



# State of Utah

DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt  
Governor

Ted Stewart  
Executive Director

James W. Carter  
Division Director

1594 West North Temple, Suite 1210

Box 145801

Salt Lake City, Utah 84114-5801

801-538-5340

801-359-3940 (Fax)

801-538-7223 (TDD)

## TECHNICAL FIELD VISIT

**Date:** July 8, 1997

**Mine:** Hiawatha Mine

**File Number:** ACT/007/011 #5

**DOGM Staff:** Robert Davidson and Susan White

**Other Attendees:** K.C. Jones, US Fuel Company

### Purpose:

- Check water quality of D002 mine discharge before it enters and after it exits the Hiawatha underground culvert.

### Observations:

- Mine discharge water (D002) discharges from a pipe on the southern periphery of the Hiawatha preparation plant area and then enters an underground culvert. The water then flows through the culvert that lies beneath the preparation plant and exits on the north side of Refuse pile #4. The water then drains into a small tributary to Miller Creek.
- Iron oxide coatings were observed at both discharge points indicating possible acid mine drainage. However, there is a difference in color and amount of iron coating. At the mine pipe discharge area, the iron coatings are thinner and reddish in color. At the town discharge culvert, the coatings are thicker, more floc-like and orange.
- To check for acid production, pH and conductivity were analyzed at both discharge points. The pH meter was calibrated using pH 4, 7 and 10 standards while the conductivity meter was calibrated using a 6680 uS/cm standard.

	D002 Mine Discharge Pipe	D002 Town Discharge Culvert
Temp, °C	67	68
pH	7.20	8.15
Conductivity, uS/cm	1026	1023

### Recommendations/Conclusions:

- Analysis of the data shows that the pH actually increased between sampling points. When the water is exposed to the atmosphere, CO<sub>2</sub> degasses and equilibrium is reached which raises the pH. If the water passes over any CaCO<sub>3</sub>, equilibrium is reached; the CaCO<sub>3</sub> equilibrium point is at pH 8.2.
- At some point, the mine water was acidified and iron was put into solution as ferrous-iron. Then at neutralization, ferrous-iron remains in the Fe<sup>+2</sup> state until exposed to the atmospheric oxygen. Ferrous iron is then oxidized to ferric iron and the iron drops out of solution.
- Finally, as the water reaches equilibrium with atmospheric CO<sub>2</sub> and CaCO<sub>3</sub>, the pH raises to 8.2 and ferric iron precipitates as Fe(OH)<sub>3</sub>. This compound is very gelatinous and orange; a very small concentration coats everything; this is consistent with field observations and pH measurements.
- The conductivity is unchanged indicating that we are dealing with small concentrations of iron and is consistent with the Fe(OH)<sub>3</sub> formation and deposition.

Signature: 

Robert A. Davidson, Reclamation Specialist III (Soils)

on July 10, 1997