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January 8, 1991

TO: Mike Dawda, NWRO

FROM: Joe Joy, EILS

SUBJECT: Review of Marysville WWTP Expansion Draft Outfall and Water Quality Analysis

I have reviewed portions of Jones and Stokes Associates' Draft Outfall and Water Quality Analysis, City of Marysville Wastewater Treatment Facilities Expansion report dated October 1990. I concentrated on Chapters 4, 5, 6 and Appendix A as you directed. General and specific comments follow.

There are two major problems with the report:

1) Since the sites under consideration are obviously in an estuary where both marine and freshwater conditions exist, all water quality data should have been evaluated against appropriate marine and freshwater criteria. This was not done, especially for the model generated data.

2) The authors put in a minimum of effort evaluating the critical conditions for discharging into the estuary. The "average flow for 7 day, 10 year low flows" used for the sites were inappropriate for evaluating acute toxicity criteria. A different flow regime is needed to evaluate these criteria in the mixing zone, and for far field influences in the estuary, e.g. low slack at 1Q10 in the river, or minimal tidal exchange periods.

A major revision of the report is necessary to address these two points since the conclusions would be significantly changed. For example, the state and federal marine acute toxicity criteria are 2.3 μg/L and 2.9 μg/L for silver and copper, respectively. Figures 5-3 and 5-4 of the report suggest these acute criteria would be exceeded outside the mixing zone. Also, the area of violation could be larger if a 1Q10 at low slack or other short-term (1-hr.) conditions were evaluated.

Specific comments for individual pages follow:

Page/Paragraph	Comment
4-6/5 (last)	How firm is the diffuser design and how was it picked? What effect will it have on the success or failure of the mixing zone?
4-10/Table 4-3	The ambient zinc data in the table do not reflect the data in Tables 5-1 to 5-4. Also, there is no indication how representative these ambient or effluent metals concentrations are. There is no indication of the number of samples they are based on and how variable they can be.
5-2/2	Several fecal coliform and metals concentrations exceeded state standards. Water quality was not "generally good."
/5	Copper concentrations at surface exceeded both acute and chronic freshwater criteria for stated sample hardnesses (both times). Lead, cadmium, and silver compliance could not be evaluated in many samples because the detection limits of the analyses were greater than the criteria.
5-3/Table 5-1	COD and Color at surface SB-3 during June and July (Table 5-3: SB-3 and SB-1) suggest possible pulp mill effluent influence. Mixing zone analyses would need to evaluate overlaps.
5-4/Table 5-2	Nitrate concentrations don't look right. Verify.
5-9/Table 5-5	Marine criteria should be shown. Mercury criteria should be shown as well.
5-10/1	Mercury concentration exceeded acute marine criteria, also.
/4	Water quality was not "good."
5-11/1	Fecal coliform levels were lower than those observed in the Snohomish, but were above 200 MPN/100 mL at SB-2 and SB-3 during the June high tide. Even July fecal coliform samples would not have been acceptable under normal Class A marine criteria. Copper concentration taken near bottom at SB-2 exceeded criteria. Lead, cadmium, and silver compliance could not be evaluated in many samples because the detection limits of the analyses were greater than the criteria.

Page/Paragraph	Comment
5-11/2	Copper at SB-1 at the surface exceeded acute and chronic marine criteria. Lead was above marine criteria in several samples.
/3	Cadmium, not chromium. Marine criteria need to be addressed in dilution zone modeling. Velocities used in dilution zone analyses were not clearly explained. Even after reading Appendix A, it was not clear if field measurements or calculated velocities from Q=AV were used.
/4	If this analysis was done, it should be shown. The thinking behind the statement is correct, i.e. constant flow is inappropriate and slack tide, zero velocity modeling should be among the conditions evaluated.
/5 (last)	The TIDE model graphics are difficult to interpret. Concentration and duration should be clearly labeled. What is the confidence bounds around the values at the two sites since the flows are "assumed" stable, i.e. 575 cfs? Again, marine criteria need to be addressed.
5-14/Fig. 5-5	Is this cadmium or chromium? What is X 1C?
5-17/Fig. 5-8	Cadmium or chromium? Another set of these figures (5-7 and 5-8) should show if there is marine criteria compliance.
5-18/Fig. 5-9	There are no data to support this figure. Either come up with a statistical basis for "0.001 μg/L" Ag concentration or remove it.
5-19/Fig. 5-10	Cadmium or chromium? The TIDE model graphics are difficult to interpret. Concentration and duration should be clearly labeled.
5-22/Fig. 5-13	Cadmium or chromium? Again, marine criteria need to be addressed.
5-23/1	Statement unfounded if no temperature and background D.O. concentration indicated (I didn't find one in the Appendix A discussion.) There is not a state BOD criterion. How do the boundary limits compare to concentrations within the boundaries?
/2	The analysis suggests other critical conditions in the tidal cycle to take a closer look at using more realistic water volume data.

Page/Paragraph	Comment
/5 (last)	A background ammonia concentration needs to be assummed. Where is the mixing zone discussion concerning ammonia?
Appendix A	
A-3/1, A-4/5	The 7Q10 is not used for regulatory purposes in estuarine environments. It may or may not be appropriate for chronic criteria evaluation in this situation, but definitely not for acute criteria. More work should be done evaluating the critical period in terms of tidal cycle.
A-5/Table 1	DILUTION RATIOS ARE ALL WRONG. EFFLUENT AND RECEIVING WATERS MUST BE IN SIMILAR UNITS BEFORE CALCULATING THE DILUTION RATIO. These are average 7Q10 dilutions, not appropriate for acute toxicity evaluation.
A-27/2	What upstream flow estimates were used?
/4	After all the previous discussion of tide heights, current velocities, and coefficients, it still isn't clear whether the model varies water volume or keeps it constant at 575 cfs.
A-29/1	Assumptions about how well effluent is dispersed upstream and downstream of the boundaries are not fully described. For example, there could well be an eddy in Possession Sound trapping effluent.
/3	Graph indicates 4.7 mgd, not 6.7 mgd.
/4	What if river flows were less than 575 cfs?
/5	The model is not sophisticated enough to make this determination. For example, how much of the flow would go up the Union Slough if it's placed near SB-2?
A-36/1	D_o is actually the oxygen deficit relative to dissolved oxygen saturation. This in turn is dependent upon temperature, salinity, and upstream source impacts. To assume it is zero is not correct and a background condition should be established.

Page/Paragraph	Comment
/2	Reference needed for reduction of the formula by the "short time interval" assumption. What is the aeration coefficient? Do the authors mean reaeration? How were the coefficients selected? Are the authors assuming 20°C since there is not a temperature compensation formula shown? What is the sensitivity of the model to changes of these coefficients (or for any other parameter, for that matter)?
/3	BOD (L_o) is the ultimate BOD, not the five-day BOD of 30 mg/L. What was used for the initial ultimate BOD in the receiving water (it is missing from equation 5)?
A-38/4	Statements about maximum deficits are different here than on page 5-23. Earlier discussion points out smaller peak deficits under higher BOD loading. Doesn't look right.
A-41/1	BOD may be associated with settleable solids which may stay longer with an associated benthic oxygen demand.
/5	It appears the whole metals discussion is missing, unless the authors are relying on the Chapter 5 discussion.
A-44/2	Reference to saltwater ammonia criteria should be 1989, not 1986.
/5	The results will be conservative for toxicity, but not for impact of nitrogenous oxygen demand. Ammonia discussion must also be only that in Chapter 5.

I hope these are helpful to you. If you have any questions, please contact me at SCAN 234-6881.

JJ:krc