining low flows in each stream occurred in November and December during the typical rainy season. In Des Moines Creek, low flows in all 47 years of record occurred between August 3 and October 24.

16. One of the primary concerns arising from changes in flow is that these changes could adversely impact the biological quality of affected streams. A discussion of potential impacts to aquatic organisms in the streams is included in the Weitkamp Declaration, describing the time of year that low stream flow mitigation is needed to avoid impacts. Contrary to the claims of Dr. Strand (Strand, ¶ 32), the proposed mitigation facilities are appropriately sized and will mitigate the change in water depth during the critical summer low flow.

17. Impacts from new impervious surfaces that were determined in the Low Stream Flow report are offset by three methods: (1) slow release of reserved stormwater during the summer low flow season (Des Moines and Walker Creeks); (2) retirement of existing water uses (Miller Creek); and (3) seepage water from the new third runway embankment (Miller and Walker Creeks). The Low Stream Flow report describes how the low flow mitigation was quantified and how it will be implemented. One component, groundwater seepage from the new embankment, required that additional modeling be completed.

18. The HSPF modeling for low stream flows was supplemented by a groundwater study conducted by Pacific Groundwater Group and referred to as the Embankment Fill Modeling (Pacific Groundwater Group 2000) ("PGG Study"). This study evaluated the stormwater that infiltrates into the embankment and flows to groundwater into the embankment for the new third runway. A copy of the PGG Study is attached to this declaration as Exhibit F.

19. The hydrogeologic modeling conducted by PGG for the PGG Study is the same model and approach used in the Ecology-sponsored Sea-Tac Runway Fill Hydrologic Studies (PGG

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2000) and additionally refined as requested by Ecology. The Low Flow Analysis, the SMP, the HSPF modeling and the groundwater modeling conducted by PGG were reviewed and approved by Ecology.

20. The hydrogeologic modeling was used to determine how groundwater that enters the embankment would travel through embankment soils and eventually emerge as seeps at the base of the embankment. These seeps from the embankment will flow into area wetlands and streams. The embankment is very large, and large volumes of stormwater will infiltrate into it. This infiltrated stormwater will remain within the embankment for many weeks or months, depending on the thickness and width of the fill (which varies depending on the amount of fill needed to raise the ground to the level of the existing airfield). This infiltrated stormwater will travel from the point of infiltration to the base of the embankment where it will emerge as seeps. This travel time means that rain that falls on the surface during the winter and spring rains will emerge as seeps later in the year during the summer low flow period, as modeled by PGG.

21. The Port's SMP has been accepted by the Washington State Department of Ecology as constituting all known and available reasonable methods of treatment. All major inputs to waters of the State are accounted for in the SMP. As is outlined in more detail below, although the scope of the MPU projects is large, the SMP is based on the construction and implementation of typical technologies for stormwater management.

22. **Calibration of the HSPF Model.** Hydrologic and hydraulic models are often calibrated before using them for design or analysis. Calibration involves simulating a recorded storm event to compare the model output hydrograph with the actual measured flow. If the model results match measured flow, the model is well calibrated. If it does not, the model input parameters are adjusted to achieve a high degree of correlation between model results and measured stream flow. Calibration of models is performed to improve the accuracy of simulations of synthetic design storms or historical precipitation records for which there are no measured flow or stage data.

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23. Dr. Willing has asserted that there were calibration errors in the HSPF model. *See* Willing Dec., ¶ 19. Contrary to Dr. Willing's testimony, however, the HSPF model was calibrated to existing gages in the three streams, as described in Volume 3, Appendix B of the SMP. *See* Exhibit B. Additional calibration for lows flows was completed as described in the low flow report and as explained in detail in the Declaration of Joe Brascher. A high degree of model calibration was achieved, and the model output provides a level of accuracy and reliability more than adequate to formulate protective mitigation requirements.

24. The calibration approved by King County in the SMP is also applicable to the Low Flow Analysis. The HSPF model provides a reliable and accurate measure of the likely low flow impacts arising from the construction of the MPU projects. Contrary to the approach suggested by Mr. Rozeboom in his declaration (Rozeboom, ¶ 10), using the gage data from a single year would overestimate stream flow and, therefore, underestimate project impacts. In my opinion, the calibration is appropriate for evaluating low flow and peak flow analyses, such as those undertaken in the SMP and the Low Flow Analysis.

25. **Review of Low Flow Analysis and Revised Analysis Requested by Ecology.** The Low Flow Analysis is the basis of conditions in the water quality certification requiring mitigation for anticipated reductions in stream flow in Des Moines, Miller and Walker Creeks.

26. Ecology has requested additional information prior to final design of the low flow facilities that will be provided in the form of an updated Low Flow Analysis. The updated Low Flow Analysis will contain the following:

- Additional detail on design elements of the reserve vaults;
- Additional model calibration;
- Modified approach to collecting reserve stormwater for the Walker Creek vault;
- Additional monitoring requirements, including infiltration testing and biological monitoring;
- Revised drawings showing the modified storage vaults;

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- Additional detail as required in the §401 Certification.

27. These additional details and requested revisions are in response to a review of the Low Flow Analysis study by King County. Dr. Willing criticized the Low Flow Analysis in his declaration and referred to a number of comments made by King County's reviewers to support his criticisms. *See* Willing Declaration, ¶ 17. Dr. Willing is apparently unaware that a new version of the Low Flow Analysis is required by Ecology as a condition of its §401 Certification, and that the new version, which will be submitted to Ecology by November 5, 2001, will address and respond to each and every condition provided by Ecology, which incorporate and address all of the King County review comments.

28. **All of the Final Design Issues Noted By Willing and Rozeboom Have Been Identified and Addressed in the §401 Certification and the Revised Low Flow Analysis.** Dr. Willing and Mr. Rozeboom have both listed alleged deficiencies in the low flow mitigation plan. *See* Willing Dec., ¶17; Rozeboom Dec., ¶20. In each instance, the potential deficiencies were previously noted by Ecology and will be addressed in the updated low flow report For reference, the proposed methods used to address potential deficiencies are listed here:

- A floating orifice outlet will be used to maintain constant head, draw water from strata below the surface yet above the bottom sediment, and allow for larger orifice openings that are dependent on floating orifice dimensions, not water depth in the vault.
- Mechanical aeration, if needed, is routinely applied in similar conditions.
- If monitoring shows that additional flow mitigation is needed to offset low flow for longer periods, sites for additional storage vaults and impervious area to fill them are available.
- Ecology has included a condition to preclude impervious areas to increase available impervious area for vault filling.

29. Mr. Rozeboom has asserted that the Port's low flow mitigation plan is inconsistent with the SMP. (Rozeboom, ¶17). This is incorrect. Mr. Rozeboom's confusion may arise from the fact that the SMP is not intended to show precise size of low flow mitigation vaults – only their probable locations in relationship to the proposed stormwater detention vaults. In fact, the SMP references the Low Flow Mitigation Plan as the place to find details for those systems. SMP Sec.

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6.2.1, pp. 6-3 to 6-5. The SMP does, in fact, show all the reserve storage facilities. Details of the precise sizing of those facilities are in the Low Stream Flow Report

30. **The Impact of Improvements to the IWS.** Both Dr. Willing and Mr. Rozeboom have asserted in their declarations that improvements to the IWS lagoons will reduce area stream flows, and that these impacts have not been adequately modeled and are not addressed in the SMP. *See* Willing Declaration, ¶18; Rozeboom Declaration, ¶¶5, 8 and 11. Contrary to the contention of Mr. Rozeboom (Rozeboon ¶11), the IWS Lagoon 3 is not in the Walker Creek groundwater contribution area, but rather in the Des Moines Creek groundwater contribution area (See Figure B1-3 or B2-2, not B2-23 as indicated by Mr. Rozeboom).

31. The IWS lagoons are man-made facilities for collecting stormwater runoff from industrial areas at Sea-Tac Airport, such as aircraft movement areas and surrounding the terminals and gates. The IWS lagoons collect and hold stormwater runoff to be treated in the Industrial Wastewater Treatment Plant. Stormwater is held in the lagoons only until it can be treated; desired operation maintains the greatest volume of available storage to prevent overflows, which means the lowest amount of water storage. Water was not routinely stored in the lagoons for infiltration (which is now prevented by lining).

32. The three lagoons at STIA are lined or scheduled to be lined, as required by Section S4 of the STIA NPDES permit (the IWS Engineering Report AKART analysis). The purpose of the liner is to prevent any seepage. Lagoon 1 was lined in 1997, followed by lagoon 2 in 1998. Lagoon 3 is now under construction for expansion and lining. The expansion and lining of IWS Lagoon 3 is not an MPU project, although additional capacity in the lagoon will serve MPU projects.

33. The HSPF model models the IWS lagoons as "water". Water in the model is treated as an area that does not infiltrate or contribute runoff. The existing lagoons therefore do not contribute infiltration to the modeled system in the predeveloped or built condition. Lining IWS

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Lagoon 3 will reduce infiltration in the model from the lagoon expansion area, approximately 8 acres. This expanded area was not included in the SMP, as lagoon expansion is not an MPU project.

34. **The Expansion of IWS Lagoon 3 Will Have Not Have a Significant Impact On the Flow in Des Moines Creek.** The expansion of IWS Lagoon 3, which is located in the IWS drainage basin, will increase new impervious area in the basin by only approximately 8 acres, compared to approximately 314 acres of existing IWS impervious area (less than 3 percent). This will have a negligible effect on groundwater recharge. The background and significance of this action is addressed in the Weitkamp Declaration. Moreover, IWS Lagoon 3 was designed with a drainage and pump system beneath the liner to reduce upward groundwater discharge pressure, which suggests that this area is actually a groundwater discharge area and an insignificant groundwater recharge area. This provides another basis for the conclusion that no significant impact will result from the expansion of IWS Lagoon 3.

35. In addition, Mr. Rozeboom asserts that reserve storage water for Walker Creek requires installation of an impervious liner on 6 acres of drainage swale. (Rozeboom, ¶ 18). While an impervious liner was included in the low stream flow report, Mr. Rozeboom did not correctly interpret its purpose. In fact, mitigation from embankment seepage was not included in Walker Creek, contrary to what was stated by Mr. Rozeboom. Ecology has directed the Port to develop an alternate plan to fill the Walker Creek low flow reserve vault, and to reintroduce Walker Creek embankment seepage. The impervious liner is not part of the Port's current proposal.

36. **Des Moines Creek Technology Center Is No Longer a Proposed Project.** Contrary to Mr. Rozeboom's assertion (Rozeboom Dec., ¶ 5), the Des Moines Creek Technology Center is no longer a proposed Port project. Because this project is currently not under consideration by the Port, the SMP and Low Flow Analysis do not take that project into account, nor is there any need to mitigate for potential impacts from projects that are not included in the JARPA or covered by Ecology's §401 Certification.

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37. **Impacts from Borrow Areas.** Mr. Rozeboom asserts that the low flow impacts from removal of soil at the Borrow areas has not been considered. *See* Rozeboom Declaration, ¶ 15. In fact, it is erroneous to state that hydrogeologic conditions at the borrow areas are comparable to the proposed Third Runway embankment, when considering the depth of material, location, material composition (grain size distribution), position relative to the respective streams, and variable stream hydrology.

38. In fact, the Sea-Tac Runway Fill Hydrologic Studies Reports (PGG 2000), prepared by PGG for the Department of Ecology, indicated that recharge to the shallow regional aquifer would be expected to increase because of excavation in the borrow area. Des Moines Creek receives substantial base flow from this aquifer.

39. **Monitoring and Adaptive Management.** The modeling and analysis in the Low Flow Analysis are a detailed and exhaustive study of hydrologic conditions in the three watersheds of STIA. I believe that we have a thorough understanding of conditions at the site, and how the MPU improvements will affect area stream flows. However, it is possible that required stream flow monitoring may identify the need to provide additional water for release during the summer dry season. Ecology's §401 Certification requires compliance with the Low Flow Analysis, which in turn requires substantial monitoring of area streams to determine whether low flow impacts have, in fact, been accurately predicted. In the event that the analysis is inaccurate, the Low Flow Analysis requires that stormwater releases be revised to provide full mitigation for low flow impacts.

40. Low flow impacts are a result of new impervious surface constructed for MPU projects. If stream flow monitoring identifies additional low flow impacts from the project, additional stormwater can be collected to provide low flow mitigation. This stormwater would be available for storage, since there is a direct connection between additional runoff from new impervious surfaces and water lost to the groundwater. In other words, precipitation that does not infiltrate to groundwater and is, therefore, unavailable to recharge area streams during low flow

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periods is available for collection and delayed release to area streams to avoid adverse low flow impacts.

41. **All Stormwater Used for Low Flow Mitigation Is Treated to Remove Sediment and Particulates.** In the NDPES permit for the facility, Ecology has previously required that the Port capture, detain, treat and release stormwater at the site to ensure that the stormwater does not contain unacceptable levels of pollutants, and to avoid harm to area streams potentially caused by increases in high stream flows caused by project improvements. See, NPDES Permit No.WA-002465-1 (copy attached as Exhibit G). Stormwater from the airport runways is treated using BMPs, as described in the SMP (primarily using filter strips). This includes stormwater runoff that flows to the reserved stormwater vaults used for low flow mitigation. In addition, the reserve vaults themselves act as a BMP that allows for additional settling and removal of particulates.

42. Scientific studies have demonstrated that biofiltration swales and filter strips are BMPs that effectively remove other pollutants besides sediment. These BMPs are included in BMP menus in the King County Surface Water Design Manual (1998) and the Revised Stormwater Management Ecology Manual (Ecology 2001) as treatment for stormwater. Such BMPs take advantage of the binding capacity of soil particles and the organic and inorganic ligands in soils to render the chemicals inert. These bound chemicals will either not be able to enter the stormwater system, or if they do, they will be unavailable to exert harmful consequences.

43. There is nothing about the stormwater discharged by STIA that would indicate that the BMPs prescribed by the King County Basic Water Quality menu are inappropriate, and this fact was confirmed by the preliminary WER analysis undertaken by the Port..

44. Dr. Willing incorrectly states the water temperature standards (Willing, ¶11). For class AA waters, the standard is not to raise the temperature of the receiving waters over 16 degrees, or not to raise the temperature of the receiving waters by more than 0.3 degrees C if they are already over 16 degrees. Therefore, the allowable temperature of discharged water depends on the

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temperature of the receiving waters and the volume of both the flow in the stream and the reserved discharge. Existing data in the Des Moines Creek Basin Plan (Des Moines Creek Basin Committee 1997) (REF) shows that in-stream water temperatures regularly exceeds 19 degrees in summer and early fall.

45. **Water Quality Will Be Maintained in the Water Used for Low Flow Mitigation.** Waters released from the reserved storage vaults will not be anoxic, and aeration measures proposed are not sporadic. In fact, the Port is committing to features that will result in favorable dissolved oxygen concentrations of reserved stormwater releases. Aeration is a commonly used technology in water treatment; there is little concern regarding engineering feasibility. The Port's proposal includes features that will add/maintain dissolved oxygen (DO) at several points throughout the cycle of collection/storage/release of the reserved stormwater. The redundancies will ensure that DO concentrations are adequate so as not to cause in-stream water quality violations. These include:

- Runoff is naturally aerated due to its contact with the atmosphere, both as precipitation and surface runoff. Therefore, water entering the vaults will have high DO concentrations.
- Runoff from the airfield has lower biological oxygen demand (BOD) than typical urban stormwater due to controlled access, vegetation management practices, and source control BMPs, so little, if any, DO will be consumed during storage (Runoff generated during deicing events is an exception, but such events are infrequent, generally occur during winter months when BOD is low, and is associated with high flow, and, in any event, flushes through system in a matter of hours).
- The reserved storage vaults will have ventilation features, allowing contact with the atmosphere to maintain DO concentrations.
- Reserved stormwater discharges will be passively aerated by splashing at discharge points or through energy dissipaters.
- DO concentrations will be monitored, and if DO concentrations are not favorable, mechanical aeration will be added. Weekly monitoring is proposed as a starting point; if DO fluctuations are noted, monitoring schedules will be adjusted.
- The discharge rates are small enough that complete aeration is easily attainable.

46. Dr. Willing assumes that the Port is using typical stormwater vaults for the reserved stormwater program, and merely using the dead storage areas to hold the reserved water (Willing,

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¶14). This is incorrect. The vaults are being designed to employ additional features to enhance their water quality treatment abilities, and to provide the reserved stormwater function, in addition to all the typical BMPs already employed. Additional features include:

- Increased baffling to enhance sediment trapping capabilities
- More intense inspection/maintenance to ensure proper function
- Special placement of inlets and outlets to minimize resuspension of sediments
- Floating discharge structures to minimize discharge of floatables/settled solids
- Ventilation features
- Provision for reserved storage above dead storage areas
- Provision for contingencies if pilot program/monitoring show that they are needed (filtration/mechanical aeration)

Also, stormwater monitoring data (annual reports) show that airfield runoff is cleaner than typical urban stormwater due to restricted access and source control. These features will continue to be employed in addition to the special features noted above. All this gives assurance that violations of water quality standards will not occur in area streams or in other receiving waters. Finally, the adaptive management system proposed (similar to NPDES approach of implementing BMPs, monitoring their effectiveness and if necessary, making changes to enhance performance) provides assurance that unanticipated concerns can be detected and corrected, both during the pilot program (prior to operation) and during operation of the facility.

47. In addition to BMPs outlined above and those conditions required by Ecology in the §401 Certification, stormwater used for mitigation will be detained for a period of time that will allow for settling and management of particulates, as well as monitoring and management for dissolved oxygen. Contrary to Dr. Strand's contention (Strand, ¶ 34), weekly monitoring for dissolved oxygen is sufficient. While DO can increase rapidly from new stormwater input, a decrease in DO occurs gradually. If necessary, reaeration can be accomplished for the small flow

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from the facilities using passive aeration systems such as drip towers or cascades over roughened surfaces.

48. Dr. Willing's observations that STIA lies in a "semi-arid" climate (Willing, ¶ 34) calls into question his conclusions with respect to the viability of filter strips and bioswales as BMPs.

49. Dr. Willing cites a 1992 Metro study that observed negative removal efficiency for fecal coliform in bioswales or open grassed channels, and then suggests that bioswales can behave as a source of bacteria. I have reviewed the Biofiltration Swale Performance, Recommendations and Design Considerations Report (Seattle Metro 1992) cited by Dr. Willing (Willing, ¶35). The report concludes that the swale which had negative removal efficiency was located next to a major arterial and near a city park and goes on to note that, "It was often observed that people walked their dogs in and around the swale." The report concluded that it was "highly likely" that the unexpected increase in coliform bacteria was due to animal feces and bacteria multiplication within the swale. It is inappropriate to compare the STIA filter strips with the bioswale cited in the study, especially given the fact that that animals will not be able to access the bioswales employed by the Port.

50. **Mitigation Losses from Evapotranspiration and Infiltration Can Be Easily Addressed.** Stormwater from the vaults will be discharged via the same pathways as the detention facilities. In the event that low flow discharge is lost via infiltration or evapotranspiration, water can be piped directly to the streams, or the drainage channels can be lined to reduce losses. Complete preliminary drawings will be provided in the updated low stream flow report.

51. **Compliance With Water Quality Standards.** Both Dr. Willing and Mr. Rozeboom express concern throughout their declarations that the MPU projects and airport operations in general may cause violations of water quality standards. Both ignore, however, the fact that, in addition to the §401 Certification, Ecology has also issued a stringent National Pollution Discharge Elimination System (NPDES) permit for STIA. The NPDES permit was issued to the Port by Ecology under §402

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of the Clean Water Act. The NPDES permit contains the requirements that mandate compliance with the Clean Water Act's standards, as well as protecting the receiving waters to which the Port is discharging. The NPDES permit states "Compliance with this permit is deemed compliance with the Federal Water Pollution Control Act, also known as the Clean Water Act (33 USC §1251, et seq.), and the Water Pollution Control Act (RCW 90.48)." (NPDES Permit No. WA0002465-1, p. 8). *See* Exhibit G.

52. The Port's NPDES permit was conditioned to comply with water quality standards. Any future NPDES permits must likewise be conditioned to comply with water quality standards and the anti-degradation requirements of the Clean Water Act. (WAC 173-201A-060, 173-201A-070, Fact Sheet to NPDES Permit No. WA-002465-1, pp. 22-23). The Fact Sheet that accompanies the Port's existing NPDES Permit states as follows:

> In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standards... The Department has reviewed the ambient water quality monitoring results gathered by the Port... and [t]he discharges authorized by this permit should not cause further degradation which would interfere with or become injurious to existing beneficial uses. (Fact Sheet, pp. 22-23).

53. In my opinion, and consistent with this language, in instances where an applicant has an existing NPDES permit, compliance with the permit will provide reasonable assurance that the discharges covered by the permit will comply with applicable state water quality standards.

54. The Port's NPDES permit imposes an ongoing process under which (1) best management practices (BMPs) are identified in the *Stormwater Pollution Prevention Plan*, (2) BMPs are implemented, (3) BMPs are inspected and monitored to demonstrate BMP effectiveness, (4) BMP improvements are made when necessary, and (5) follow-up sampling is used to demonstrate that the improvements are effective. The Port submits an Annual Stormwater Monitoring Report to Ecology. Ecology reviews this report to ensure that the Port's discharges are in compliance with the Clean Water Act, and that discharge conditions actually protect receiving waters. See also *Comprehensive*

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Stormwater Management Plan (December 2000), Sec. 2.2 "Water Quality Management Standards" (p. 2-5 – 2.6).

55. **Glycols Will Not Impact the Quality of Water.** The Federal Aviation Administration (FAA) authorizes only ethylene and propylene glycol for aircraft deicing and anti-icing. Port tenants apply all glycol at STIA. Prior to 1997, some isolated areas where glycol was applied did drain to storm drains. However, as of 1997, all ramp areas where aircraft are routinely deiced drain to the IWS.

56. The Port continues to sample for glycols in stormwater and develop BMPs to address findings. For example, glycol found in SDS1 appeared to come from runoff of glycol from aircraft sprayed in the IWS area under an overhang at the South Satellite. When this problem was identified, drains in this area were connected to the IWS.

57. Additional BMPs are continually evaluated to limit deicing activities to areas that drain to the IWS. Other source controls are not possible, based on the public safety policy that gives aircraft pilots the final say on glycol application. Overspray, tracking, and other possible sources are continually reviewed to determine if additional areas should be diverted to the IWS.

58. The Declaration of Linda Logan contains an extended discussion of the appropriate standard for determining the toxicity of glycols. See Logan Dec., pp. 16-26.

59. **Retrofitting Undertaken In Conjunction with the Construction of MPU Improvements Will Allow for Complete Peak Flow Control and Water Quality BMPs.** Contrary to the assertion of Dr. Strand (Strand, ¶25), the Port will retrofit the entire STIA facility for peak flow control, including portions of the facility that are not modified for MPU projects. The SMP (§§ 2.1.2; 2.1.3; and 6.2.2) describes the standards for retrofitting the airport to meet peak flow reduction objectives. The King County review letter indicates that the peak flow control "will serve to reduce existing rates of erosion." Mr. Rozeboom states in his declaration that the SMP "...should provide sufficient capacity to mitigate for quantitative airport impacts to peak flows...". Since the

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peak flow controls in the SMP includes retrofitting, there is consensus (including consensus from the ACC's experts) that there is 100 percent retrofitting for peak flow controls.

60. In addition to retrofit for peak flow control, the Port will retrofit the airport for water quality BMPs to the extent practicable. All of the new MPU improvements will have water quality BMPs.

61. Section 7.1.4. of the SMP details the proposed retrofitting of areas not included in the MPU improvements that will be retrofit. Section 7.1.5 describes approximately 80 acres (of 570 acres in the STIA industrial stormwater drainage area, or 14 percent) of existing STIA area that will not be retrofit. This area is not proposed for any modifications by the MPU, and construction costs and service disruption make retrofitting impracticable at this time.

62. Moreover, Section 7.1.5 requires the Port to retrofit this area in the event that future redevelopment takes place on those 80 acres or emerging technology in stormwater treatment makes retrofitting these areas practicable.

63. Irrespective of whether this area is ultimately retrofit or not, source control BMPs are applied to those 80 acres, as described in Table 7-10 of the SMP and the STIA Stormwater Pollution Prevention Plan.

64. Dr. Strand is incorrect when he asserts in his declaration that there has been no final decision on retrofitting. *See* Strand Declaration, ¶6. Table 7-8 of the SMP describes the proposed water quality BMPs for STIA that are practicable for implementation. The schedule for implementation is described in Section 7.1 of the SMP. This schedule is required under Condition J.1.c of Ecology's §401 Certification.

65. **Construction of the MPU Improvements Will Result in Increased Water Quality.** The MPU projects will be constructed on existing STIA areas or, in the case of the third runway, on recently acquired residential land. Many existing land uses and potential water quality impact sources will be retired as a result of the MPU projects. For example, over 400 houses and

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businesses will be removed, each of which contributes stormwater pollutants such as sediment, metals, pesticides, herbicides, fertilizers, and animal waste. In addition, farms in the Port's acquisition area will be removed, reducing pollutants commonly associated with farms, such as sediments, animal waste (fecal coliforms), and agrichemicals. Animal waste is by far the primary contributor to fecal coliform in area creeks. Removing uses such as houses, septic systems, golf course (favored goose habitat), and farm should have a positive impact on fecal coliform. The new uses (ruways, taxiways, infields, and rooftops) are insignificant contributors of fecal coliform into the environment.

66. Finally, stormwater runoff from runways compares favorably with runoff from residential areas. This fact is elaborated more fully in the Declaration of James C. Kelley. Contrary to the assertion made by Tom Luster (Luster, ¶ 26), it is unclear what is unique about existing conditions near the site. From the perspective of stormwater management, this is an urban/suburban setting very similar to hundreds of other such sites located throughout the Puget Sound region, with small salmonid-bearing streams heavily impacted by development and few BMPs for stormwater quality management in place.

67. Contrary to Mr. Luster's assertions, what may be unique about the stormwater from STIA is that runways and aircraft movement areas typically have lower concentrations of stormwater pollutants, especially when compared with other land uses in the vicinity of STIA and in the affected watersheds. *See* SMP, p. 4-17.

68. While the MPU projects are significant in their scale, the size and extent of stormwater management facilities that will be constructed to mitigate potential stormwater impacts are likewise significant in their scale.

69. Several factors must be considered in a assessing whether the Port's proposed MPU improvements will have an impact in the overall water quality of the watersheds of Miller, Des Moines and Walker Creeks.

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70. First, the extent of the Port's impacts to the watershed is limited to property that is actually in the Port's control. In the Miller Creek watershed (which includes Walker Creek), even with the acquisition of west side properties, the Port's holdings will increase from approximately 3% of the total Miller Creek watershed to approximately 9% of the watershed.

71. A majority of this acquisition will be permanently set aside for wetland mitigation or stormwater management. The SMP and natural resource mitigation plans describe how the Port is mitigating potential watershed impacts and providing additional mitigation to retrofit existing impacts. The Port's mitigation plans are consistent with overall watershed-wide objectives.

72. In the Des Moines Creek watershed, the Port controls approximately 23 percent in airport area. Several acres in the Port's control are included in noise abatement and runway protection zones that are undeveloped. The Des Moines Creek Basin Plan identifies existing problems in the heavily impacted watershed. Each of the Port's actions addresses a component of the Des Moines Creek problems including:

- Peak flow impacts, which the Port will mitigate and improve with peak flow retrofitting described in the SMP
- Water quality impacts that will be reduced by retrofitting water quality BMPs and on-going monitoring under the §401 Certification and NPDES permit
- Wetland enhancement and riparian area restoration on the Tyee Valley Golf Course
- Continued participation in the Des Moines Creek Basin Plan
- Low flow water to mitigate low stream flow impacts

The Port's mitigation plans are consistent with overall watershed-wide objectives.

73. Copper, lead and zinc are common pollutants from roadways. Given the amount of the three watersheds that the Port actually controls, there is a strong probability that these pollutants are also contributed from sources other than the Port's operations.

74. **The Port's MPU Project Has Changed and Many New Reports and Analyses Have Been Submitted to Ecology Since October 2000.** Since the withdrawal and reapplication of

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the MPU's Joint Aquatic Resource Permit Application (JARPA) in October of 2000, several additional analyses and reports have been completed. The SMP was resubmitted in December 2000 for King County review. The updated report included a revision to the retrofitting standard on the west side acquisition area, in addition to addressing review comments to the August draft SMP. Multiple iterations of revised reports and review are typical, especially for large, complex projects such as this and the "new ground" of continually changing stormwater standards. The December report was then updated through a facilitated review and page replacement process. Therefore, there have been at least two significant updates to the last stormwater documents "reviewed" by Mr. Luster, prior to his reassignment within the Department of Ecology.

75. The Low Flow Analysis was a part of the August 2000 SMP. The Port elected to remove an updated low flow analysis from the SMP and convert it to a stand alone document that was released in December 2000. An updated low flow study was submitted to Ecology in July, 2001 to address review comments by Ecology. Here again, there have been two updates to review documents since the last review by Mr. Luster when working at the Department of Ecology.

76. **The Northwest Ponds Do Not Exceed Water Quality Standards.** The Dissolved Oxygen Deicing Study (Cosmopolitan Engineering Group 1999) shows that, contrary to Mr. Luster's assertion in ¶29 of his declaration, copper, lead, and zinc levels in the Northwest Ponds do not exceed water quality criteria in the Northwest Ponds (see Table 16, instream metals results).

77. The Northwest Ponds are man-made ponds that were excavated for peat in the 1950s and farmed prior to mining. The surrounding wetland complex has been highly altered by clearing and golf course operations. The Port discharges stormwater into the Northwest ponds from the SDS3 and SDS2 outfalls. The discharge point for SDS 3 is approximately 1,500 feet from the Northwest ponds; SDS2 is approximately 980 feet upstream of the ponds.

78. In response to the assertion that there may be impacts to Northwest Ponds, the Port undertook a study of dissolved oxygen (DO) in the Northwest Ponds subsequent to the Mr. Luster's

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departure from the Department of Ecology. Because multiple factors influence the levels of dissolved oxygen in Northwest Ponds and Lake Reba (e.g., rainfall, wind, temperature, length of dry period, natural organic carbon in runoff and pond sediments), the Cosmopolitan (1999) study was unable to show any relationship between the application of de-icers and levels of dissolved oxygen in the ponds. The Port undertook a second study the following winter that reached similar conclusions. *See* Examining the Effects of Runway Deicing On Dissolved Oxygen in Receiving Waters: Results of the 1999-2000 Winter Season (Seattle-Tacoma International Airport, Janaury 2001). Given the infrequent and minimal use of ground de-icers at Sea-Tac Airport, further studies are not likely to change the findings reported thus far.

79. **Mr. Luster Has Misconstrued the Booth and Horner Study.** Research conducted by Horner and Booth on Puget Sound Lowland streams is extensive and has looked at several biological and physical parameters of stream integrity (Horner et al 1996). A copy of the Horner and Booth study is attached as Exhibit H. Parameters measured include Benthic Index of Biological Integrity, ratio of coho salmon/cutthroat trout, zinc concentrations, ratio of 2-yr peak to winter base flow, LWD, ratio of water column dissolved oxygen (DO) to intragravel DO. Zinc concentrations are regulated by the Washington State Department of Ecology under WAC 173-201A. The others are indices of quality, but are not regulated parameters. Mr. Luster has cited the Horner and Booth research in his declaration in support of his claim that watersheds that have more than 20% impervious surface will show a decline in water quality. *See* Luster Declaration, ¶29.

80. A key finding of Horner & Booth study was that there is little association between water and sediment quality and relatively low and moderate levels of urbanization, and that "increasing hydrologic fluctuation seems to be an early harbinger of rising impervious surface cover". In general, according to Horner & Booth's research, the condition of urban streams, such as Miller and Des Moines creeks, are more related to changes in watershed hydrology than an increase in chemical pollutants. The data that supports this conclusion is summarized below:

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- "the concentration [of zinc] was well below both criteria under all conditions until TIA [total impervious area] rose above 40 percent." (Horner et al 1996).

- all zinc concentrations were "below the 'lowest effects threshold' of the Washington State Department of Ecology (1991) freshwater sediment criteria and far below the 'severe effects threshold.' The low measured concentrations relative to advisory or regulation criteria were found with other metals as well. As with water quality, it appears that sediment quality does not change appreciably until urbanization reaches the vicinity of 50 percent impervious." (Horner et al 1996).

- Concentrations of metals in sediments "did not change much over the urbanization gradient until imperviousness approached 50 percent ... and sediment concentrations remained far below freshwater sediment criteria." (Horner et al 1996).

81. Horner et al 1996 concluded that "There was direct evidence in both stream and wetland cases that altered watershed hydrology was at the source of the overall changes observed." Based on this statement, the SMP proposes significant measures to enhance beneficial uses of the streams.

82. The Port is proposing to retrofit an area of 2.7 square miles in the three watersheds located at both the existing airport and in new airport area and provide Level II detention for all new impervious surfaces. The HSPF models developed for the SMP demonstrate that these BMPs will restore the hydrologic regime, peak flows and flow durations of these airport basins to a pre-developed condition. The Low Flow Analysis demonstrates that the proposed Master Plan Improvements will not significantly impact summer base flows.

83. It is also important to note that the studies referred to in Horner et al 1996 were performed on watersheds where development was constructed prior to 1990 and which therefore had little or no stormwater detention and treatment. In addition to the proposed stormwater improvements, the Port is also proposing to restore 1.4 miles of stream buffer in Miller Creek, which Horner et al 1996 also state may "help ameliorate the effects of more distant urbanization."

84. **The Mitigation Plans Submitted to Ecology Contained Appropriate Levels of Detail to Allow for Review.** Monitoring plans for construction are typically submitted and reviewed prior to construction. The mitigation plans submitted by the Port to Ecology contain a sufficient level of detail to allow for review by the Department and there is reasonable assurance that

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those plans can be developed and implemented. A project cannot start if a plan has not been submitted and reviewed.

85. Contrary to the assertion of Mr. Rozeboom (Rozeboom, ¶ 7), the mere fact that there is not a technical manual for the low flow proposal does not mean it is not feasible or based on sound engineering. The low flow mitigation approach is fully described and the analysis supporting the mitigation approach is fully explained. The details of final vault construction are not fully drawn, but these are not feasibility concerns. The vaults and other systems used in the Low Flow Analysis utilize standard engineering that is common in stormwater management. The scale of the proposal is significantly larger than most projects, but the constructibility and engineering issues are far from unique and do not raise feasibility concerns.

86. Similarly, Mr. Luster's contention (Luster, ¶35) that final drawings are required for reasonable assurance is not well taken. Reasonable assurance does not require that the project be put to final design and built to determine if the proposed mitigation and other plans will work. Also, as Mr. Luster notes, this was the last in a long series of applications and submittals and Ecology's review of the current Port plans did not start over with the submittal of the Port's final application. The Ecology team had been reviewing the project for years (including a year when Mr. Luster wasn't involved in the review).

87. In fact, the detail of Ecology's review is demonstrated by the specification of the revisions and updates required in the §401 Certification. This level of analysis demonstrates a detailed evaluation by Ecology and the fact that the Port's plans were well understood by Ecology.

88. **Dr. Willing Overstates the Impact of "First Flush."** Dr. Willing asserts that BMPs for stormwater will be ineffective based on the existing low stream flows that provide little dilution of contaminants and that the first flush of accumulated pollutants in stormwater runoff will have severe impacts on streams. *See* Willing Declaration, ¶ 37. In fact, when the "first flush" of pollutants are flowing to streams, those streams are rising in response to the same storm. In addition,

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as was noted above, runways and taxiways have reduced concentration of stormwater pollutants. Based on the increased dilution from the "first flush" storm and the reduced concentration of stormwater pollutants from runways and taxiways, the severe water quality impacts asserted by Dr. Willing will not arise.

89. **The Port's Proposed Plans Provide Reasonable Assurance that Water Quality Standards Will Be Met.** The Port has approached stormwater management at STIA with BMPs that have been studied, applied, updated, and monitored for decades. Potential stormwater and water resource impacts from the MPU project have been thoroughly assessed. Peak flow impacts due to new impervious surfaces and embankment construction are mitigated with 344.1 acre-feet of stormwater detention. Existing airfield facilities will be retrofit to mitigate existing peak flow impacts as well. The MPU projects are redevelopment of land that caused water quality impacts without mitigation, such as residential areas, streets, businesses and farms. Water quality impacts have been addressed using BMPs to reduce pollutants in stormwater runoff for new MPU projects as well as existing Port facilities. These BMPs are continually reviewed and tested, and emerging technology to address complex or unique stormwater runoff is being applied at STIA. The Port's NPDES permit provides the opportunity to continually monitor stormwater and update BMPs as problem areas are found. Finally, the Port's low stream flow mitigation plan has been developed using innovative applications of state of the art modeling approaches to determine impacts and simple, straightforward BMPs to offset impacts.

90. The Port will operate STIA for many years to come. There is continual oversight of the Port's operations and permits. The NPDES permit provides a mechanism to implement updated stormwater control BMPs. The Port has sufficient resources to perform ongoing monitoring, apply new technology BMPs when needed, and implement contingencies. There is reasonable assurance that water quality impacts have been fully mitigated for MPU projects.

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I declare under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

Executed at Kirkland, Washington this 28th day of September, 2001.

Paul S. Fendt

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