January 28, 2021 Project No. 123-93309-09

Kevin O'Hara
Ohio Environmental Protection Agency
Division of Environmental Response and Revitalization
Ohio Environmental Protection Agency
Southeast District Office
2195 Front Street
Logan, OH 43138

WORKPLAN FOR PHASE 2 MINE AREA INVESTIGATION
SATRALLOY SITE (JEFFERSON COUNTY, OHIO)

Dear Mr. O'Hara:

On behalf of Cyprus Amax Minerals Company, Golder is submitting this workplan for the Phase 2 investigation of the former coal mine area of the Former Satralloy site. The initial (Phase 1) Investigation, as described in the Phase I workplan submitted July 16, 2020, was completed last year. Phase 2 will complete a comprehensive investigation of the former coal mine area to support the Focused Feasibility Study, identified in Amendment No. 7 to the Interim Action Workplan. The purpose of the comprehensive investigation is to determine if the area is suitable for placement of slag as part of remediation, and to provide pre-design data for remediation.

We propose to perform the Phase 2 investigation this year.

1.0 SCOPE OF WORK

1.1 Instrumentation of Existing Wells and Seeps

Transducer instrumentation and collection of water quality was initiated Autumn 2020 at existing RBH-1 and RBH-2 wells and three flowing seeps (SSW-121, SSW-241 and SSW-242). Pressure transducers also record conductivity provide pressure data and high-resolution conductivity data about water quality variability based on timing of the hydrologic cycle. This data will be integrated with the additional seep and surface water collected during Phase 2 Investigation.

1.2 Phase 2 Surface Geophysical Program

A series of linear transects (approximately 4,500 linear feet total) will be completed to supplement the Phase I geophysics survey. Along each transect, three datasets will be collected, consisting of: seismic refraction (to determine depth to rock/thickness of fill), electrical resistivity tomography (ERT), and electromagnetic induction (EM).

Golder Associates Inc.
18300 NE Union Hill Road, Suite 200, Redmond, Washington, USA 98052 T: +1 425 883-0777 F: +1 425 882-5498

During geophysical data collection geological features and water features pertinent to the investigation will be located using global positioning systems (GPS) and staked, the types of material observed (mine spoil, slag, etc.) will be recorded, descriptions of the slopes on the slag piles, locations of seeps and springs, and locations of the geologic contacts between pertinent lithologic units will be noted.

1.3 Drilling, Downhole Geophysics, and Well Installation

Sixteen (16) boreholes will be drilled ranging in depth from approximately 30 to 210 feet during the spring and summer of 2021. Each borehole will be drilled using sonic methods with drilled material logged by an on-site geologist. Lithology, color, water content, relative strength, and structural features will be continuously logged for each borehole. Static water level, staining or smell, evidence of contamination, or other anomalies will also be noted and logged. Rock cores will be collected from the bedrock boreholes and documented photographically.

Preliminary locations for each borehole are shown in Figure 1. Depth of completion is generally planned to be either in bedrock, or the lowest water-bearing unit.

Immediately following drilling to total depth, Golder will conduct a borehole logging program consisting of collection of the following: formation resistivity, fluid temperature and conductivity, caliper, televiewer, and natural gamma in each borehole. Electronic logs of each borehole will be generated, and the draft logs used to determine optimal screen depths for monitoring well installation. Oriented geologic structural data will be obtained using optical and acoustic televiewer logging of the boreholes.

Once drilling and geophysical logging are complete, two-inch PVC monitoring wells will be installed and developed at the selected boreholes. Installation of vibrating wire piezometers, if needed, in up to 10 boreholes to monitor zones of perched water conditions will be incorporated in the well design. A Golder geologist will verify development records and complete a slug test to determine the hydraulic conductivity of the screened water-bearing zone prior to demobilization from the well.

Up to five (5) samples will be selected from each borehole for grain-size analysis, resulting in up to 75 samples for laboratory analysis. These samples will be used to source native cover materials and support feasibility design.

1.4 Seep and Surface Water Sampling

To investigate potential Site impacts to groundwater and flow paths through the Former Mine Area, 29 seep and surface water samples will be collected. Sample locations are shown in Figure 3.4-1 of the RI/FS. These samples will be collected during both late summer/early fall (2021) to provide water quality data for the Site during dry seasonal periods (coordinated with sampling of groundwater and Cross Creek water).

Rigid porous polyethylene samplers (RPP) will be inserted into capped PVC cylinders and lowered into small trenches or vertical borings that have been hand excavated below the water table. A durable cover will be placed above the PVC cylinder to prevent surface water from entering the sampler and mixing with the groundwater being sampled. The PVC cylinders will be perforated to promote the flow of water and good connection between the groundwater and the sampler. The PVC cylinder will also serve to protect the sampler and simplify sample collection and handling procedures.

For each surface water sampling location, both lab-filtered and unfiltered samples will be collected. Analyzing for both total and dissolved metals will indicate constituent contributions from suspended particulates. Water quality

analysis, including major cations and anions, will allow comparison of the geochemistry of groundwater, flow paths, Site surface water, and Cross Creek water.

1.5 Groundwater Sampling and Transducer Installation

Following completion of the geophysical logging and installation of monitoring wells, a water quality sampling event will be conducted that includes all new monitoring wells and the five existing bedrock monitoring wells nearest the Former Mine Area, surface water and seep sampling. These samples will be collected during both late summer/early fall (2021) to provide water quality data for the Site during dry seasonal periods (coordinated with sampling of groundwater and Cross Creek water).

Water quality samples will be analyzed for total and dissolved target analyte list metals, total and dissolved mercury, hexavalent chromium, and major cations and anions.

Additionally, dedicated pressure transducers will be installed in selected wells to obtain continuous records of groundwater elevation (assumed to be all locations in the cost estimate). Transducer data will be downloaded periodically to support a baseline monitoring program.

1.6 Optional Time-Lapse Geophysical Monitoring

The results of the surface geophysics indicate the need to monitor seasonality and/or changes in groundwater flow due to precipitation. If confirmed by drilling observations (correlated to geophysical data), time-lapse geophysical monitoring will be conducted. This involves installation of a semi-permanent geophysical monitoring system. Long-term subsurface environmental monitoring can be completed using electrical resistivity tomography (ERT) to collect large, high-density data sets using two-dimensional (2-D) arrays of surface and/or borehole electrodes. Because electrical resistivity measurements are highly repeatable, ERT can measure very small changes in subsurface properties over time. The method is sensitive to fluid content, saturation, and composition, as well as subsurface temperature. Consequently, this approach can provide enhanced information regarding the extent and nature of any bedrock plume encountered without the need for repeat water quality sampling events.

1.7 Report

A report will be prepared documenting the results of the Former Mine Area Investigation. This report will include:

- Description of the investigation procedures
- Description and discussion of results
- Data tables (chemical and geotechnical analytical data, well details, etc.)
- Boring and wells logs, including selected geotechnical data
- Maps integrating groundwater, seep, and surface water quality results
- Maps showing known and/or potential hydrologic connections and flow paths

2.0 CLOSING

We request your expedited review of this workplan in order to ensure the timely initiation of drilling and other field activities early in the 2021 calendar year. If you have any questions, please contact Barbara Nielsen at (480) 313-2895.

Sincerely yours,

Golder Associates Inc.

Lee K. Holder, PE
Associate Engineer, Project Manager

LKH/

Attachments: Figure 1

cc: Barbara Nielsen, Cyprus Amax Minerals Company

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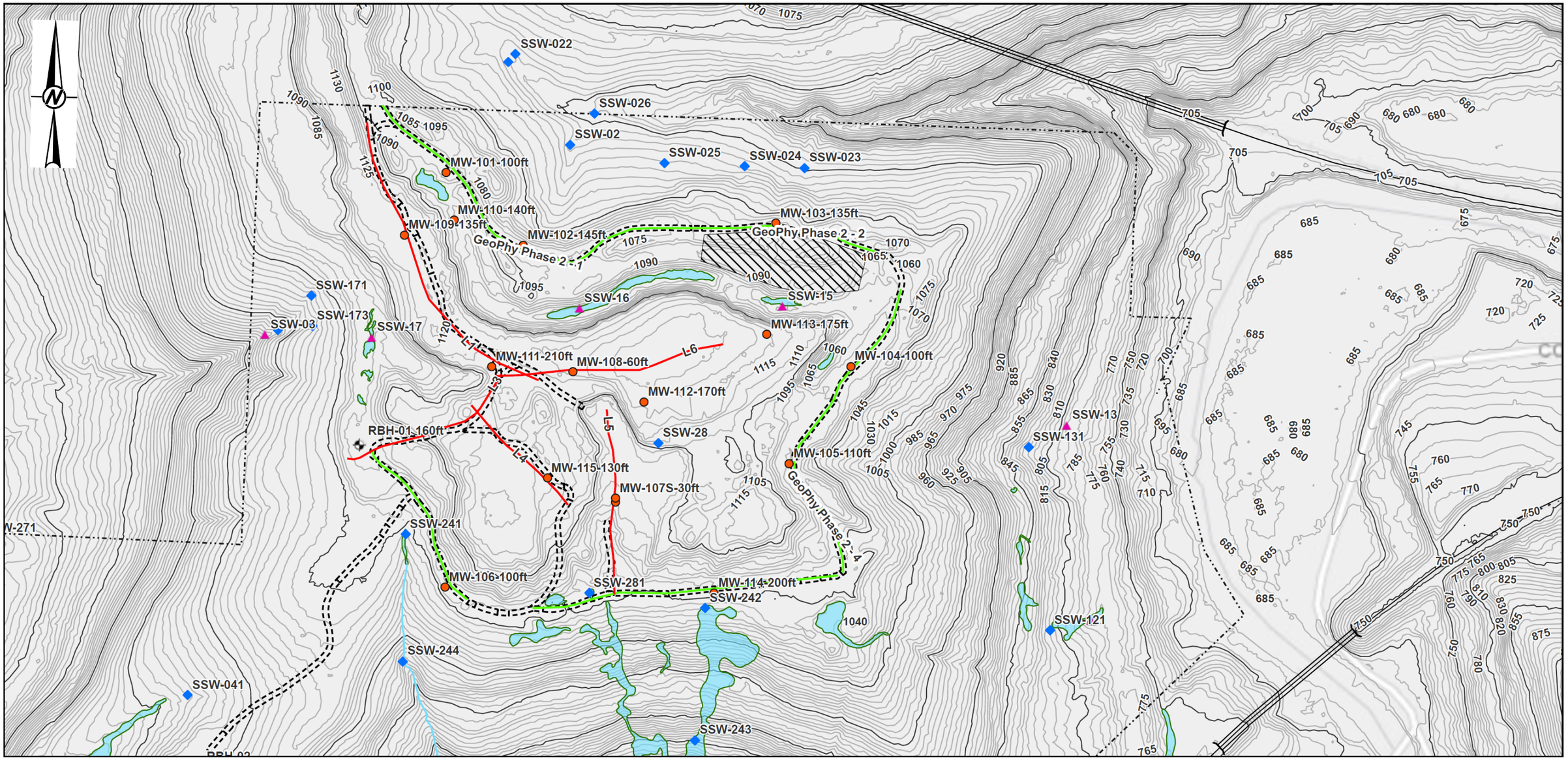

REFERENCES:
1. GOLDER (PHASE 1 GEOPHYSICS TRANSECT, SURFACE WATER, SEEP, PROPOSED/EXISTING MONITORING WELL LOCATION)
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE OHIO NORTH FIPS 3401 FEET

LEGEND

- Existing Monitoring Well Location
- Seep Location
- Surface Water Location
- Phase 1 Geophysics Transect
- Phase 2 Geophysics Transect
- Proposed MW Location
- Fence
- Culvert
- Railroad
- Road
- Slurry Pipe
- Existing Facility
- Property Boundary
- Tributary
- Wetland
- Creek
- Elevation Contour (5-ft Interval)
- Elevation Contour (50-ft Interval)

CLIENT
CYPRUS AMAX MINERAL COMPANY

PROJECT
FORMER SATRALLOY SITE

CONSULTANT
GOLDER

YYYY-MM-DD	2021-01-28
PREPARED	PEF
DESIGN	PEF
REVIEW	DJB
APPROVED	LH

TITLE
LAYOUT FOR PHASE 2 INVESTIGATION
FORMER MINE AREA

PROJECT No. 12393309x09 Phase 200 | Rev. 0 | Figure 1