

The U.S. Environmental Protection Agency (EPA) is planning to treat mining influenced water (MIW) from the National Tunnel Adit that discharges to North Clear Creek near the City of Blackhawk, Colorado. North Clear Creek is part of the Clear Creek/Central City Superfund Site, and the National Tunnel is a major contributor of contaminants to this tributary. The EPA would like to determine the trade-offs between two modes sulfate reducing bioreactor (SRBR). One is an ethanol-fed SRBR and the other is a solid substrate fed SRBR. Ethanol fed and solid substrate-fed SRBR were operated in parallel. The bioreactors were constructed from 55-gallon drums. The nominal hydraulic residence time for the bioreactors initially was approximately 3 days for the period of October through September 2006 and later increased to 9 days for the period of October through November 2006. Measurable sulfate removal (approximately 100 mg/L as S) was noted by the end of July for all bioreactors. Sulfate removal increased through August 2006 and on September 7, 2006 was 170 to 200 mg/L as S. Sulfate removal decreased to 50 to 100 mg/L by the end of September. This decrease coincided with a drop in MIW and ambient air temperatures. The flow was decreased by a factor of three at the beginning of October, which resulted in increased sulfate removal in October and November relative to the end of September. Removal of zinc was observed prior to the onset of sulfate reduction. There was some variability in removal of zinc but greater than 95% zinc removal was observed for all bioreactors after the end of July. Both types of SRBRs were capable of reducing zinc concentrations to below 0.1 mg/L. The effect of cold temperatures was greater in the solid phase substrate bioreactors than the ethanol fed bioreactors. This suggests that cellulolytic fermenters were affected to a greater extent than sulfate reducers by cold temperature because they indirectly provide the soluble substrate for the sulfate reducers.