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Small-Scale Pilot Studies Using Coagulants for Turbidity and Phosphorus Removal at Lake Tahoe

ABSTRACT

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The California Department of Transportation (Caltrans) has constructed a small-scale test facility at the South Lake Tahoe Maintenance Station for developing appropriate treatment technologies to meet stringent numeric storm water effluent limits for turbidity (20 NTU), total phosphorus (0.1 mg/L), and total nitrogen (0.5 mg/L) in the Lake Tahoe Basin. “Non-mechanized” processes included various combinations of settling (with and without coagulant) and gravity filtration with different kinds of media. The goal was to simulate systems that might be deployed on state highways where power is not available. The pilot units were constructed of 30-inch diameter plastic tanks and dosed with storm water collected from local detention devices. Flocculation (slow mixing) was not provided. “Mechanized” processes included a batch version of a proprietary high-rate coagulation and sedimentation system, and a nonproprietary conventional coagulation, flocculation, sedimentation, and pressure filtration system. Slow mixing was provided in these systems. The primary coagulant used in both kinds of systems was a liquid polyaluminum chloride. The mechanized systems also used an organic polymer. Both mechanized systems produced effluents that consistently (though not always) met the effluent limits for turbidity and phosphorus. Non-mechanized systems employing settling and fine sand filtration with a constant dose of coagulant consistently met the turbidity standard, but not the phosphorus limit. Both limits were met when the coagulant dose was optimized for each experimental run through the use of jar testing. When coagulant was not used, neither limit was met. Filtration was a necessary element in achieving the turbidity limit, but did little to remove phosphorus after chemically-enhanced settling.
