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**MEMORANDUM**

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**TO:** JEFF GROV, CBS OPERATIONS INC. **VIA EMAIL**  
MIKE HOLMES, EPA  
WENDY NAUGLE, CDPHE

**FROM:** DAVE HINRICHS, KERRI SITLER

**SUBJECT:** GROUNDWATER AND SURFACE WATER MONITORING IN 2009  
EAGLE RIVER MINE SITE

**DATE:**<sup>1</sup> JANUARY 20, 2009

**CC:** JOE TRUJILLO, JIM FRANK, HANK IPSEN

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To obtain the data necessary to support a Focused Feasibility Study<sup>1</sup> (FFS) of alternatives designed to achieve compliance with new Water Quality Standards during March and April, the “routine” surface water and groundwater monitoring program for the Eagle Mine Site will be modified for 2009 with a focus on characterizing the magnitude and timing of metal loading to Segment 5a of the Eagle River. This Memorandum describes the monitoring program that CBS Operations Inc. (CBS) proposes for 2009.

**BACKGROUND**

In the spring, typically described as March and April prior to the major snowmelt that generates flows greater than 150 cubic feet per second, copper, cadmium, and zinc concentrations within Segment 5 of the Eagle River can be elevated and at times exceed the new Water Quality Standards promulgated in 2008. Historical zinc loading estimates have identified an “unaccounted” load that enters Segment 5a between Eagle River stations E-3 and E-12A. The Belden area near station E-5 has been identified as the largest source of zinc loading to the river, on average contributing approximately 75% of the additional zinc load to Segment 5a. The Belden metals source is believed to be highly mineralized groundwater recharged by snowmelt or mine leakage, or both. As documented in three Belden Groundwater Extraction Performance Reports, the Belden groundwater averages 231 mg /L zinc during late summer and fall. Metal concentrations have not been measured in Belden wells in March or April due to deep snow and limited access.

An additional zinc load enters between Eagle River stations E-10 and E-12A, the reach into which Rock Creek flows. Since the spring of 2005 zinc loads contributed to this segment by Rock Creek (measured at station T-10) have been less than 14 pounds/day and Rock Creek alone cannot explain the segment loading. The groundwater in Rock Creek colluvium is also a potential source; however, the historical data indicate that Rock Creek groundwater contributes a smaller zinc load than Rock Creek itself. Based on the data we currently have, zinc loading from Rock Creek is a small part of the measured E-10 to E-12A loading, and the primary source is more likely residual Belden

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<sup>1</sup> USEPA 2008. Draft Statement of Work for Eagle Mine Superfund Site, December 2008.

loading emanating from the river channel alluvium. However, it is recognized that much of the groundwater data are outdated, especially in the spring when groundwater levels are highest.

A decrease in zinc loading from Rock Creek surface water and groundwater can be demonstrated over the last several years, owing to lower zinc concentrations and slow permeability in the colluvium. We believe that the relatively small zinc loads emanating from Rock Creek are evidence that a decade of remediation efforts have been effective. The remedial work includes the MDD mine pool reduction program, runoff and runoff interception at Waste Rock Pile No. 8, an enhanced surface water collection system in Rock Creek and year-long extraction of Rock Creek groundwater.

Seepage of iron-stained water from the south end of the Old Tailings Pile area (OTP) during the spring has been observed for several years. Snowmelt in the OTP diversion ditch combines with the seepage flow at Tigiwon Road and discharges to the river. A sample of the combined flow in April 2004 contained 1.9 mg/L dissolved zinc; however, the flow was not measured so the load cannot be calculated.

### **MONITORING OBJECTIVES**

The objectives of 2009 monitoring are:

- Quantify the volume and distribution of the metal loading sources in the Belden and Rock Creek areas during the spring
- Correlate source information and river loading to assess the timing of the loading
- Compare water levels in the Copper Tipple Extraction Trench to nearby wells to determine the timing of recharge and possibly the source of recharge
- Use the 2009 data with the extant database to identify potential alternatives that could be employed to control metal loading and minimize the exceedances of Water Quality Standards in Segment 5 of the Eagle River
- Characterize spring metals loading to the river in the OTP ditch at Tigiwon Road
- Provide data for water quality standards attainment determination.

### **MONITORING PROGRAM**

The proposed monitoring program coordinates groundwater monitoring with monitoring of Segment 5a of the Eagle River.

### **MONITORING LOCATIONS**

Belden Groundwater will be monitored at:

- BPS-1\*, well in the Copper Tipple Extraction Trench
- BW-9R\*, groundwater extraction well east of the Copper Tipple
- BW-10\*, groundwater extraction well south of the Copper Tipple.

Rock Creek Groundwater will be monitored at:

- RX-4, well adjacent to siphon location
- EDS-3\*, well near the Energy Dissipation Structure.

The Eagle River will be monitored at:

- E-3, Eagle River above Belden
- E-10, Eagle River above Rock Creek

- E-12A, Eagle River below Old Tailings Pile and Rex Flats, Segment 5a
- E-15, Eagle River below Cross Creek, Segment 5b.

Two tributaries will be monitored at:

- T-10, Rock Creek at mouth
- T-18, Cross Creek near mouth.

Surface water runoff from the OTP will be monitored at:

- OTP ditch at Tigiwon Road.

### **MONITORING FREQUENCY**

A water quality sample will be collected at each of the above-listed Surface Water stations concurrent with groundwater sampling. One set of samples will be collected in January and in February and samples will be collected every other week in March and April or until high river flows occur (>150 cfs). The four Eagle River stations and the two tributaries will be sampled again in September or October. The OTP ditch will be sampled once in March and in April.

Water level readings will typically be collected manually concurrent with sampling. Dedicated water level loggers have been installed in selected wells in Belden and Rock Creek (labeled with asterisk in list above). The HOBO U20 loggers automatically record water levels at 18-hour intervals.

### **ANALYTE LIST**

The following analytes will be measured in surface water samples:

- pH, field
- Specific Conductance, field
- Temperature, field
- Cadmium, dissolved
- Calcium, dissolved
- Copper, dissolved
- Magnesium, dissolved
- Zinc, dissolved.

The following analytes will be measured in groundwater samples:

- pH, field
- Specific Conductance, field
- Temperature, field
- Cadmium, total
- Copper, total
- Zinc, total
- Total Suspended Solids.

### **FLOW MEASUREMENTS AND ZINC LOADING**

Flow estimates for the river will be made using the USGS gage at station E-12A and the correlation curves for other main stem stations established in the 2007 Eagle Mine Site Annual Report. Flow will be measured using the flume at Rock Creek (station T-10). The flow

measurements, flow estimates, and zinc concentration results will be used to develop estimates of instantaneous zinc loading (in pounds/day) for Rock Creek (T-10) and the Eagle River between:

- E-3 and E-10 (Belden, upper segment 5a)
- E-10 to E-12A (Rock Creek, lower segment 5a).

A detailed comparison of 2009 flow measurements at various Eagle River stations to assess loading from “unaccounted sources” is not contemplated because the flow components are small and well within the error of the measurement method. Loading from the OTP ditch will also be calculated.

### **CHANGES FOR YEAR 2009**

The proposed monitoring program for 2009 is substantially different than routine monitoring and is considered to be temporary and will be revised for the Environmental Monitoring Plan for 2010. For 2009, the changes that have been made relative to the 2008 Eagle Mine Site sampling program are:

Added OTP seepage sampling – At the request of CDPHE, seepage from the OTP will be monitored during the spring at the ditch at Tigiwon Road.

Discontinue sampling at station E-5 – Eagle River stations E-5 and E-10 are located within and downstream of the Belden reach, respectively. E-5 is located approximately mid-way in the reach while E-10 is located downstream of Belden but upstream of Rock Creek. E-10 was chosen as the site for sampling since it is an integrator for more Belden loading.

Discontinue sampling at station E-22 – sampling at E-22 (Segment 5c) was deleted as analytical results from approximately 70 discreet samples are available in the project database to characterize metal concentrations and water hardness of Segment 5c. Based on a verbal agreement with CDPHE, CBS believes that it is not responsible for monitoring Segment 5c between E-15 and Dowd’s Junction.

Discontinue sampling at station E-13B – the project database contains analytical results from more than 150 discreet samples collected at E-13B. These data are sufficient to characterize metal concentrations at this mid-Segment 5b station located above the confluence with Cross Creek. The zinc load contributed by the CTP and WTP to Segment 5b will be estimated in the 2009 Annual Report by subtracting E-12A and Cross Creek zinc loads from E-15.

Discontinue groundwater sampling at OTP, Rex Flats, and CTP – the project database contains analytical results from years of sampling. The large data set is more than sufficient to characterize metal concentrations in groundwater.