MICROBIAL AND SUBSTRATE CHARACTERIZATION OF FOUR BLM BIOCHEMICAL REACTOR SYSTEMS IN THE COEUR D'ALENE IDAHO AREA[1]

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Abstract: The Bureau of Land Management (BLM) has constructed four biochemical reactor systems (BCRs) to treat mine impacted water in the Coeur D' Alene Superfund area near Coeur D' Alene, Idaho. Passive treatment systems are especially suited to these remote locations; however, the treatment efficiencies of the BLM BCRs have declined over the last several years.

These biochemical reactor systems rely heavily on the presence of sulfate reducing bacteria (SRB), which produce hydrogen sulfide that precipitates dissolved metals out of solution. In order to insure long-term sustainability of passive treatment systems sulfate reduction levels must be sustained.

The central objective of this study is to characterize the fraction of sulfate reducing microbial species and bioavailable substrate present within the BLM BCRs to understand how to promote sustained sulfate reduction levels.

The substrate analysis includes both a chemical and biological assessment. The chemical analysis consists of an acid extraction to separate the organic substrate into two fractions: acid soluble organics (organic acids, starches and holocellulose) and acid insoluble organics (lignin). The bioassay consists of incubating the solid phase sample from the BCR in an anaerobic bottle with a buffered nutrient solution and an anaerobic inoculum in order to measure the degradation of the bioavailable fraction of the residual organic substrate.

The microbial analysis will be conducted using Quantitative PCR (Q-PCR). Primers have been established for all bacteria and subsets of SRBs, which allows for an estimate of the relative number of SRBs with respect to total bacteria present.

The analysis results will expand the understanding of the sulfate reducing capacity of the BLM BCRs., facilitating performance enhancement of both the current BLM BCRs and future passive treatment systems for mine impacted waters.

Additional Keywords: passive treatment, biochemical reactor, sulfate reducing bacteria, mine drainage

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