ATTACHMENT A
Scope of Work
Remedial Investigation and Feasibility Study
Site: Formosa Mine Site, Douglas County, OR.
Site ID: ORN001002616

Purpose

This Interagency Agreement (IA) between the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA) is for the OU2 remedial investigation and feasibility study (RI/FS) activities at the Formosa Mine Superfund Site (Site).

Background

The Formosa Mine is an abandoned underground mine in southwest Oregon. Copper was the primary metal of value, and some gold and silver were produced as byproducts of copper production. The mine is located in Douglas County, approximately 25 miles south of Roseburg, Oregon, and 7 miles south of Riddle, Oregon, within Sections 23, 26, and 27, Township 31 South, Range 6, West Willamette Meridian as shown in **Figure 2-1**. It is in the Coast Range Klamath Mountains at elevations between 3,200 and 3,600 feet (ft) above mean sea level (amsl) near Silver Butte Peak (3,973 ft amsl). Surface terrain is characterized by steep mountains, narrow ridges, and deep valleys. The Site is managed as two separate OUs.

- OU1 includes all surface and subsurface mine materials deposited outside the underground mine workings. These mine materials are defined as OU1 mine materials and include materials that were excavated during construction and operation of the mine such as waste rock, ore, tailings, construction rock, road surfaces, and contaminated soils that are comingled with waste rock, affected by dispersion of contaminants from mine materials, and/or affected by mining-influenced water (MIW) discharges.
- OU2 includes all remaining media and site contamination areas, including surface water, stream sediment, groundwater, underground workings, and adit water drainage. Mine materials present within the underground workings are defined as OU2 mine materials.

Site History

Geologic exploration activities in the area of the Formosa and Silver Butte Mines (referred together as the Silver Peak Mine) were first conducted in 1910. In 1926, underground mining and shipping of ore began and continued through 1937. Waste rock from the underground mining was dumped on the hillsides adjacent to adit portals and roads and integrated into road beds.

Further underground development and explorations were conducted from 1952 through the
1980s, but no additional mining was conducted. In 1984, Formosa Resources Corporation (FRC
[formerly Rand Ventures Inc.]) acquired a portion of the Silver Peak Mine and adjoining
properties and conducted an exploration program to further define the ore reserves. In May
1987, FRC (incorporated in Canada) established a subsidiary company called Formosa
Exploration Inc. (FEI). In spring of 1990, Oregon Department of Geology and Mineral Industries
approved FEI's mine-operating permit. Underground mining was conducted by FEI from early
summer 1990 until August 1993. Waste tailings from the milling operations were backfilled into
the mine workings and stored on-site within the 2-acre, lined mill pond. On August 1, 1993, the
mine officially ceased operations.
Reclamation was conducted by FEI from August 1993 through August 1994. Reclamation
activities included removal of the crusher facility and stockpiled ore; removal of a zinc
concentrate storage site; cleanup of diesel fuel spills; removal of sulfide tailings from upper
Middle Creek; backfilling mine workings with crushed ore and tailings; reclamation of the adit
portals; removal of the mill building, shop building, and processing equipment; backfilling and
capping of the mill pond; removal of crib wall fill and wood crib wall structures; and removal of
the million-gallon tank and other structures used for process water storage, diversion, and
treatment operations.
In 2000, Oregon Department of Environmental Quality investigated the Site and conducted an
interim remedial action measure (IRAM) for the adit diversion and treatment system. A removal
assessment report was prepared, and construction of the adit collection system portion of the
IRAM was completed by November 2000. This IRAM functions as an adit water diversion pipe for
Formosa 1 Adit and Silver Butte 1 Adit.

EPA completed the OU 1 RI/FS in 2012 with a Record of Decision signed April 16, 2014.
EPA prepared OU2 Baseline Ecological Risk Assessment in July 2014. There is also an OU 2
Data Summary Report dated November 15, 2015.

Work Statement
The USACE shall perform the RI/FS at the Site.
General Requirements

The USACE shall conduct the RI/FS in accordance with the *Guidance for Conducting RI/FS Studies under CERCLA* (USEPA, October 1988). The USACE shall also develop a Preliminary Ecological Risk Assessment in accordance with EPA 540-12-97-996, *Ecological Risk Assessment Guidance for Superfund* (ERAGS), June 5, 1997 (or, most recent guidance) and a Preliminary Human Health Risk Assessment in accordance with EPA 540/1-89/002, as updated.
The USACE shall furnish all necessary and appropriate personnel, including materials, and services needed for, or incidental to, performing and completing the RI/FS.
The USACE shall manage all aspects of the work specified in this statement of work and be responsible for the selection, management, and oversight of all USACE contractor personnel who may be involved in the performance of this work.

Specific RI/FS Activities
The USACE will be responsible to conduct the RI/FS activities described below in order to develop (potential) remedial alternatives:

Task 1 – Project Planning
Upon receipt of this Scope of Work (SOW), the USACE shall identify activities necessary to perform the RI/FS activities. The USACE shall meet with EPA in one or more scoping meetings to discuss the following items:

- The proposed scope of the project and the specific investigative and analytical activities that will be required to complete the RI/FS;

- An inventory and overview report of historical data, reports, and papers that are pertinent to the Site Study Area, including but not limited to groundwater, surface water, sediment, and soil. An acceptable graphic representation (e.g. GIS format, as specified by EPA) of the Site Study Area that contains all relevant existing data should include but not be limited to locations of known past and present contributors of the contaminations found at the Site in the sediment, the locations of all previous sampling locations and the data associated with those samples, and contoured, contaminant concentration gradients;

- Preliminary conceptual site model;

- Preliminary remedial action objectives and general response actions;

- Early actions, if necessary;

- Field activities to include evaluation of mine pool characteristics, seeps, springs and surface water characteristics (analytical and field methods)

 Potential remedial technologies including, but not limited to, passive bio-reactors for the contaminants found at the Site;

 Potential applicable or relevant and appropriate requirements (ARARs) associated with the Site and the potential response actions being contemplated. Based on these discussions, the USACE shall conduct the work using, to the extent applicable, existing information about this Site; and

 Community involvement.

After the scoping meeting, the USACE shall develop the specific project plans to meet the objectives of the RI/FS. The project plans shall outline the technical approach, complete with corresponding personnel requirements, activity schedules, deliverable due dates, budget estimates for each of the specified tasks. EPA anticipates that the following will be developed: Work Plan; Quality Assurance Project Plan (a Field Sampling Plan should be incorporated within the QAPP); and a health and safety plan for field activities.

Task 2 – Technical Studies and Investigations

The USACE shall conduct the investigations necessary to determine the overall nature and extent of contamination groundwater and sediment at the Site. Such investigations shall not duplicate work already performed at the Site. Instead, the studies and investigations will build on the existing database. Prior to developing a final Work Plan, the USACE shall provide a written report summarizing the results of the data collected to date and recommendations for additional investigations and studies, including the collection of groundwater, surface water and sediment samples from the Site.

Task 3A – Work Plan Preparation

Subsequent to approval by EPA, the USACE shall provide EPA with a Work Plan for Field Investigations, including all necessary planning documents. A Quality Assurance Project Plan developed in accordance with *Uniform Federal Policy for Quality Assurance Project Plans* (EPA-505-B-04-900A), which should incorporate a Field Sampling Plan, should also be developed as well.

Task 3B – Baseline Risk Assessment

The USACE shall prepare a Baseline Risk Assessment for the site to include but not limited to: Screening Level Ecological Risk Assessment (SLERA) in accordance with EPA 540-12-97-006, *Ecological Risk Assessment Guidance for Superfund Sites* (ERAGS), dated June 5, 1997 (or more recent guidance) and a Baseline Human Health Risk Assessment in accordance with EPA 540/1-89/002, as updated. This also includes a Memorandum on Exposure Scenarios and Assumptions and Pathway Analysis Report. EPA will review the SLERA and determine whether a full Baseline Ecological Assessment is required. The Baseline Risk Assessment will be used by the USACE to propose additional sampling and/or work (if deemed necessary) to complete the Risk Assessments.

Task 4 – Work Plan Implementation

Upon EPA approval of the Work Plan, the USACE shall implement the Work Plan. The

USACE shall submit the Work Plan and all other submittals in electronic formats (e.g., Word text files, Portable Document Format (PDF) and Excel spreadsheets), as specified by EPA.

Task 5 – Sample Analysis/Validation

The USACE shall coordinate with the Regional Sample Control Coordinator (RSCC) regarding analytical, data validation, and quality assurance issues. The EPA Field and Analytical Services Technical Advisory Committee (FASTAC) procedures shall be followed. For all non-time critical data collection projects, EPA Region 10 requires that a sequential decision tree for procuring Superfund analytical services be followed, which includes:
Tier 1: EPA Region 10 laboratory
Tier 2: National Analytical Services Contract laboratories (CLP and Non-RAS)
Tier 4: Contractor, IAs and Field Contractor Subcontract laboratories
The USACE shall follow the FASTAC strategy unless written direction is provided by the RPM to deviate from the FASTAC strategy. The USACE submits the R10 Analytical Services Request Form (ASRF) along with the QAPP at least 3 weeks prior to field sampling.
The USACE shall provide electronic submittal of sampling data via Scribe in accordance with EPA
Region 10 policies, guidelines, and formats (EPA R10 DMP 2014).
The data collected during the RI shall support the FS. Collected data should be validated in accordance with the approved QAPP to determine whether it is appropriate for its intended use. Task management and quality controls shall be provided by the USACE. The USACE shall incorporate this information into the RI/FS appendices.

Task 6 – Data Evaluation
The USACE shall analyze all Site investigation data and present the results of the analyses in an organized and logical manner so that the relationships between Site investigation results for each medium are apparent. The USACE shall prepare a summary that describes: (1) the concentrations of specific chemicals at the Site and the ambient levels surrounding the Site and (2) the potential transport mechanism(s), the expected fate of the contaminant in the environment and the identification, if any, of any other possible source of contamination.

Task 7 – Preparation of RI Report and Human Health and Ecological Risk Assessment Report
The USACE shall prepare the RI and Risk Assessment Reports in conformance with all applicable EPA guidance. Based on sound data quality objectives, the results of the Baseline Human Health Risk Assessment and Baseline Ecological Risk Assessment (point estimate or deterministic risk), EPA will determine whether a probabilistic risk assessment is appropriate and, if so, the USACE shall conduct a probabilistic risk assessment consistent with the Risk Assessment Guidance for Superfund Volume III, Part A: Process for Conducting Probabilistic Risk Assessment (RAGS Part 3A, December 2001, OSWER 9285.7-45, and subsequent updates), and the Guiding Principles of Risk Assessment available at http://www.epa.gov/oswer/riskassessment/superfund_hh_characterization.htm and other

related guidance. EPA will determine the level and extent of the probabilistic risk assessment in accordance with Risk Assessment Guidance for Superfund Volume III (Part A) and other appropriate EPA guidance and policy. EPA has already completed a Human Health Risk Assessment for OU 1, which determined no unacceptable risk from Soils. Depending upon the exposure scenarios, a similar risk may be present for human health. The assumption should be the human health risk assessment would be less effort than a typical site.

Task 8 – Remedial Alternatives Development and Screening
The USACE shall conduct remedial alternatives development activities in accordance with Section 4.2 of the *Guidance for Conducting RI/FS Studies under CERCLA*. The USACE shall perform alternative screening activities in accordance with Section 4.3 of the above referenced guidance.
The USACE shall meet with EPA to determine the remedial action objectives for the Site. If additional meetings are required, they will be authorized in writing.

Task 9 – Detailed Analysis of Alternatives
Detailed analysis of alternatives will be conducted consistent with Chapter 6 of the *Guidance for Conducting RI/FS Studies under CERCLA*.

Task 10 – Feasibility Study (FS) Report
The USACE shall present Tasks 8 and 9 in an FS report(s). Supporting data, information, and calculations will be included as appendices to the report. The USACE shall proceed with the development of a draft FS report only after consultation with the EPA regarding the scope of each report. The USACE shall prepare and submit a draft FS report under the *Guidance for Conducting RI/FS Studies under CERCLA* for comments and subsequently incorporate those comments into the final FS report. Depending on the selected alternative, treatability/pilot tests are likely to be required to prove the effectiveness of the technology. If appropriate, this work will be performed as part of Task 10. There is existing testing data on using passive bio-reactors for treating Formosa Mine Water. The article: Mechanisms and effectivity of sulfate reducing bioreactors using a chitinous substrate in treating mining influenced water, Chemical Engineering Journal 323 (2017) 270–277, Souhail R Al-Abed et. al.

Anticipate constructing field pilot scale bio reactors at the Formosa 1 Adit portal to evaluate appropriate substrates, pretreatment, and scale to address MIW.

Task 11 – Post RI/FS Support
The USACE may be called upon to assist EPA by providing technical expertise in responding to oral and/or written public comment(s) on the Proposed Plan and/or the RI/FS reports.

Other Requirements
The EPA RPM shall be notified at least sixty days in advance of reaching 75 and 100 percent expenditure of the total approved IA budget.The USACE shall submit monthly progress reports in an electronic format to the EPA RPM and Project Officer, which summarize the following: key project milestones achieved; meeting summaries; activities performed for the month; accomplishments; project goals, schedules and planned activities for the next three months; an identification of all delays encountered or anticipated that may affect the future schedule for

performance of the RI/FS work, and all efforts made to mitigate delays or anticipated delays. A monthly cost report shall also be included. The USACE shall use technologies and practices that are sustainable in accordance with EPA Region 10 Clean and Green policy (August 2009) or most current version. At the direction of the EPA RPM or EPA Project Officer, the USACE shall incorporate requirements for the appropriate practices into the terms of its contracts consistent with the EPA Region 10 Clean and Green policy. The USACE shall report monthly on the use of these technologies and practices, including the associated quantities of materials reduced, reused, or recycled as a direct result of these practices. The USACE shall be responsible for maintaining all technical and financial records associated with this IA. At the completion of this IA, the USACE shall perform all necessary closeout activities as specified in the IA. The closeout activities may include closing out any contracts, indexing and consolidating project records and files as required above, and providing a technical and financial closeout report to EPA.

Project Organization

The EPA Remedial Project Manager for this project is:

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