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4G-23

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Permit Coordination Unit
Department of Ecology
P.O. Box 47703
Olympia, WA 98504-7703
ATTN: Tom Luster,
401 Certification Coordinator

Subj: Determining Whether the Washington Department of Ecology (Ecology) Has a Scientifically Adequate Basis to Certify Compliance, Under Clean Water Act Section 401, for the Port of Seattle's Project Proposed in Public Notice Nos. 1996-4-02325 and 1999-4-02325

Dear Mr. Luster:

On behalf of Citizens Against Seatac Expansion (CASE), I have undertaken a review and evaluation of pertinent and readily available literature in an effort to answer the subject question. It is Ecology's responsibility under the Clean Water Act to certify that the Port's proposed project will not violate applicable water quality criteria and will not harm aquatic resources inhabiting the project site. In undertaking this effort, I have relied on my relevant education, specialized training, and professional skills acquired over a 40-year career as an environmental scientist (see attached Curriculum Vitae).

I approached this task by first determining whether water quality in surface waters near Seattle-Tacoma International Airport (STIA) has been impacted by stormwater runoff from the Port of Seattle's ongoing operations at STIA. I addressed both historical and present conditions. I next looked at whether conditions in the receiving waters might improve following the filling of the subject wetlands and subsequent installation and operation of the proposed stormwater retention facilities at STIA. My opinion in this matter was based primarily on reviewing three documents prepared by the Port of Seattle:

- *Storm Water Receiving Environment Monitoring Report for NPDES Permit No. WA-002465-1. Volume 1, and 2 (Technical Appendices). June 1997.*
- *Annual Stormwater Monitoring Report for Seattle-Tacoma International Airport for the Period July 1, 1998 through June 30, 1999. September 1999.*

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- *Preliminary Comprehensive Stormwater Management Plan. Master Plan Update Improvements. Seattle-Tacoma International Airport. Technical Appendices. October 1999.*

I also reviewed and included applicable citations from the scientific literature when the need arose. My conclusions and the detailed evaluations on which they are based are can be found in the succeeding sections:

Conclusions

In my opinion, for the following reasons, the Port has not provided sufficient information to enable Ecology to conclude, on a scientifically defensible basis, that there is reasonable assurance that the Port's discharges will comply with applicable water quality standards:

- Violations of toxic substances criteria in Miller and Des Moines Creeks, particularly for copper and zinc, occur as a result of stormwater discharged from STIA. These violations occurred historically and occur currently. This finding suggests that additional waste treatment (additional connections to the Industrial Waste System at STIA) may be required before stormwater impacts to area surface waters diminish.

- At present (based on the Port's 1999 report), an insufficient number of samples are being collected pursuant to demonstrating compliance with applicable toxic substances criteria. Sampling upstream of STIA no longer occurs.

- The potential effects of de-icers and anti-icers in stormwater discharged to area surface waters cannot reasonably be quantified without conducting WET tests during de-icing events.

- The Port has failed to consistently follow proper quality assurance procedures when collecting and analyzing stormwater samples, thereby diminishing the credibility of the data reported.

- The Port's reports include questionable conventions, e.g., use of inappropriate comparators, perhaps erroneously labeling high or unexpected analytical results as outliers, and not truthfully reporting qualified data, that undermine the scientific validity of the Port's conclusions.

- The Port has not adequately supported its assertion that the proposed stormwater management activities (installation of larger detention basins) will result in substantial improvements in the water quality of either Miller Creek or Des Moines Creek. This conclusion is based mainly on the lack of simulation modeling to address the fate of metals and other chemicals discharged in stormwater at the project site. As a result, the Port has not provided adequate information to enable Ecology to develop conditions that would insure compliance with the water quality standards, Chapter 173-201A WAC.

Historical (1995-1996) Stormwater Discharges to Miller and Des Moines Creeks

While there are several constituents (metals, fecal coliforms, turbidity) associated with STIA stormwater in Miller and Des Moines Creeks that have historically violated State of Washington Water Quality Criteria, the metals copper and zinc are of particular concern given their designation as toxic substances. In both creeks, the Port has presented metals data for stations at the STIA stormwater outfalls, upstream of the outfalls, and downstream of the outfalls. These data are presented as either total recoverable or dissolved metal. The State's toxic substances criteria for these metals are based on the dissolved fraction. The Environmental Protection Agency's (EPA) toxic substances criteria for these metals are based on total recoverable metal. In both cases, the hardness of the water influences calculation of the metal criteria.

Data presented by the Port in 1997 indicated that concentrations of both copper and zinc in STIA stormwater discharges greatly exceeded applicable State/EPA toxic substances criteria, in some instances by more than an order of magnitude. For example at the stormwater outfall to Miller Creek (see 1997 report page 35), total copper concentrations ranged from 4.2-82.9 ug/l. The EPA criterion is 4.4 ug/l. The Port's 1997 data also indicated that concentrations (4.7-14.8 ug/l) of total copper upstream of STIA were at or slightly exceeded the EPA metals criteria. That Miller Creek was unable to assimilate the STIA discharges, however, is confirmed by downstream sampling data showing total copper concentrations of 0.72-44 ug/l. For zinc in Miller Creek, the values at the outfall, upstream, and downstream were 15-525 ug/l, 37-69 ug/l, and 2.3-295 ug/l., respectively, again showing that the influence of zinc additions at the outfall persisted downsteam. The EPA criterion for zinc is 33.7 ug/l.

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The concentrations of copper and zinc downstream exceeded the applicable toxic substances criteria. The Port's 1997 Report does not provide evidence that would support a scientifically valid conclusion that STIA does not impact Miller and Des Moines Creeks downstream of their respective stormwater outfalls. Persistence of an influence of stormwater downstream, and at the magnitudes illustrated above, also suggests the need for treatment of the waste streams. Additional connections to the Industrial Wastewater System (IWS) at STIA should be considered.

Present (1998-1999) Stormwater Discharges to Miller and Des Moines Creeks

Data presented by the Port in 1999 confirm that exceedences of toxic metals criteria continue to occur at the Port's stormwater outfalls to the creeks. In addition, the downstream stations, where sampled, show that the influences of STIA stormwater discharges persist in the receiving waters. What appears missing in the 1999 report, however, is any indication that the Port sampled upstream of STIA. The Port's failure to maintain the original sampling protocol in this regard greatly diminishes the value of their stormwater monitoring program.

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In my opinion, the Port has failed to demonstrate that STIA stormwater does not adversely impact the water quality of Miller and Des Moines Creeks. To the contrary, the Port's sampling data confirms that STIA stormwater greatly contributes to exceedences of toxic metals criteria in the receiving waters. The Port's reminder on page 22 of their 1999 report that the Water Quality Standards apply to receiving waters and not the discharges from their outfalls also is of little consequence if the Port fails to present data from both above and below their outfalls.

Potential Effects of De-Icers and Anti-Icers Discharged to Surface Waters

The Port tends to diminish the potential for toxicity from glycols and the additives found in glycol-based de-icers and anti-icers, which are employed at STIA. LC50 values for invertebrates and fish are generally greater than 1000 mg/l for pure ethylene glycol (Cowgill et al., 1985; Hartwell et al. 1995), although bioassays of commercial de-icer or anti-icer chemicals have resulted in toxicity at much lower concentrations of the parent compound. Hartwell et al., 1995 suggested that this response was attributable to additives and contaminants. For example, Fisher (1994 [in Hartwell et al. 1995]) reported that the 48-hour LC50 for stormwater runoff contaminated with aircraft de-icers or anti-icers ranged between 1.9 and 8.7 mg/l total glycols for *Daphnia magna*, and 1.8 and 5.4 mg/l for *Pimephales promelas*. These values were for combined ethylene and propylene glycols in the stream, and were consistent with toxicity levels found by Hartwell et al. (1995), who tested the commercial chemicals in the laboratory. Hartwell et al. 1995 also reported finding sublethal effects (histological changes in gills) in *P. promelas* following seven days of exposure to 17.6 mg/l propylene glycol. The levels where toxic effects were observed by Fisher (1994) and (Hartwell et al. 1995) are substantially below the concentrations of total glycols (up to 158 mg/l) reported in the Port's 1999 monitoring report.

Some examples of additives found in de-icers and anti-icers that may affect toxicity include: sodium nitrite, sodium benzoate, borax, diethylene glycol, ethylene oxide, acetaldehyde, dioxane, high-molecular weight polymers, polyamines, triazoles, and urea, (MacDonald et al. 1992; Hartwell et al. 1995; Lokke 1984). At issue here is whether the Port ever conducted whole effluent toxicity testing on the runoff during a time when aircraft were de-iced at STIA? It would not appear that they did.

It is uncertain from the text whether the outliers included in Figure 11 of the Port's 1999 Report are, in fact, outliers. Maybe what are called outliers are actually real values within the natural range of variance for this data, and that additional samples will need to be taken to decrease this variance. It would appear that Figure 11 reports a mean value and the spread of data (box plots) over the year. However, only a single grab sample followed by a composite sample are collected during each sampling interval. It is unclear which sample results are included in Figure 11. Clearly, additional samples need to be collected and analyzed before the Port can comment intelligently on the fate of these materials in their stormwater and in affected surface waters.

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It is interesting to note that at the bottom of page 27 of the 1999 report, the Port mentions the finding of high BOD in samples from SDE4, SDS3, SDN1, SDN3, and SDN4, which the Port attributes to an acetate-based runway (ground) de-icing chemical. Glycols were found at low concentrations (15-113 mg/l) in these samples, which suggests that the Port should be asked why they do not also analyze for acetate-based de-icers? Are acetate-based de-icers more toxic than glycol-based de-icers?

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Technically speaking, the Port has only begun to address the issue of de-icers and anti-icers. They have not addressed toxicity in any meaningful way, particularly with regard to the additives found in commercially available de-icing or anti-icing chemicals. Without toxicity testing during de-icing events, they have not in my opinion provided information sufficient to enable Ecology to conclude that de-icers/anti-icers pose no risk to surface waters as a result of their use at STIA.

Use of Water Quality Comparators

In both the 1997 and 1999 reports, the Port includes comparator concentrations for metals, fecal coliforms, turbidity and other water quality parameters in stormwater. Comparator concentrations are based on stormwater data collected by other authorities (e.g., City of Bellevue, City of Portland). These comparators are found in Table 21 in the Port's 1997 report and in table 4 in the Port's 1999 report.

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While these data maybe of some scientific interest, these data do not address the question of whether documented exceedences in water quality criteria in Miller and Des Moines Creeks are attributable to stormwater discharges from STIA. What is germane in this case is a comparison of the concentrations of metals in Miller and Des Moines Creeks with the applicable State or Federal water quality criteria. It really doesn't matter if the concentrations of metals in Miller Creek are the same as the concentrations of metals occurring in surface waters near Portland or Bellevue. All this means is that the City of Bellevue and the City of Portland are also not in compliance with applicable water quality criteria. How the Port has used these comparators is not good science and could be construed as an effort to bias the results of their monitoring.

Reporting of Qualified Data

The Port also failed to properly report data as qualified by their analytical laboratory, King County Environmental Laboratory (Metro). Both Microtox and metals data from Miller Creek and De Moines appear to be affected by this omission. Many results of analyses of samples collected in 1996 (in January, May, June, August, September, October, and November) were qualified with an "H," which indicates that the sample (s) exceeded the holding time before being analyzed. See Volume 2, Technical Appendices of the Port's 1997 report. These same data, however, were not qualified when reported in Volume 1 of the same report.

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For example, in Table 19 on page 35 of Volume 1, which reports metals concentrations in Miller Creek, a range of values of 0.72-44 ug/l for total copper is entered for the

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downstream stations. There is no qualifier for copper in the table or accompanying text, yet in the King County (Metro) Lab Analytical Report for October 4, 1996 (see Volume 2), the copper concentration for sample MC4 (Lab ID L9668-10), which is a downstream station on Miller Creek, is qualified as "H." This sample is reported to contain 0.044 mg/l or (44 ug/l) total copper. This must be the sample that was included in Table 19 in Volume 1.

It also appears that "H-" qualified Microtox data were entered into Table 1 on page 8 of Volume 1. For example, King County's Analytical Report, that included results of samples collected from Miller Creek on January 20, 1996, reported the results of a Microtox bioassay for sample MC1 (Lab ID L7724-3) as "H" qualified, yet no such qualifier is entered into Table 1 in Volume 1, nor is one included in the text.

Reporting qualified data as unqualified is not appropriate and violates proper quality assurance procedures. It allows a bias to affect the data, which has no place in good science. Reporting qualified data as unqualified may also have violated the conditions of the Port's NPDES permit. In my opinion, the samples should have been collected again. At issue is how the results might have changed if the Port or their consultant followed protocol? It is incumbent on Ecology to catch glitches like these.

Transport and Fate of Stormwater Discharged from STIA

What else that appears missing from the pertinent literature are the results of any simulation modeling that addresses the fate of chemicals (e.g., metals, de-icers/anti-icers, etc.) discharged to Miller and Des Moines Creeks in STIA stormwater. With so much at stake, it might have been expected that the Port would undertake such a study. Ecology also should have required this of the Port. Simulation modeling should be used to address compliance with the applicable water quality criteria, and test the efficacy of alternative wastewater treatment options.

References

Cowgill, U.M., I.T. Takahashi, and S.L. Applegath. 1985. A comparison of the effects of four benchmark chemicals on *Daphnia magna* and *Ceriodaphnia dubia* tested at two different temperatures. *Environ. Toxicol. Chem.* 4:415-422.

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Thank you for the opportunity to comment on this issue. I am available at your convenience to discuss any of my comments in greater detail.

Yours very truly,

John A. Strand, Ph.D.
Principal Biologist

attachment: Curriculum Vitae

cc: Rick Poulin
Greg Wingard
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