USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Getting at Background Chemistry of Mineral-rich Drainages: A Study of Two Montana Mining Districts

Nancy Hinman, Dave Alt, and George Furniss

Department of Geology, University of Montana, Missoula, MT 59812

Duration: Sept. 1, 1997 to Aug. 31, 2000

Federal Funds Requested: $ 49,997

Non-Federal Matching Funds: $101,026

Congressional District: Montana, at large.

Summary of Water Quality Issues

Federal and state regulations require that mining activities be performed in such a way that the quality of surface and groundwaters is not significantly degraded as a result. Further, closed mines must provide for the maintenance of this water quality into perpetuity. Finally, abandoned mine sites must be remediated to this same water quality level. Most streams in Montana mining areas are classified as B-1 (ARM 16.20.618 Surface Water Quality Rules) suitable as drinking water or, approximately the eq uivalent of a blue ribbon trout stream. However, because of the nature of host rocks and associated mineral deposits, it is likely that many of these streams never achieved these high water quality standards even prior to mining. The status of the origina l water quality is controversial as no adequate method of developing pre-ming background water quality has been established. Herein we propose to develop criteria for establishing background chemistry in operating and abandoned mining districts which addr esses this need in the State of Montana and has application to other states in which resource extraction occurs; for example, coal, gold, copper, and silver mining.

Summary of Groups Benefiting from this Research

Throughout the Western U.S., mineralized systems are mined for precious and strategic materials. In Montana, alone, 28,419 mining claims are now recorded. Proposed, operating, and abandoned mines all have the potential to impact the quality of surface and ground waters. Resource extraction industries, such as metal mining and coal mining, affect 2,365 stream miles in Montana at levels considered high to moderate impact. The results of this work will aid government officials and industry experts in esta blishing regulatory water quality limits for operation and remediation practices at producing and abandoned mining areas or other resource-rich geologic terrains.

Summary- of Anticipated Results

A method for estimating background water quality in naturally-occuring acid rock drainages (ARD) will be developed based on the study. of two representative mineralized districts. We will demonstrate that iron oxide deposits m natural metal-rich ARD, w hich have been forming for thousands of years, can be used to estimate natural background water quality at these and other areas in Montana and throughout the Midwest. The study will include documentation of natural melioration processes and an estimate o f the impact of surface disturbances on runoff water quality. Our preliminary study suggests that prehistoric iron oxide deposits (21 radiocarbon dates of ferricretes ranging from 300 to 9,000 years) in ARDs can be used to predict pre-mining water quality . As a result, drainage specific water quality standards can be established based on the trace element chemistry of these deposits. Additionally, the well-preserved iron oxide deposits in these drainages record past alpine biotic and climatic environments .