

**401 Permit – Post-Issuance Clarification  
Sea-Tac International Airport, Third Runway**

**FINAL MEETING NOTES**

**LOW FLOW ANALYSIS**

**October 30, 2001**

**8:30 – 11:30**

These meeting notes have been prepared by Kate Snider, Floyd Snider McCarthy, Inc.

**ATTENDEES**

Ann Kenny, Dept. of Ecology  
Kelly Whiting, King County  
David Masters, King County  
Lisa Scott, Corps of Engineers  
Keith Smith, Port of Seattle  
Robin Kordick, Port of Seattle  
Paul Fendt, Parametrix  
Joe Brascher, Aquaterra  
Pony Ellingson, Pacific Groundwater Group  
Felix Kristanovich, Foster Wheeler  
Kate Snider, Floyd Snider McCarthy

**MEETING SCOPE AND AGENDA**

Work is underway by the Port of Seattle to revise the Low Streamflow Analysis and Summer Low Flow Impact Offset Facility Proposal per 401 Permit conditions. In the process of preparing the revised document, Port of Seattle consultants identified errors in the low streamflow modeling that require correction in the revised document, and that will affect the conclusions of the low streamflow analysis.

This meeting was called by the Port to allow the Port consulting team to explain the modeling errors and revisions that will be made to correct the errors.

**DESCRIPTION OF ERRORS AND ASSOCIATED REVISIONS**

1. Conversion factor error in embankment fill input to HSPF:

When output from the embankment modeling was input to HSPF, an error of 1/24<sup>th</sup> magnitude was made. Conversion of daily output to hourly output was occurring twice – once by the modeler (Joe Brascher, Aquaterra) and once automatically within the HSPF program. This error affects all areas where embankment discharge is input to low streamflow analysis. The error has been corrected in revised modeling which shows the contribution of flow from the embankment fill to low stream flow is now 24 times the previous value.

2. Incorrect input files for embankment modeling:

In the previous modeling, Aquaterra gave Pacific Groundwater Group daily "AGWO" files as input to the embankment modeling. Instead, hourly "AGWI" files should have been provided.

3. Revised approach to modeling of impervious area at embankment filter strips:

The error listed above in #2 has a level of significance that has led the modelers to propose more direct modeling of the impervious area that runs off to filter strips at the top of the embankment. In 401 permit decision-making discussions between the Port, King County and Ecology, several alternatives were discussed for how to model the impervious area tributary to the filter strips. It was decided then that rainfall on the pervious area of the embankment would be "scaled up" to address the impervious area. With the revision in embankment modeling input files to hourly "AGWI" files, more direct modeling of the impervious area and filter strips will be performed by the Ports consulting team.

In this more direct modeling, Aquaterra will give Pacific Groundwater Group the "AGWI" time series data for the pervious embankment, and "SURO" time series data for impervious areas on the embankment, both on a per-acre basis. Pacific Groundwater will calculate the total impervious area and total filter strip area for each basin. Then, both "AGWI" and "SURO" time series data will be added on an hourly basis to compute total water available to the filter strips. Peak flows to the filter strips that are greater than the infiltration capacity of the filter strips will be categorized as surface runoff, and not used in Hydrus. Flows less than the infiltration capacity of the filter strips will be input to Hydrus.

It was noted by King County that all areas included in the embankment model should be removed from the HSPF stream model. The King County reviewer has questioned the length of the embankment modeled relative to the point on the SMP grading plans where the embankment transitions to on-grade or cut. The length of the embankment question was resolved during post meeting discussions. However, a remaining comment is that approximately 8 acres of the Walker Creek embankment (approximately 16 acres total) appears to be included in both the Hydrus embankment model and the HSPF stream model. The Port's consultants will further investigate this remaining comment.

4. Use of "1-d" version of Hydrus:

The revised approach for modeling of filter strips listed above in #3 requires Pacific Groundwater Group to use a 1-dimensional version of the Hydrus model, rather than the 2-d version of the model used previously. The 2-d version of the model used previously is not able to handle variability of wetness and saturated conditions associated with the revised input files described above.

5. Modeling of discharge from infiltration basins:

The revised approach to the embankment modeling listed above in #3 results in a more significant surface water runoff component from the embankment. To model more closely the full water balance, revised low streamflow analysis modeling will now model and document water infiltrated from the infiltration basins that receive surface water runoff in the Miller Creek basin. A time series of embankment surface water runoff will be provided by Pacific Groundwater Group to Aquaterra for this work. The water infiltrating from the infiltration basins will be routed to the groundwater component of

HSPF modeling. Water infiltrating from the infiltration basins was ignored in previous modeling, because surface water runoff from the embankment was negligible in previous modeling.

6. Predeveloped Conditions for SDS-5,6&7 in DesMoines Creek Basin:

In previous modeling, all groundwater from pervious areas in SDS-5,6 & 7 in the 1994 pre-developed conditions was inaccurately routed to DesMoines Creek. In reality, groundwater from significant portions of these basins flows to Walker Creek. Post-developed 2006 conditions did not route this groundwater to DesMoines.

For revised modeling, the predeveloped conditions for the DesMoines creek basin will include accurate routing for SDS-5,6 & 7.

### QA REVIEW OF LOW FLOW MODELING BY HYDROCOMP

Following discovery of the 1/24<sup>th</sup> conversion error in HSPF, the Port submitted the entire low flow modeling package to Norm Crawford, of Hydrocomp, for an independent round of review. Dr. Crawford is one of the people who developed the HSPF model. Dr. Crawford prepared a memo documenting his review, including recommendations for revision.

Adjusted approaches listed above as numbers 3, 5 & 6 are consistent with Dr. Crawford's memo.

Additionally, Dr. Crawford made a recommendation that the "seepage to till" output component of embankment modeling be routed directly to the Creek, rather than to "AGWO".

The Port, with concurrence from Ecology and King County at today's meeting, decided not to adopt this recommendation. Approach to handling the "seepage to till" component of embankment modeling will not be changed. The rationale for this decision is that:

- There is no clear error or problem in the previous modeling that requires correction.
- Any approach has associated potential modeling uncertainty. The approach used by the Port team to date is conceptually sound and does not need to be changed.
- There is no clear reason to route groundwater directly to the stream.

### MEETING CONCLUSIONS

- The revisions to the low streamflow analysis described in these meeting notes will be made to correct errors in the previous modeling.
- All revisions required by 401 permit conditions and these additional revisions will be included in the revised Low Streamflow Analysis and Summer Low Flow Impact Offset Facility Proposal, meeting the requirements defined by the 401 permit.
- Very clear documentation and rationale for all changes must be included in the revised deliverable to Ecology, with appropriate and thorough backup. The acceptability of revised

modeling will be based on Ecology review of the final Low Streamflow Analysis and Summer Low Flow Impact Offset Facility Proposal.

- Ecology is separately considering a request from the Port for extension of the schedule for submittal of this 401 permit deliverable.