POLLUTION CONTROL HEARINGS BOARD
FOR THE STATE OF WASHINGTON

AIRPORT COMMUNITIES COALITION, Appellant, v. DEPARTMENT OF ECOLOGY AND THE PORT OF SEATTLE, Respondents.	No. 01-160 SECOND 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.

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 ("SMP") and a principal author of the Low

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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 11years. A copy of my current curriculum vitae is attached as Exhibit A to the earlier Declaration Of Paul S. Fendt that was filed in this appeal on October 1, 2001.

4. In its reply on the motion for stay in this matter, the Airport Communities Coalition claims that the Port has control of the schedule to retrofit the existing portions of the stormwater system at Seattle-Tacoma International Airport. That claim is incorrect. As I explained in my earlier declaration, the Port will retrofit the entire STIA facility for peak flow control, including the portions of STIA that are not being modified for MPU projects. The project Stormwater Management Plan ("SMP") at §§ 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." As a result, there will be 100 percent retrofitting for peak flow controls at STIA. True and correct copies of SMP §§2.1.2, 2.1.3 and 6.2.2 are attached as Exhibit A.

5. In addition to retrofit for peak flow control, the Port has committed in the SMP to retrofitting the existing stormwater system at STIA for water quality best management practices ("BMPs) to the extent practicable. All of the new MPU improvements will have water quality BMPs.

6. Section 7.1.4. of the SMP details the proposed retrofitting of areas not included in the MPU improvements that will be retrofit. The retrofitting schedule at STIA is set forth in the SMP Appendix A, Table A-3. 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. This 80-acre area will be retrofit for BMPs in the event that future redevelopment takes place on those 80 acres or that emerging technology in stormwater treatment makes retrofitting these areas practicable. True and correct copies of SMP §7.1.4, §7.1.5, and Table A-3 are attached as Exhibit B.

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7. Irrespective of whether this area is ultimately retrofitted 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.

8. Contrary to ACC's assertions, final decisions have been made on retrofitting the existing facilities at STIA, and those decisions are reflected in the SMP. 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. Implementation of the SMP (including all the implementation schedules in the SMP for retrofitting) was required pursuant to Condition J.1 in Ecology's August 10, 2001 §401 Certification, and continues to be required in the Condition J.1 to Ecology's revised §401 Certification issued, which was issued on September 21, 2001.

9. In addition to Condition J.1, the original (August 10, 2001) §401 Certification contained a potentially contradictory condition for the retrofitting schedule, Condition J.1.c, which required 20 percent of retrofit to be accomplished for each 10 percent of new impervious surface added at STIA. In my opinion, this condition not only conflicted with Condition J.1, but it is also impracticable. In order to physically construct the water vaults, filter strips and other BMPs for the retrofit, that construction must be coordinated with the other construction on site (e.g., construction for the embankment for the new runway). This requires construction of the retrofit to precede construction of the new MPU stormwater facilities, some of which are in the same locations or will be constructed jointed in the same facility. Accordingly, the revised §401 Certification modified Condition J.1.c to give Ecology and the Port flexibility to determine the most appropriate retrofit schedule when there is a conflict between the approved retrofit schedule in the SMP (as required by Condition J.1) and the 20%:10% requirement in Condition J.1.c.

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 9th day of October 2001.

Paul S. Fendt

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In response to these differences, the Port has combined the standards of the two manuals to create an "Enhanced Level 1:"[4] flow control standard:

- Enhanced Level 1 standard requires detaining the 2-, 10-, and 100-year post-developed peak flows to their pre-developed magnitudes.

Proposed regional detention facilities would provide the storage needed to control streamflows to meet the Level 2 flow control goal, as discussed below.

2.1.2 Base Year

A common element of the different flow control standards is the need to define the existing (pre-developed) conditions. The selection of a base year defines the degree of basin development (i.e., impervious area and land cover) against which future development conditions will be compared. As described below, current regulations specify different base year conditions. However, STIA implementation of this SMP will involve retrofitting all of the STIA basins to pre-developed conditions (as described in Section 2.1.3), which is more restrictive (less developed) than the proposed base years. Therefore, the base year comparison is used only to determine the degree of development that existed prior to application of the retrofitting standard.

Several base year alternatives were considered for defining the existing condition for the MPU:

- 1974 was used as the base year for the *1997 Seattle-Tacoma International Airport Storm Drainage System Comprehensive Plan* (HDR 1997). This base year was required by Ecology in the August 1995 amendment to the Port's National Pollutant Discharge Elimination System (NPDES) permit since 1974 was the first full year in which flow controls were in effect in compliance with the Kludt (1972) stipulated agreement.

- The King County Manual requires the base year to be either (1) the year since 1979 in which a project was permitted and constructed in compliance with the Manual, or (2) the year 1979, when King County first required flow controls (King County 1998). With the exception of NEPL (see below), no significant drainage plans were implemented by the Port between 1979 and the present; therefore, 1979 is generally the base year required by the King County Manual.

- 1994 was used as the base year for the MPU EIS, with the assumption that all changes made to airport land use since 1994 were the result of MPU activities or NPDES requirements.

1994 conditions were used to define existing conditions for purposes of retrofitting the airport, with the exception of NEPL. [5]

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[4] "Enhanced" refers to the addition of the 100-year peak for MPU improvements.

[5] NEPL was permitted in 1997 and constructed in 1997-1998, in compliance with the 1992 King County Manual. Therefore, NEPL's existing site conditions are those created by the site improvements and drainage facilities constructed per the approved permits and engineering plans. If applicable, the retrofitting standard applied to NEPL assumes that the existing constructed parking lot will be retrofitted.

2.1.3 Target Watershed Flow Regime

To reduce stormwater peak flows and flow volume impacts from existing airport areas, the Port has committed to adopting a flow control goal for streamflows in Miller, Walker, and Des Moines Creeks that will protect the creeks from frequent, high velocity flows. The flow control goal, or target flow regime, was determined based on flow duration analyses.[6] Development of the target flow regime is described below.

Streamflow is expressed as a flow duration curve, which is calculated from a continuous streamflow time series (or hydrograph). The flow duration curve shows the amount of time that streamflow is exceeded at different flow magnitudes. Greater imperviousness in a watershed typically increases the duration and magnitude of high flows in a stream if these impacts have not been mitigated through detention.

The Miller and Des Moines Creek watersheds have been altered by human activities such as farming and logging for more than 100 years (Des Moines Creek Basin Committee 1997). Urbanization over the last 50 years (since the airport has been in existence) has resulted in total impervious surface area within the watersheds of about 24 percent in Miller Creek and 30 percent in Des Moines Creek.

While it was recognized that the level of imperviousness in Miller and Des Moines Creek watersheds has resulted in considerable degradation of the natural stream ecosystem, to a certain degree the stream morphology has stabilized and adapted to the more recent flow regimes. By re-introducing streams to pre-developed (i.e., forested) flow regimes that existed prior to development, unstable channel conditions may again result, and the stream could require years to adapt to this change. For example, a large reduction in peak flow magnitudes and sediment transport capability could cause increased sedimentation in a channel.

In watersheds experiencing low levels of urban development, it has been shown that streams can handle a certain amount of urbanization before signs of stream degradation are observed. The relationship between watershed imperviousness and resulting stream channel changes has been discussed in several comprehensive reviews (e.g., Scheuler 1994; Booth and Jackson 1997). Research models and data developed in the Pacific Northwest suggest that a threshold for urban stream stability exists at about 10 percent imperviousness (expressed as effective impervious area). Impervious area above this level results in unstable and eroding stream channels. Booth and Jackson (1997) measured habitat quality variables such as pool and riffle sequence, overhead cover, and wetted perimeter. They found decreases in these indices at 10 to 15 percent imperviousness. Therefore, 10 percent imperviousness was identified as a threshold for degraded channel conditions.

There is currently no policy by local jurisdictions to retrofit the Miller and Des Moines Creek watersheds through the site development permitting process. During the Des Moines Creek watershed basin planning process, the Des Moines Creek Basin Committee chose to rely on regional detention facilities to mitigate existing impacts for development constructed prior to adoption of stormwater detention standards (first enacted by King County in 1979 and then upgraded in 1990

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[6] A flow duration analysis depicts the percent of time that a range of flows are exceeded over the hydrologic period of record.

and 1998). In the Miller Creek basin, the MCDF was constructed in 1992 by King County to reduce downstream flooding and reduce the impacts of future development.

Therefore, for the purposes of establishing a target flow regime, a uniform watershed[7] land cover of 10 percent impervious was assumed, with 15 percent pervious grass and 75 percent pervious forest.[8,9] Basing target flows on theoretical basin development of 10 percent is expected to reduce existing peak flows and durations and be beneficial in maintaining stable stream channels (Ecology 2000a).

The above assumptions and goals are compatible with the goals of the Des Moines Creek Basin Committee for stabilizing the Des Moines Creek channel. The Draft Preliminary Design Report for the Des Moines Creek Regional Detention Facility (RDF) notes that the critical erosive flow rate under current conditions is higher than would exist under forested conditions (King County CIP Design Team 1999). With the proposed reduction in assumed impervious area, the resulting assumed pre-development flow duration curve will be lower than the actual existing conditions flow duration curve.

2.1.4 Updated Detention Requirements

During Section 401 Water Quality Certification discussions with Ecology in 1998, additional mitigation to reduce stormwater discharge rates was identified. To provide additional protection to Miller, Walker, and Des Moines Creeks, the following standards were added to the mitigation requirements for MPU improvements:

- In the Miller and Walker Creek basins (draining airport areas), the stormwater detention facilities will be designed to Level 2 (using a theoretical basin development of 10 percent impervious area as described above). For sub-watersheds draining to the Miller Creek Detention Facility (MCDF), additional future analysis by the Port or the Miller Creek Basin Committee may show that the target flow and Level 2 standards can be met at the outlet of the MCDF (with or without expansion or modification of the facility). Stormwater detention facilities shown by the Port may be modified, with approval by Ecology, to reflect using available detention in the MCDF and a new point of compliance. In either case, the objective to meet the target flow using the Level 2 standard in Miller Creek will be met.
- The Level 2 detention storage will be provided in on-site stormwater detention vaults in the Des Moines Creek basin (using a theoretical basin development of 10 percent impervious area). However, if the proposed Des Moines Creek RDF is constructed, the detention standard will be Enhanced Level 1, and 1994 land cover will be used.

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[7] For application of this standard a "watershed" means the area that drains to a detention pond and/or has a unique point of compliance.

[8] This target flow regime of 10 percent impervious area, 15 percent grass, and 75 percent forest is more restrictive than the flow regime used in the November 1999 SMP. The previous retrofitting target flow also assumed 10 percent impervious area, but existing impervious was converted to grass, and the remaining pervious area was unchanged.

[9] In watersheds when existing imperious area is less than 10 percent, the impervious area is not changed and the difference between actual percent impervious and 10 percent is assumed to be grass.

current water quality conditions in the stream and may also improve downstream fish habitat conditions. The basin plan recommended that the augmentation system supply up to 400 gpm (about 0.8 cfs) of water from the well to the stream for several weeks during the normal summer low-flow period.

Streamflow data recorded in 1996 and 1997 (King County 1997) indicate that late summer flow rates in the stream below the confluence of the east and west branches drop to about 0.3 to 0.5 cfs. Based on a potential well supply of 0.8 cfs, flow augmentation should prevent streamflow levels from dropping below 1.0 cfs.

The baseflow augmentation system would probably be operated by an automated stream gage on Des Moines Creek at the location where King County currently operates a gage. The County gage is located at a concrete weir a short distance north of South 200th Street. Permanent instrumentation would be installed at that site to operate the flow augmentation system. The pump system would be turned on when the streamflow drops below 1.0 cfs. The system could also be set to pump cool groundwater to the stream when temperatures exceed a critical level. Initially, the critical water temperature would be set at 19°C, which was about the maximum water temperature in lower Des Moines Creek in 1996 (upper Des Moines Creek reached 20.5°C). The pumping rate would have different levels so that flow augmentation could be ramped up as the streamflow drops or as the temperature increases. Additional streamflow measurements should be conducted to confirm the late summer flow rates, and tests should be conducted after the facility is installed to evaluate the benefits of different pumping rates on instream temperature and dissolved oxygen levels.

The Des Moines Creek Basin Committee will be responsible for implementing the plan, as provided in the Des Moines Creek Basin Plan. However, the Port will work with the Des Moines Creek Basin Committee to ensure that the flow augmentation project is implemented once the Section 401 Water Quality Certification for the Third Runway is issued. Ecology has indicated its support of this project.

6.2.2 Retrofit of Stormwater Detention for Existing Airport Areas

As previously discussed, stormwater impacts from existing airport areas will be mitigated by proposed detention ponds and vaults. In addition, the entire airport will be retrofit to the theoretical basin development condition with the proposed detention facilities. However, the Port will continue participation in constructing regional stormwater detention facilities. Miller Creek Detention Facility expansion and the proposed Des Moines RDF would reduce peak flows and durations, and achieve stable and non-degrading flow regimes in Miller and Des Moines Creeks. If the facilities are expanded (MCDF) or constructed (RDF), the Port would reduce detention volumes to meet the Enhanced Level 1 or other applicable standard. Regional detention facilities provide stormwater detention storage needed to retrofit the airport to pre-developed conditions (as defined in Section 2.1).

6.3 CONSTRUCTION SCHEDULE

The MPU improvements would be constructed over a period of approximately 10 years. The goal of the scheduling analysis is to verify that stormwater detention requirements for the MPU

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Table 7-7. Summary of existing areas in compliance with water quality treatment BMP requirements.

Area	Existing Treated Land Use	PGIS Treated	BMPs
SDN1-Kitchens[a]	Parking lot	0.7	Treatment wetland, bioswale
SDN3	Runway and taxiways	24.7	Filter strips
SDN4	Runway and taxiways	9.0	Filter strips
SDE4-Taxiways[a]	Taxiways	4.6	Filter strips
SDE4-NEAT[a]	Parking lot	2.9	Bioswale
SDS3[a]	Runway and taxiways	190.0	Filter strips
SDS4	Runway and taxiways	32.3	Filter strips
SASA area[a]	Construction staging area	17.6	Bioswale

[a] The areas reflected in this table represent the treated portion of the PGIS in these areas. Some existing PGIS in these areas is untreated. Treatment of untreated portions of these areas is discussed in Sections 7.1.1, 7.1.2, 7.1.4, and 7.1.5.

7.1.4 Treatment BMP Retrofitting

Additional BMPs were identified to provide runoff treatment to the maximum extent practicable for subbasins where existing BMP coverage is not consistent with the Ecology Manual (Table 7-8). The proposed additional BMPs were selected and sized based on best available information. These BMPs were identified to demonstrate the Port's ability and intent to provide treatment BMPs per the implementation plan described at the beginning of Section 7.1.

7.1.4.1 Subbasin SDN1

An existing bioswale provides full treatment for approximately 0.7 acre of the flight kitchen parking lots north of South 154th Street. Approximately 6.8 acres of PGIS in subbasin SDN1 are currently partially treated or untreated.

As shown in Appendix D, a detention vault will be constructed to detain runoff from subbasin SDN1, with a volume of approximately 5.6 acre-ft and a footprint of approximately 22,000 square ft. Subbasin SDN1 will be retrofitted for water quality treatment by constructing a wetvault combined with the detention vault. The approximate wetvault volume required to treat this area would be calculated as follows (formula given for land use types found in subbasin SDN1; note that 0.27 acre of airport fill was included in the till grass area):

$$\text{Volume} = 3^* [(0.9 * A_{impervious}) + (0.25 * A_{till\ grass}) + (0.01 * A_{outwash})] * (R/12)$$

Where:

R = rainfall from mean annual storm (inches)
All areas in square ft

$$\text{Volume} = 3^* [(0.9 * 576{,}700) + (0.25 * 97{,}600) + (0.01 * 267{,}500)] * (0.47/12)$$

Volume = 64,200 cubic ft

Four ft of dead storage plus 1 ft of sediment storage within the footprint of the detention vault would provide more than this volume and would meet minimum and maximum wetvault depth requirements (with baffle and other design requirements also included).

The Port will implement the above alternative, or another alternative that will provide treatment for all PGIS in subbasin (SDN1).

7.1.4.2 Terminal Drives

Based on the volume of vehicle traffic and the traffic use pattern (idling, stop-and-go traffic) on the Upper and Lower Terminal Drives (approximately 2.0 acres), the area meets the intent of the King County Manual definition of a high-use site. Therefore, oil control BMPs in compliance with the King County Manual will be applied to drainage from the Terminal Drives. The Terminal Drives will be diverted to the IWS. As discussed in Section 4.5.3, the IWS meets the oil-control treatment requirement for high-use sites. However, should diversion to the IWS be unfeasible, oil control facilities will be installed per the King County Manual (coalescing plate oil-water separator or equivalent).

7.1.4.3 South Satellite Canopy

Stormwater monitoring in subbasin SDS1 indicated that approximately 0.6 acre of area under the building overhang at the South Satellite Terminal may have been contributing types and quantities of pollutants more appropriate for drainage to the IWS. Therefore, the entire south Satellite SDS area was diverted to the IWS in 2000. The 0.6-acre SDS area under the overhang could not be effectively separated from the roof drainage; thus, the entire South Satellite SDS was diverted.

7.1.4.4 Alaska Airlines Parking

The Alaska Airlines Parking Lot (approximately 2.0 acres) is currently untreated. The area, which is part of subbasin SDS1, drains to South 188th Street. A bioswale (approximately 1,500 square ft) would be installed along the vegetated strip of South 188th Street.

7.1.5 Areas Not Practicable for Retrofitting

The Ecology Manual states that the minimum stormwater requirements (including water quality treatment) shall be implemented to the maximum extent practicable for the entire site.

As described in Sections 7.1.1 through 7.1.4 above, water quality treatment will be implemented for the majority of the SDS, via treatment BMPs installed concurrently with new development or redevelopment, or installed solely as a retrofit. However, as described below, retrofitting of approximately 35.4 acres of subbasin SDE4 and 44.6 acres of subbasin SDS3 with conventional treatment BMPs would be impracticable, requiring extensive disturbance of complex drainage areas not scheduled for redevelopment (Figure 7-1). Retrofitting these fully developed existing areas would require the use of wetvaults. The total cost to retrofit these areas would be approximately $15 million (Appendix M). The Port will continue to evaluate the need for and use of innovative

Table A-3. Sea-Tac Airport Master Plan Update projects requiring stormwater management.[a]

Activity	Construction Start	Construction End	Permanent Stormwater Detention Provided?	Year MPU in Service[b]	Facility (Year in Service)	New or Retrofit	Comment
A. RUNWAY AND TAXIWAYS							
Runway Safety Area							
Runway 34R Safety Fill	1/96	12/96	Yes	T	SDS(5)	Retrofit	No new impervious; detention was not required when the facility was built
Auburn Wetlands Mitigation	8/01	6/04	No	—	N/A	—	No new impervious
Miller Creek Relocation	4/02	12/02	No	—	N/A	—	No new impervious
Vacca Farm Floodplain Restoration	3/02	12/02	No	—	N/A	—	No new impervious
154th / 156th Street Relocation	4/02	10/03	Yes[c]	3	MCDF (T)	Retrofit	No new net impervious; detention provided in regional facility
Safety Areas 16R/16L	5/04	10/05	Yes	5	SDN2x/4x (4)	New	New fill and impervious
Miller Creek Sewer Relocation	3/02	12/02	No	—	N/A	—	No new impervious
Embankment							
Property Acquisition, Street and Utility Vacation	1/98	12/04	No	—	N/A	—	Impervious area removed
Borrow sites 1, 3A, and 4	6/02	6/06	No[g]	—	Temporary detention	—	Cleared and graded areas will drain to temporary TESC ponds
Phase 1 1997 Embankment Stockpile	6/97	11/97	No[d]	—	Temporary detention	—	Cleared and graded areas will drain to temporary TESC ponds
Phase 2 1998 Embankment Fill	3/98	10/98	No[e]	6	Temporary detention	New	Cleared and graded areas will drain to temporary TESC ponds
Phase 3 1999 Embankment Fill	3/99	3/01	No[e]	6	Temporary detention	New	Cleared and graded areas will drain to temporary TESC ponds
Phase 4 2000-2001 Embankment Fill	5/01	1/02	No[e]	6	Temporary detention	New	Cleared and graded areas will drain to temporary TESC ponds