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MEMORANDUM

July 1, 1998

55-2912-01

To: Paul Fendt

From: Ken Ludwa KSL

Re: Results of Reasonable Potential Analysis

This memo is to describe the results of the Reasonable Potential Analysis (RPA) that was performed yesterday for the STIA Third Runway area. The analysis was done in a working meeting attended by Lisa Zinner (Ecology), Lori Terry (Preston, Gates, and Ellis), Tom Hubbard (POS), John Rogers (CH2M Hill), Bill Taylor (Taylor and Assoc.), Jim Good, and myself.

Lisa Zinner stated at the beginning of the meeting that the analysis was intended to be informal. Some of the data used was based on best available information and professional judgment reached by consensus.

The attached spreadsheet documents the process, which was performed in steps:

1. Data from outfall 005 (SDS-3) was used to represent the predicted runoff from the Third Runway (with two 1996 deicing sampling events removed from the data set). The geometric 95th percentile of the SDS-3 data was calculated as per the RPA methods. This was done by calculating the natural log of each parameter's reported value, taking the 95th percentile of the transformed values, then taking the antilog of that value.

2. The criteria for Miller Creek and Des Moines Creek were determined, based on background condition and hardness information. The fecal coliform criterion is the limit set for all class AA waters. The turbidity criterion is based on observations made in Miller Creek during winter 1997-98 storms, for NEPL treatment plant and Lake Reba discharge monitoring (to be verified upon review of the data). The metals criteria were based on a hardness of 23 ppm in Miller Creek, and 35.6 ppm in Des Moines Creek, as discussed in the STIA 1998 NPDES Permit Fact Sheet/Response to Comments (for comparison, metals criteria were also calculated for hardness values of 20 and 70 ppm).

3. Expected pollutant removal efficiencies for various BMPs were agreed upon. The high and low ends of the treatment range, and a recommended value, or best guess, were determined based on the results of a literature review that I had performed for

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this analysis (summary attached). The literature review was not comprehensive, and consisted of a number of other compilations and project-specific studies. The values chosen for the RPA were weighted heavily on studies done after 1990.

4. The resulting predicted effluent pollutant concentrations (high, low, and best guess) were calculated based on the treatment efficiencies.

Using the assumptions described above, pollutant concentrations are predicted to be at approximately the criteria values or less, except for copper. Copper concentrations after treatment remained higher than the criteria.

Dilution in the receiving waters was also discussed. Based on our cursory examination of available data, pollutant concentrations in the receiving waters (during storms) exceed criteria, and are higher than the concentrations of pollutants predicted for Third Runway stormwater runoff.

The results of the literature review and this analysis suggest the bioswales, sand filters, and wet ponds/vaults would provide roughly similar treatment results. Infiltration was not discussed among these BMPs because infiltrated water would not be subject to surface water criteria.

Parameter	Units	Criteria DesMoines	Criteria Miller	GeoTransformed 95% of SDS3 1994-98 data
Fecals	CFU/100mL	50	50	122
Turbidity	NTU	30*	30*	15.9
Copper	ppb	6.7	4.4	86.3
Lead	ppb	21.9	12.6	11.3
Zinc	ppb	48.8	33.7	107

* provisional, to be verified with turbidity data taken in Miller Creek as part of NEPL monitoring

metals criteria based on 10%ile values of hardness in Miller Creek (23ug/L) and DesMoines Creek (35.6 ug/L)

Copper at 20 ppm hardness: 3.7
Copper at 70 ppm hardness: 12.2

Zinc at 20 ppm hardness: 30.0
Zinc at 70 ppm hardness: 86.5

Parameter	Units	Removal Efficiency (%)											
		Detention			Bioswale			Sand Filter			WetPond/Vault		
		lo	hi	rec val	lo	hi	rec val	lo	hi	rec val	lo	hi	rec val
Fecals	CFU/100mL	74	100	80	20	40	30	22	69	50	0	90	45
Turbidity	NTU												
Copper	ppb	11	54	25	42	46	45	19	70	30	10	47	40
Lead	ppb	2	79	40	62	67	65	65	85	75	10	95	70
Zinc	ppb	6	80	30			63	33	80	55	20	95	60

Parameter	Units	RESULTS (predicted values)											
		Detention			Bioswale			Sand Filter			WetPond/Vault		
		hi	lo	rec val	hi	lo	rec val	hi	lo	rec val	hi	lo	rec val
Fecals	CFU/100mL	31.72	0	24.4	97.6	73.2	85.4	95.16	37.82	61	122	12.2	67.1
Turbidity	NTU												
Copper	ppb	76.81	39.7	64.73	50.05	46.6	47.47	69.9	25.89	60.41	77.67	45.74	51.78
Lead	ppb	11.07	2.373	6.78	4.294	3.729	3.955	3.955	1.695	2.825	10.17	0.565	3.39
Zinc	ppb	100.6	21.4	74.9			39.59	71.69	21.4	48.15	85.6	5.35	42.8

Photos of Vacca Farm – January 31, 2002

Photo 1. View of Vacca Farm, standing on fill, looking west towards Des Moines Way across area designated as Prior Converted Cropland.

Photo 2. Panning south but still looking west over PC cropland, farmed wetlands and part of Wetland A1.

Photo 3. Close-up of wetland vegetation.

Photo 4. Miller Creek and Vacca Farm looking west across Wetland A1 (see Exhibit H for map of site).

Conclusions regarding the seismic performance of the wall are based upon unwarranted extrapolation from the observed satisfactory performance of much smaller MSE walls subjected to strong earthquake shaking and an unverified FLAC numerical model. Experience with the performance of MSE walls in earthquakes that approached the intensity of the design earthquake is limited to walls less than half the height and typically less than one-third the height of the West MSE wall. While FLAC is a sophisticated and complex model, its ability to reliably predict the behavior of either actual MSE walls in earthquakes or model MSE walls subject to simulated seismic loads has never been demonstrated. Without this "benchmarking," the results of the FLAC analyses cannot be relied upon. Furthermore, details of the FLAC analyses have never been provided for review and comment. The combination of unwarranted extrapolation and an unproven numerical model do not provide reasonable assurance that West MSE wall can withstand the design earthquake loading.

Given the above considerations, the Port has failed to establish the true extent of impacts to the wetlands and Miller Creek from the West MSE wall. Unless and until the Port provides a proper seismic assessment of the massive MSE structure and proper assessment of the impacts of excavation and dewatering, and until the design is complete so that all other impacts of wall construction may be identified and evaluated, the Department of Ecology cannot be reasonably assured that the wetlands and streams will not suffer substantial harm from the construction and from the performance of the structure itself.

Respectfully submitted,

Edward Kavazanjian, Jr., Ph.D., P.E
Registered Professional (Civil) Engineer No. 34612

which adversely affects the ability to simulate both flood flows and low flows. For Des Moines Creek, the ability to simulate low flows is especially poor and again indicates a lack of understanding of important hydrologic processes. With the current deficiencies, there can be no assurance that mitigation measures proposed to date will meet their intended performance standards of preserving flows in the affected streams.

49. In my opinion, considerable uncertainty remains as to the hydrologic response of the proposed fill embankment. There appears to be significant uncertainty in prediction of the as-built infiltration rates for the embankment and a corresponding lack of reasonable assurance that the embankment will perform as needed to ensure mitigation of low flow impacts in Walker and Miller Creeks.

DATED this 22 day of February 2002, at Seattle, Washington.

K.M. Leytham, Ph.D., P.E.

"Grad, Andrea E." <agrad@helsell.com>

02/22/02 04:31 PM

To: "Dyanne Sheldon (E-mail)" <dyanne@bogstomper.com>, "John A. Strand Ph. D. (E-mail)" <jstrand427@aol.com>, "Peter Willing (E-mail)" <pwilling@telcomplus.net>, "W. A. Rozeboom (E-mail)" <brozeboom@nhc-sea.com>, "Malcolm Leytham (E-mail)" <mleytham@nhc-sea.com>, "Greg Wingard (E-mail)" <gwingard@earthlink.com>, "Ed Kavazanjian (E-mail)" <edkavy@geosyntec.com>
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Subject: Please mail us your original signatures

Please mail to us your original signature page of your pre-filed testimony, which we'll need to submit to the Board. It doesn't matter if your signature is on a page which was faxed from us.

And, thanks again so much for all your hard work!

Andrea

Peter and/or
Andrea:

Enclosed please find original signature pages
for me & Malcolm.

Bill

2) retrofitting the storm drain system with water quality facilities so as to improve the quality of stormwater runoff; and 3) retrofitting the storm drain system peak flow controls so that the duration of erosive flows from the developed airport mimics as close as possible the flows from a mostly-forested basin. The underlying reason for these Ecology-imposed retrofit requirements is presumably to improve the health of the streams. However, the Certification conditions imposed by Ecology would only require implementation of low flow contingency measures if the low flow impacts are so severe as to surpass the combined benefits of the retrofit activities described above. In my opinion, this is a futile approach to monitoring for low streamflow impacts.

On behalf of the ACC, I thank you for your consideration of these concerns.

DATED this 22 day of February, 2002, at Seattle, Washington.

William A. Rozeboom

William A. Rozeboom, P.E.

appropriate for this peer reviewed and accepted method. The only explanation for why it was not utilized was that "it was not available". Why Ecology did not require its use on those wetlands where it was appropriate is not explained.

53. The lack of a reputable functional assessment method means that assessing function loss or gain is reduced to expert opinion, and 'best professional judgement'. No one is able to make an effective and replicable objective analysis as to whether the project will result in net gain or net loss of wetland function. That stands in sharp contrast with Ecology's published guidance managing public resources.

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

DATED this ___22__day of February, 2002, at Seattle, Washington.

Dyanne Sheldon

In my opinion, then, it's an unwarranted stretch to suggest that the BIBI can be used to assess any biological effects of the Low Flow Impact Offset Facility.

42. The monitoring requirements contained in the Section 401 Certification [see Section I(1)] also should not be the basis for approving the low flow mitigation plan and cannot provide reasonable assurance of compliance with WQC. If monitoring detects a problem it usually means that the stream(s) has/have suffered some degree of harm. More importantly, the streams will continue to undergo harm until the problem(s) is /are rectified. If the monitoring is flawed as the Port's existing monitoring appears to be, the degree of harm incurred could be all that more. Reasonable assurance that the water quality will not be impaired, in my opinion, should not be based on monitoring alone. Rather, it should be based on a facility design that is well grounded on scientific principles, a learned assessment of the potential problems, laboratory experimentation (not experimentation in the streams), pilot studies (testing one reserve stormwater vault is not enough) and external peer review.

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

DATED this 22 day of February, 2002, at Richland, Washington.

John Strand, Ph.D.

Conclusion

54. The Section 401 Water Quality Certification issued on September 21, 2001 fails to provide reasonable assurance that water quality standards of the State of Washington will not be violated. The plan to provide low flow augmentation water to SeaTac area streams is full of uncertainties and unproven assumptions. The substantive provisions for managing water quality do not take advantage of well known and eminently reasonable technology. The water quality monitoring regime at SeaTac fails to provide basic data that is required for the Department of Ecology to know whether or not the Port is violating state law. Consequently, the Department of Ecology has not provided reasonable assurance that the Port's proposed projects will not result in violations of state water quality standards.

DATED this 22nd day of February, 2002.

Peter Willing, Ph.D.