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July 30, 2002

Mike Suflita
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Incoming
a/007/005
Copy Mike

Subject: Revised Work Plan for Eccles and Mud Creeks

Dear Mike:

Enclosed at the request of Chris Hansen, Canyon Fuel Company, Skyline Mine are three copies of our *revised* "Work Plan to Evaluate Min-Water Discharge Impacts on Eccles Creek and Mud Creek." Revisions have been made to this plan in accordance with your July 25 e-mail to Mr. Hansen.

Please direct questions or comments to Mr. Hansen. It is our intent to begin field work under this work plan the first of next week.

Sincerely,

Rich

Richard B. White, P.E.
President

Enclosure

cc: Chris Hansen

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WORK PLAN TO EVALUATE MINE-WATER DISCHARGE IMPACTS IN ECCLES CREEK AND MUD CREEK

CANYON FUEL COMPANY
Skyline Mine
Scofield, Utah

July 2002

Prepared by

EARTHFAX ENGINEERING, INC.
Engineers/Scientists
Midvale, Utah

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WORK PLAN TO EVALUATE MINE-WATER DISCHARGE IMPACTS IN ECCLES CREEK AND MUD CREEK

1.0 INTRODUCTION

In early August 2001, a fractured channel sandstone was encountered in the Skyline Mine, resulting in a significant inflow of groundwater to the mine. In an effort to minimize environmental impacts and meet effluent limitations, much of the water encountered was initially pumped to inactive sections of the mine for temporary storage.

It was assumed that the water encountered would have a high inflow for a short duration and then decrease with time, as frequently occurs in the area. However, rather than decreasing significantly with time, the inflow has remained fairly constant. Once available underground areas for water storage were filled, the mine began pumping both the inflow water and the stored water to the surface to prevent mine flooding and allow continued operation. Since early September 2001, discharges from the mine to Eccles Creek have ranged between about 10,000 and 15,000 gpm, compared with an average discharge for the prior 18 months of about 4,000 gpm.

On October 11, 2001, EarthFax Engineering, Inc. conducted a reconnaissance geomorphic evaluation of Eccles Creek to assess potential impacts of the discharge on the stability of the stream channel. The results of this evaluation were combined with an assessment of potential water-quality impacts in a letter report to Canyon Fuel Company dated October 24, 2001. Additional information regarding potential impacts to phosphorus concentrations was provided on December 3, 2001 and December 13, 2001.

On November 26, 2001, EarthFax conducted a more extensive field evaluation of the impacts of mine-water discharges on Eccles and Mud Creeks. Samples of the bed and bank materials were collected to allow an assessment of the structural and erosional stability of the stream channels. In addition, subsequent analyses were conducted to determine the potential effects of mine-water discharges on peak annual flows in the streams and the potential impacts to man-made structures in the streams. An evaluation of alternative discharge points was also conducted. The results of these investigations were presented in a letter report to Canyon Fuel Company on February 27, 2002.

Following a review of the submitted information, Canyon Fuel Company and EarthFax met with representatives of the Utah Division of Oil, Gas and Mining to discuss the results. In these meetings, the Division requested additional information to better quantify and monitor potential impacts to Eccles and Mud Creeks. The objective of gathering this additional information is to:

1. Quantify whether or not increased flows may be causing erosion and/or sediment deposition in quantities that are adverse to the hydrologic regime of Eccles Creek and Mud Creek.

2. Quantify the degree to which the increased flows may be contributing to sediment and phosphorus loads in Scofield Reservoir.

3. Provide a means for monitoring potential long-term impacts to the morphology of Eccles and Mud Creeks.

4. Quantify whether or not changes are occurring in the elevation of the water table in the alluvial deposits adjacent to Eccles and Mud Creeks due to the increased flows.

5. Collect data to determine whether or not an Alluvial Valley Floor exists adjacent to Mud Creek.

6. Quantify whether or not changes are occurring to the vegetation adjacent to the stream corridor due to the increased flows. Also, quantify whether or not vegetative changes occur as a result of the potential future decrease in present discharge rates from the mine.

The purpose of this document is to present a work plan for the collection of data to address items 1 through 5 above. A separate work plan will address item 6.

2.0 WORK PLAN

2.1 Establish and Characterize Reference Sites

Reference sites will be established on Eccles and Mud Creeks at the approximate locations shown on Figure 1. Sites EC-1, 2, and 3 as well as MC-1, 2, and 3 correspond to cross sections used in previous investigations (EarthFax Engineering, 2002). Sites MC-4 and MC-5 will be established to evaluate conditions on Mud Creek within a section of agricultural pasture and upstream from the Eccles Creek confluence, respectively.

All reference sites will be established in general conformance to the recommendations of Harrelson et al. (1994). This will involve the following:

- Establishing benchmarks at each site. Benchmarks will consist of cement or boulder monuments, with a metal marker stamped with the site number. Photographs will be taken and descriptions provided to allow others to return to the sites in the future.

- Establishing monumented cross sections. The endpoints of cross sections will be marked with roof bolts or steel reinforcing bar that has been driven into the ground. If roof bolts are used, the bars will be painted to increase visibility. If steel reinforcing bars are used, plastic survey end caps will be placed on the bar ends. The locations of the cross section endpoints with respect to the benchmarks will be measured, using a tape and Brunton compass, with the measurements noted in the field log book. The location of another permanent feature (e.g., embedded boulder, long-lived tree, etc.) will also be measured and noted, to provide triangulation.

- Surveying the channel cross section at each site. A measuring tape will be attached to one of the cross section monuments and stretched tight and level across the stream to the other monument. The level of the tape will be checked with an attached bubble level. Surveying will be performed using a survey level and rod. Elevations will be shot at each important feature or change in elevation

(e.g., slope breaks, channel banks, bankfull stage, etc.). The survey will be closed by re-shooting the station benchmark.

- Surveying the longitudinal profile at each site. The profile will extend a distance of at least 20 times the channel width (half upstream and half downstream from the cross section location). At a minimum, data to be collected from the profile will include the channel bottom, the water surface, indications of bankfull stage, and the top of the stream bank. Measurements will be collected on intervals approximately equal to the channel width. Data will be collected using a survey level and rod, with the location of the starting and endpoints being measured as noted above.

- Establishing photo points. As recommended by Harrelson et al. (1994), convenient locations will be selected to take photographs upstream, downstream, and across the channel at each cross section location. These locations will be noted in the field book, with respect to the benchmark.

- Collecting streamflow data. The flow will be measured at each site, using standard procedures, with a rotating-cup flow meter.

Samples of the bed and bank materials will be collected at the newly established stations (MC-4 and MC-5) to evaluate geomorphic and stability relationships at those locations. Similar samples were collected in February 2002 at the remaining sites (EarthFax Engineering, 2002) and are still considered valid.

2.2 Determine Depth to Groundwater

The depth to groundwater will be determine at each of the reference sites on Mud Creek. This will be accomplished by installing two temporary piezometers in the alluvium on each side of the stream. The piezometers will be installed using portable flighted augers and a hammer drill. Perforated PVC pipe will be installed in the hole and the water table allowed to stabilize for a period of at least 4 hours prior to measuring the depth to water. The relative elevation of the piezometer will be established by standard surveying techniques from the previously-

established benchmark at each site. Within the constraints offered by each site, the locations of each piezometer will be sited in an attempt to determine the slope of the water table perpendicular to the stream channel at each reference site.

2.3 Gather Available USGS Flow Data

Flow data on file with the U.S. Geological Survey will be gathered for Eccles Creek near Scofield, Utah (station 09310600) and for Mud Creek below Winter Quarters Canyon at Scofield, Utah (station 09310700). If these data are available electronically, they will be provided to the Division in electronic form. Otherwise, paper copies will be provided.

2.4 Gather and Evaluate Historic Aerial Photographs

Historic aerial photographs will be gathered of Pleasant Valley between the town of Scofield and the confluence of Mud Creek and Eccles Creeks. Both private sources (on file with aerial photography companies) and government sources (USDA, USGS, EROS) will be searched. These photographs will be evaluated to assess historic land use in this reach of Pleasant Valley. Use this information, together with the additional data collected as part of this study, to evaluate whether or not Pleasant Valley can be classified as an Alluvial Valley Floor.

2.5 Collect Additional Water-Quality Data

Water-quality samples will be collected at monitoring points MC-2 through MC-5. In addition to the collection of flow data as indicated in Section 2.1, these samples will be analyzed for total dissolved solids (TDS), total suspended solids (TSS), and total phosphorus.

2.6 Evaluate Bank Stability Indexes

As field information is gathered, sufficient data will be gathered to determine the bank erodibility hazard (Rosgen, 1996; 2001) for each reference site. These data will include measurements of the following values:

- Bank height
- Bankfull depth
- Rooting depth
- Root density
- Bank slope
- Degree of surface protection of the bank

The in-stream velocity gradient (between the core of maximum velocity and the stream bank) and the ratio of average hydraulic stress and near-bank hydraulic stress will also be calculated. Each of these indexes will be compared with typical values provided by Rosgen (1996; 2001) to provide another assessment of bank stability in addition to that provided previously (EarthFax Engineering, 2002).

2.7 Long-Term Monitoring

Flow and water-quality data (TDS, TSS, total phosphorus) will be collected at monitoring points MC-2 through MC-5 four times per year (i.e., seasonally), when accessible, for a period of one year following a sustained reduction in mine-water discharge to a rate of 5,000 gpm or less (i.e., pre-September 2001 levels). Channel cross sections and longitudinal profiles will be collected from each reference site annually during the same period. Flow and water-quality data will also be collected any time there is an increase in discharge rates from the mine of at least 25% above the average rate for the prior month.

2.8 Review Past Studies

The records of State and Federal agencies (e.g., Utah Department of Natural Resources, Utah Department of Environmental Quality, U.S. Geological Survey, etc.) will be searched to obtain copies of past studies performed on Eccles and Mud Creeks. These reports will be reviewed for additional baseline information regarding the streams.

2.9 Prepare Project Report

Once the initial data are collected and evaluated, a report will be prepared and submitted to the Utah Division of Oil, Gas and Mining for review. This report will include drawings of the cross sections and longitudinal profiles, copies of photographs collected during the field investigation, copies of data collected, results of data evaluations, and copies of field notes.

3.0 REFERENCES

EarthFax Engineering, Inc. 2002. Hydrologic and Channel-Stability Evaluation of Eccles and Mud Creeks. Letter report submitted to Canyon Fuel Company. Midvale, Utah.

Harrelson, C.C., C.L. Rawlins, and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. General Technical Report RM-245. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado.

Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, Colorado.

Rosgen, D.L. 2001. A Practical Method of Computing Streambank Erosion Rate. Proceedings of the Seventh Federal Interagency Sedimentation Conference. U.S. Geological Survey. Reno, Nevada.

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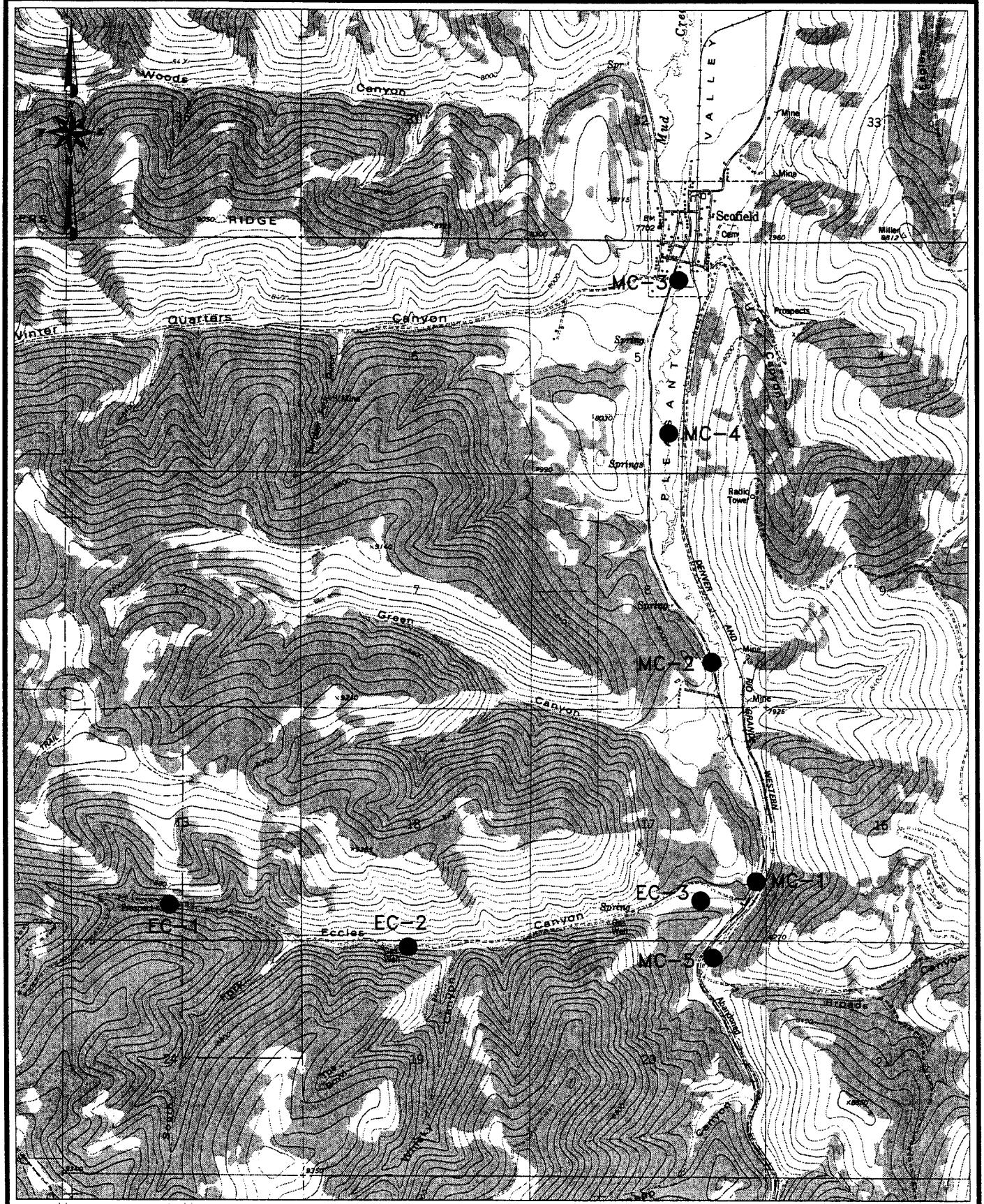

BASE MAP: USGS 7-1/2 MIN. QUADRANGLE
SCOFIELD, UTAH (1979)

0' 3000'

FIGURE 1. LOCATION OF REFERENCE SITES

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