TESC 496

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Internship to Determine the Source of Toxicity in Effluent at a Pulp Mill in Western Washington

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This study was conducted to address chronic bivalve toxicity detected in the effluent of a local pulp mill during the fourth quarter of 2019 and the third quarter of 2020. The Department of Ecology mandates that effluent must be nontoxic at the edge of a 207-foot chronic mixing zone. However, quarterly tests revealed sublethal effects on marine bivalve development, indicating noncompliance with the permit. The objective of this Toxicity Identification and Reduction Evaluation (TI/RE) was to identify the toxicants responsible using data analysis and suggest possible mitigation strategies. Initial investigation focused on effluent characterization, with special attention given to High Molecular Mass (HMM) components, which prior studies have identified as key contributors to chronic toxicity in bivalves. Data was compiled from plant operations, effluent chemistry, bioassay results, and field data. Most analysis centered on wastewater trends, due to accessibility and time constraints. Findings suggest that operational conditions, specifically harder cooking processes requiring more aggressive bleaching-led to increased toxicity. These changes resulted in higher flow and pollutant loads to the bioponds, pushing the system near capacity. Corresponding increases in Biological Oxygen Demand and decreases in Dissolved Oxygen on test-fail dates supported this conclusion. Although time limitations prevented a full evaluation of upstream processes or solution development, this analysis lays essential groundwork for future testing. The findings indicate that operational strain on bioponds may play a central role in effluent toxicity and can help guide further investigation and mitigation efforts by the mill’s Technical and Environmental teams.