

Review Comments on the Low Streamflow Analysis - Summer Low Flow Impact Offset Facility Proposal, December 2001

Underlined text include edits made since the February 19th discussion with Ecology, Port of Seattle, and Port consultants. The underlined text represents a summary of the reviewer's understanding of discussions and clarifications provided at the February 19th meeting. The purpose of the meeting was to provide verbal feedback on the initial findings of our technical review of the current low-flow plan. The Port is in the process of investigating the comments and revising the plan accordingly. Material was received at the February 19th meeting and electronic files received February 22nd on CD-ROM. These materials have not been reviewed to date. Additional comments may be forthcoming.

Review Scope and Limitations

The December 2001 Low Flow Analysis Flow Impact Offset Facility Proposal (Low Flow Report) has been reviewed against the current conditional 401 Certification and 10/30/01 facilitated meeting notes. Review also includes an evaluation of consistency in hydrologic modeling and demonstration of feasibility to achieve the performance objectives identified by the Washington State Department of Ecology (Ecology) and Port of Seattle (Port). The Low Flow Report supplements the Port's Comprehensive Stormwater Management Plan (SMP).

These review comments comprise findings and recommendations for Ecology's consideration of the revised Low Flow Report's compliance with applicable conditions of 401 Certification. The conclusion of this review is that additional refinements are needed prior to concurrence with the revised impact numbers in Miller Creek, and for demonstration of sufficient and timely water collection for Walker creek. Additional comments directly related to the updated report and modeling work are also provided for your consideration.

King County's review has been limited to the HSPF hydrologic modeling, the impact assessment, and the conceptual design of related facilities. With the exception of the external HSPF hydrologic inputs and outputs, the review of the embankment modeling is performed by Ecology staff with expertise in that area.

Review of a stormwater management plan is primarily a review of design concepts and assumptions to determine if the proposed mitigations demonstrate a feasible approach to comply with the identified performance goals. As the proposed Master Plan Update (MPU) development projects move from the planning stages to development of construction plans, the proposed low-flow mitigations may need to be updated to reflect any change in conditions. Prior to construction of specific projects, additional review and approval of the final construction drawings and associated technical information reports is typically performed by local permitting agencies. A similar process is recommended for the development proposals covered by the 401 Certification. It is recommended that Ecology and the Port develop a plan to oversee and monitor compliance with the mitigations set forth in the Stormwater Management Plan and Low Flow Report. One option is to create an Ecology "Compliance Team", representing the necessary disciplines, to work with the Port to achieve compliance with the goals and objectives laid out in the SMP and related documents. Oversight and monitoring are key elements to successful implementation of any stormwater management plan.

Above discussion is mostly repeated from previous review comments. Not discussed at meeting.

basin to match observed flows. This is apparent in the Appendix A hydrograph comparisons and Table 3-5 summary table. A possible source of additional stream volume has been identified by public comments the ACC as the IWS storage lagoons which were unlined during much of the calibration period. The upgrades to the IWS treatment facility are not defined as a master plan project and therefore not included in the SMP or Low Flow reports. If IWS lagoon infiltration is included in 1994 conditions, a regulatory determination would need to be made as to whether low-flow mitigation would be required for this non-master plan IWS lining project. If no mitigation would be required, it is difficult to predict whether accounting for other sources of baseflow in the calibration would change the low-flow impact numbers.

The current revised mitigation proposal provides low-flow offset mitigation for 100 acres of lost pervious groundwater area. *Note: externally modeled embankment areas are considered pervious in this summary.*

Recommendation was made that a validation report be prepared to evaluate the revised 1994 condition models (all three streams) against the SMP 1994 calibration models and determine whether the base model calibrations should be adjusted.

Other problems with the observed data were reported by the modeler and include summer periods where recorded baseflow increases across the low-flow season. Modeler indicated that the HSPF groundwater storage decay coefficients cannot produce this result, and this observed data is inconsistent with other years and typical stream response in this region. Portions of the observed record show changes to observed baseflow not consistent with normal hydrologic response (e.g., small summer storms generating significant and immediate increase in base flows). Modeler also indicated discrepancies exist between the gauge record and manually collected measurements at the gauge location. Discussions with stream gauging staff indicated the focus of the gauging station was to collect peak flow data. Without a constant controlled cross section at the gauge, the accuracy of observed low flow record is questionable.

- HSPF parameter settings used for low flow analysis were found to be consistent with SMP calibration. The Appendix A hydrograph comparisons and summary table show a reasonable match to observed gauge records. The current revised mitigation proposal is based on an increase of 55+ acres of gained pervious groundwater area (see above comments). *Note: externally modeled embankment areas are considered pervious in this summary.*

Discussion included the reviewer's recommendation that a validation report be prepared to evaluate the need to refine the model calibration based on the updated 1994 landcover and groundwater routing.

additional calibration refinements might affect the low-flow mitigation proposal. The current revised mitigation proposal is based on a reduction of 90 acres of lost pervious groundwater area.

Review comment discussed. It is difficult for reviewer to not accept a development proposal's calibration that is consistent with the final basin plan performed by King County. The proposed mitigations have been found to be generally consistent with the basin plan performance objectives for flow controls.

The reasons for the poor match should be evaluated as part of the recommended evaluation of the ramifications on the existing calibration considering the revised 1994 landcover and groundwater routing. The existing basin plan model calibration and groundwater routing should be included as a baseline condition.

5. General Modeling comments include,

- Reviewer thinks the future condition hydrographs are important documentation of the low flow plan and should not have been removed from the report.

It is reported that these hydrograph figures have been updated per the new simulations. Indication is that they will be included in the report. Reviewer preference would be for inclusion as hard-copy as well as electronic files. Note: It is possible that these hydrographs were included with the electronic files received on January 25th.

- It is recommended to have only one HSPF stream model defining 1994 existing conditions, used for the low-flow report and for the base calibration, as documented in the SMP. How would the new 1994 landcover and groundwater routing affect the base calibrations?

See recommendations for a validation report to investigate the need to refine model calibrations.

- *Note: current analysis shows same impact level at calculated 2-year level and for the greatest annual difference of 4-year test period. Where impact assessment is based on 4 years of embankment data, the previously accepted approach was to use the greatest annual difference (out of 4 years) to define impact.*

Discussed. No action requested, but reserves the right to perform impact calculation as agreed to during the 2001 facilitated meetings.

- Section 2.5.2 provides response to permit condition asking what reductions in in-stream low flows look like in the stream. Review comments focused on the early summer period where flow offset is not proposed and future condition hydrographs (previous submittal only) showed similar magnitude reductions in base flow.

“The late spring and early summer periods are when fish typically grow at the greatest rate. It is difficult to put these early summer hydrologic changes into perspective without an evaluation of what these flow reductions will look like in-stream. Will fish be forced into pools at times they currently are not? Will the number of available pools be reduced? Will this change the spatial distribution of fish? Will juvenile fish be subject to increased predation? Will there be impacts to invertebrate diversity and/or abundance? Will there be shifts in timing and duration of insect hatches?”

The analysis provided uses between 1-3 cross sections per stream and associated rating curves for that section. The rating curves appear to be averaged into a single rating curve from which an average change in water depth and width are calculated and graphically scaled. There are no biological conclusions drawn from the analysis to answer questions raised or to support the position of no biological impacts from base flow reductions in early summer. (See also Walker Creek modeling comment).

No action item discussed. Reviewer defers the usefulness of this analysis to Ecology staff with biological expertise. Reviewer understands the substantial amount of detail needed to develop results supportive of meaningful biological predictions. The determination as to whether more detailed evaluations be performed should be contingent on whether the results will be used in decision making. In Des Moines Creek, the 0.08 cfs reduction in baseflow appears to account for as much as 25% of the in-stream flow at 200th Street (e.g., July 18, 1970). From another perspective, in some years the offset flows (currently proposed to start on July 24th) is predicted to comprise 25% of the total in-stream flow. Of course, the above percentages would diminish if you

- Results and statistics should be based on this same test period . For example, references to Table 3-1 indicate that the inflow mass balance numbers represent the 1991-1994 test period. Response to inquiry indicated the volumes shown in Table 3-1 include the 7 year wet-up period. Results and statistics should be limited to the 4 year test period, therefore representing only the flows imported into the stream model.
- Of interest would be the mass balance information of the embankment model outflow timeseries for the same test period. This could be added to Table 3-1.
- The embankment model report (Appendix B) indicates that the embankment model generated 3% more volume in Miller and 4% more volume in Walker. This may be due to changes between the embankment water storage at the start/finish of the simulation. Some increase in volume seems reasonable for this reason. The reason for the volume change should be confirmed. Do these numbers represent test period 1991-1994 only, or do they include the entire wet-up period?
- If the embankment models are run again, the test period should be extended 2-3 months to ensure inclusion of the low flow event associated with water year 1994.

All of the above observations were discussed, and were previously discussed with Ecology's technical review lead for the embankment modeling.

8. *Specific Clarifications included below,*

- Page 1-2 #5: Reviewer contends that infiltration facilities were of significance in the previous low-flow plan. As noted in the previous low-flow comments, significant areas outside the embankment footprint will continue to drain to these infiltration facilities. The extra non-infiltrated volume coming off the surface of the embankment would constitute a small percentage of the total infiltrated volume in these facilities.

Comment discussed and generally agreed with.

- Page 3-3, Section 3.4.1 - Statement that facilities have been designed to be retrofitted according to the 2001 Ecology Stormwater Manual generates the following comments,
 - Enhanced water quality treatment is only shown for the low-flow offset outlet. Water exiting the reserve storage vault into the flow control vault would bypass enhanced treatment and monitoring.
 - The enhanced WQ treatment is shown to indicate feasibility of retrofitting the proposed system, if monitoring data demonstrates a need.
 - Unclear whether adequate fall exists for a SDW2 filter.
 - Maintenance feasibility may be a concern for the SDS3 filter, since the filter is approximately 30 feet below existing grade.
 - Review of the filters against the State manual's performance objectives and design criteria was not performed.
 - Alternatives exist to basic sand filtration that have been shown to effectively target particular pollutants of interest. For example, improved metals removal has been shown with leaf compost based filtration media, while an alternate iron infused media would be recommended for improved phosphorous removal. This may be worth considering depending on the findings of proposed water quality monitoring.

Above comments were presented. There has not been a determination made by this reviewer as to consistency with the 2001 Ecology manual.