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M E M O R A N D U M
July 8, 1980

To: Bob Monn
From: Bill Yake
Subject: Briefing Memo, Intensive Survey: Renton WTP and Green/Duwamish River

During September, October, and November of 1979, the Water & Wastewater Monitoring Section of the Department of Ecology conducted a series of studies to define the impact of Renton Wastewater Treatment Plant effluent on the lower Green River and Duwamish Waterway during river low-flow conditions. The investigations included two time-of-travel studies. During each study, the investigators placed drogues (submerged floats) in the river near the treatment plant outfall and followed them for 24 hours, taking field measurements and collecting samples for laboratory analysis. In addition, a detailed in-plant sampling inspection was conducted.

Although the treatment plant achieves a high degree of conventional secondary treatment, the low river-flow/plant-flow ratio (dilution ratio) during the summer and fall leads to a substantial degradation of river quality. This low dilution ratio (4:1 during the survey) is aggravated by tidal flow reversal which causes the formation of "poor dilution blocks" near the outfall at high tide. These blocks contain up to 60% plant effluent.

Specific deleterious effects of the effluent include:

1. Residual chlorine - In-stream residual chlorine concentrations 5 to 100 times the USEPA criteria were measured from the outfall to distances greater than two miles downstream. Residual chlorine is toxic to aquatic organisms including fish.
2. Un-ionized ammonia - The USEPA criteria level was exceeded for more than two miles downstream from the Renton outfall. Un-ionized ammonia is toxic to aquatic organisms including fish.
3. Dissolved oxygen - A combination of depressed dissolved oxygen (D.O.) concentration in the effluent and in-stream nitrification of effluent ammonia resulted in dissolved oxygen concentrations falling from about 9 mg/l above the plant to about 6 mg/l at the upstream head of the Duwamish Waterway. This depression was modelled (by computer) and based on this model, it is predicted that by 1985 in-stream D.O. concentrations may fall as low as 2 mg/l. D.O. concentrations below 5 mg/l stress many aquatic organisms; salmonids are particularly sensitive to depressed oxygen concentrations.
4. Temperature - Because of the very low dilution ratio, effluent temperatures were elevating in-stream temperatures. This increase was sufficient to result in excursions of state water quality standards.
5. Nitrite - Nitrite (formed as an intermediary product of the in-stream nitrification of effluent ammonia) concentrations in the Green River approached the USEPA criteria levels. Nitrite is also toxic to salmonids.

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Flows to the treatment plant are increasing, as are demands for water from the upper Green River. This will aggravate the current water quality degradation by further decreasing dilution ratios.

Information obtained from these surveys was used in redrafting the Renton plant's effluent discharge permit (NPDES permit). Further studies are foreseen, but based on presently available information, the re-routing of Renton effluent directly to Puget Sound appears to be a possible solution.

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