



Waste Characterization Plan

East Mesa Geothermal Test Facility

El Centro, California

USACE Contract No. DACW45-94-D-0005, Delivery Order No. 0038

OHM Project No. 18904

Revision 2

August 26, 1996



OHM Remediation
Services Corp.

1202 Kettner Blvd., Suite 3400
San Diego, California 92101

Prepared by:


Pete Everds
Project Hydrogeologist

Approved by:

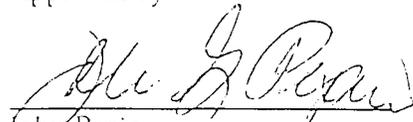

John Pepin
Project Manager

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List of Acronyms and Abbreviations

ARRA	Arizona Radiation Regulatory Agency
COC	chain-of-custody
DO	Delivery Order
EPA	Environmental Protection Agency
LIMS	Laboratory Information Management System
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NORM	Naturally Occurring Radioactive Material
OHM	OHM Remediation Services Corp.
QC	quality control
RCRA	Resource Conservation Recovery Act
TCLP	toxicity characteristics leaching procedure
USACE	United States Army Corp of Engineers
USDOE	United States Department of Energy
WCP	Waste Characterization Plan

Section 1

Introduction

This Waste Characterization Plan (WCP) has been prepared to describe the protocols for waste characterization sampling and analysis associated with the soil contamination at the former brine holding pond at the United States Department of Energy (USDOE) East Mesa Geothermal Test Facility at El Centro, California (the site).

The WCP is issued in support of the OHM Remediation Services Corp. (OHM) Construction Work Plan for the site. Procedures described in this WCP were developed subsequent to submittal of the Construction Work Plan to address State of Arizona waste disposal requirements and regulatory agency concerns. As a result, the WCP supersedes the waste characterization requirements provided in the Construction Work Plan. The work is being performed by OHM, under Delivery Order (DO) Number 0038, for the United States Army Corps of Engineers (USACE), Contract Number DACW45-94-D-0005.

1.1 Site Location, Background, and Characteristics

Site location, background and characteristics are discussed in Section 1 of the OHM Construction Work Plan.

1.2 Site Characterization Scope and Objectives

This WCP was prepared in accordance with the appropriate guidance documents, including the following:

- *Program Guide for Determination of Regulated Quantities or Concentrations of Radioactive Materials in Bulk or Waste Materials* (Program Guide), Arizona Radiation Regulatory Agency (ARRA).
- NUREG 1505. Nuclear Regulatory Commission.
- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition* (SW-846), U.S. Environmental Protection Agency

This WCP describes the procedures and protocols to support waste characterization of approximately 12,000 cubic yards of contaminated soil and waste profiling. The sampling and analytical work consists of obtaining and testing the contaminated soil to identify the acceptability for disposal of the soil at the Copper Mountain Landfill in Wellton, Arizona. Representative samples of brine residues will be collected, based on the disposal facility requirements, to characterize the waste for the off-site disposal.

1.3 Criteria for Acceptance of Waste

As stated in the Copper Mountain Landfill Letter, dated 2 August 96 (Attachment 1), the acceptance of the waste stream from the Geothermal Test Facility will be based on the following:

- Acceptance by ARRA of a suitable site sampling and analysis plan
- Adherence to the following concentrations of radionuclides:

- Five (5) picocuries per gram or less of radium-226 or radium-228, above background
- 150 picocuries per gram of any other Naturally Occurring Radioactive Material (NORM) radionuclide, provided that these concentrations are not exceeded at any time
- Potassium and potassium compounds that have not been isotopically enriched in K40
- Waste is classified as non-NORM based on the analytical data and approved by the ARRA.
- Corrosivity, reactivity, and toxicity characteristics leaching procedure (TCLP) metals analyses to verify that the waste is classified as Resource Conservation Recovery Act (RCRA) nonhazardous.

Section 2

Field Activities

The brine pond was evaluated to determine the appropriate sampling approach for characterization of the waste. It is assumed that the brine residue is homogeneous based on the following information concerning the brine pond:

- Visual observations of the brine pond indicated that waste residue was relatively uniform in color and thickness.
- Analytical results from previous investigations indicate that distribution of contaminants (total and soluble metals, petroleum hydrocarbons, pH, radiological constituents) is relatively uniform. In addition, results of samples collected from “visibly discolored areas” within the pond were consistent with the other data.
- There are no indications that the brine liquid which deposited the residue was nonhomogeneous.
- The brine pond has a relatively level surface and does not contain depressions or barriers that could have obstructed the free flow of liquids or concentrated residues in isolated or deeper areas.

In order to select representative samples from the pond, the systematic random sampling strategy will be used. The initial sample collection strategy follows the methods described in Chapter 9 of SW-846. In this sample selection method, sample locations are selected at regular fixed intervals, typically using a grid system. The systematic random sampling strategy is most appropriate when the population is random, (i.e., the material to be sampled is homogeneous and lacks any stratification or trends). It is considered by USEPA to be the best classical sampling strategy for minimizing bias and providing complete site coverage.

Statistical evaluation of the radiological analysis will follow guidelines provided in NUREG 1505, and will be described in Section 4, Data Evaluation, of this plan. Calculations following NUREG 1505 will be used to verify that the required minimum number of samples were collected to support a 95 percent confidence factor in the data.

2.1 Random Sample Locations

A 100 foot square grid will be established over the approximately 500 by 590 by 1 foot thick pond area resulting in 30 grid cells. Computer-generated random numbers were used to select 15 grid cells for sampling. One sample will be collected from the approximate center of each of the 15 grid cells. Figure 2-1, Proposed Waste Characterization Sampling Plan, shows the grid and the proposed sampling locations. Each sample will consist of a continuous core from surface to the bottom liner of the pond (approximately 12 inches). In addition, one background sample will be collected from outside the pond area.

2.2 Sampling Rational and Frequency

Two types of waste characterization analyses will be performed to determine the following:

- Non-NORM classification
- RCRA nonhazardous classification

The waste stream must be characterized as RCRA nonhazardous waste and as non-NORM by ARRA prior to disposal at the Copper Mountain Landfill. Table 2-1, NORM Analytical Requirements and Sample Frequency, provides the NORM analytical requirements, including number of samples, sample containers, preservation, holding time, and analytical method. Descriptions of the gamma scan and gross alpha/beta analytical methods and laboratory operating procedures are provided as Attachment 2, Laboratory Procedures for Gamma Scan and Gross Alpha/Beta Analyses. The methods also include a description of laboratory QA/QC procedures. Table 2-2, RCRA Analytical Requirements and Sample Frequency, provides the RCRA requirements.

Table 2-1
NORM Analytical Requirements and Sample Frequency

Parameter	Number of Samples	Container	Preservation/ Holding Time	Method	Description
NORM	17 (15 plus 1 background and 1 duplicate sample)	one 8-oz. jar	no requirements	Gamma spectroscopy	Gamma Scan
NORM	7	one 8-oz. jar	no requirements	EPA 900.0	Gross alpha/beta

Table 2-2
RCRA Analytical Requirements and Sample Frequency

Parameter	Number of Samples	Containers	Preservation/ Holding Time	Method	Description
Leachability	6	one 8 oz. jar	cool at 4° C / 6 months	EPA 1311/6010A	TCLP for As, Ba, Cd, Cr, Pb, Hg, Se, Ag
Reactivity	6	one 8 oz. jar	no requirements	SW-846 (EPA 90101A/9030A)	Release of CN and H ₂ S
Corrosivity	6	one 8 oz. jar	no requirements	EPA 9045	pH

Table 2-1 includes the 15 randomly selected samples, one background sample, and one duplicate sample. Pursuant to landfill requirements, only six samples are required for the RCRA nonhazardous classification. The six samples identified in Table 2-2 will be randomly selected from the 15 samples of pond waste.

2.3 Sampling Procedures

This section describes the procedures used for collection and handling of soil samples during the course of the project. Sample collection will be performed according to the procedures outlined below.

Soil samples will be collected using hand auger techniques. The samples will be collected in wide mouth glass jars, labeled, and packaged for laboratory analysis. The following summarizes the sampling procedures to be used:

1. Decontaminate hand auger and mixing bowl by washing with liquinox solution and double rinsing with tap water.
2. Sample from surface to pond liner using a 3-inch diameter hand auger.
3. Place sample of auger cuttings (core) into a stainless steel mixing bowl and thoroughly homogenize. Transfer the homogenized soil to two separate, precleaned 8 ounce wide mouth jars with Teflon-lined lids.
4. Cap the jar and place a sample label on the jar, completed with the information described in Section 3, Sample Labeling.
5. Place the jar in a ziplock bag.
6. Place the ziplocked bag containing the sample in a cooler at 4° C or less for shipment to the off-site analytical laboratory.

2.4 Quality Assurance/Quality Control Sampling and Frequency

Field quality control (QC) samples, including field duplicates, will be collected and analyzed during the project to assess the consistency and performance of the sampling program and to evaluate the precision and accuracy of the environmental data.

Field duplicates are two samples of the same matrix, which are collected, to the extent possible, at the same time, from the same location, and using the same techniques. The purpose of field duplicate samples is to confirm the precision of the overall sample collection and analysis process. One field duplicate sample will be collected.

2.5 Sample Containers and Preservation

Sample volumes to be collected and sample containers to be used will comply with Environmental Protection Agency (EPA) protocols. Certified-clean new containers for all analyses will be provided by the subcontracted laboratory. Tables 2-1 and 2-2 identify the number and type of containers, preservation, and holding time required.

2.6 Sample Handling, Packaging and Shipping

Immediately after sample collection, sample labels will be affixed to each sample container. All sample labels will be covered with transparent tape. Each sample container will be wrapped individually and be placed in a resealable plastic bag to protect saturation from "wet" ice (i.e.,

condensation caused by the ice while within the ice chest) in a manner which will not insulate the samples from the cooling effect of the ice.

Each cooler will contain a temperature blank. A temperature blank is a container that is filled with tap water, and stored in the cooler during sample collection and transportation. Temperature of the temperature blank will be recorded by the laboratory upon receipt of the samples to provide information on the temperature of the samples.

Samples will be packed inside an ice cooler with the spout taped closed. Ice cubes, double-sealed in Ziploc bags, will be added to the cooler. A chain-of-custody (COC) form will be completed, sealed in a Ziploc bag, and taped to the inside of the sample cooler lid. The cooler will be sealed with strapping tape, and a minimum of two chain-of-custody seals will be taped across the cooler lid; one seal in the front and one seal in the back. Both COC seals will be covered with clear tape. The samples will then be shipped or hand delivered to the subcontracted analytical laboratory.

Samples will be delivered to the laboratory, preferably the same day the samples were collected. Samples that cannot be shipped the same day will be properly preserved and custody will be maintained in a secure area. Based on radiochemical data from previous investigations which indicates the NORM concentrations in the samples are below the United States Department of Transportation regulatory limits, additional precautions for shipment will not be required. If samples are shipped via a commercial carrier, the following additional packaging procedures will be followed:

- Determine maximum weight allowed per package by shipper (if applicable).
- Complete shipping form for courier and retain as part of permanent documentation.
- After acceptance by the shipper, wrap cooler completely with strapping tape at two locations, secure lid by taping, and do not cover any labels.
- Place laboratory address on top of cooler.
- Place "This Side Up" labels on all four sides and "Fragile" labels on at least two sides.
- Affix custody seals on the front right and back left of the cooler. Place clear tape over both custody seals.

Sample shipments that will be received on a Saturday must be cleared with the subcontract analytical laboratory in advance to ensure that the samples can be received and that the holding times will not be exceeded.

2.7 Laboratory Identification

Lockheed Engineering Services Company (Lockheed) in Las Vegas, Nevada was selected to perform the radiological analyses. Lockheed is an Arizona Department of Health Services licensed environmental laboratory (License No. AZ0358). License documentation is provided as Attachment 3, Lockheed Engineering Services Arizona License Documentation, and indicates that Lockheed is licensed to perform the proposed radiological analyses including the required QC procedures.

Section 3

Sample Identification and Field Documentation

3.1 Sample Labeling

A sample label marked in indelible ink with the sample identification and other required information as indicated below will be affixed to sample containers. Each label will be neatly and legibly printed. The following information will be recorded on the labels:

- sample location
- sample identification number
- sample collection date - month/day/year
- military time of sample collection - 0900, 1430, 2240, etc.
- Laboratory Information Management System (LIMS) Number - 4074 is assigned for this project
- initials of Sampling Technician
- analyses requested
- all sample labels will be covered with transparent tape

3.2 Field documentation

3.2.1 Chain-of-Custody Documentation

In any sampling and analysis program, the integrity and tracking of the samples from the time of field collection through laboratory analysis is an essential aspect of custody. Custody begins after the sample has been collected in the field. The field sample collection personnel is the first sample custodian. The collected sample remains the responsibility and accountability of the field sample custodian until shipment to the appropriate destination, such as an off-site analytical laboratory.

COC documentation is required for each sample to track collection, shipments, laboratory receipt, custody, and disposal. The COC form is pre-printed with a unique six-digit number in the upper right hand corner. The COC will be used to record the samples taken and the analyses requested. Information recorded will include time and date of sample collection, sample number, the type of sample, the Sampling Technician signature, the number of containers, a brief description or location of the sample, the name of subcontracted laboratory, and other project specific instructions, such as turn around time and laboratory QC (MS/MSD), to the laboratory. The project LIMS Number must also be written on each COC. The LIMS Number for this project is 4074. The top two copies of the completed COC will accompany the samples to the subcontracted laboratory, and the remaining two copies will be kept for project files (one will be filed at the project site, and one will be sent to the project chemist).

The COC form will be signed by each individual who has the samples in their possession. A sample is considered to be in one's custody if it is:

- in actual possession or in view of the person who collected the sample
- locked in a secure area
- placed in an area restricted to authorized personnel

If the samples are transported to a subcontracted laboratory by an express shipping company, the waybill or air bill number will be noted on the COC form. The waybill or air bill number serves as an extension of the COC. The original COC form will be placed in a plastic bag, and the bag will be taped to the inside of the cooler lid.

3.2.2 Field Logbook

Proper and accurate documentation in the field logbook is necessary to prevent misidentification of samples and to facilitate interpretation of analytical results. A field logbook is bound with consecutively numbered pages and is assigned to a specific person who is responsible for entry of information into the logbook. The logbook will be signed and dated by this person prior to initiation of field work. All entries into the logbook will be executed by this designated person in indelible ink. Corrections to erroneous data will be made by drawing a line through the entry and entering the corrected information. The correction shall be initialed and dated by the person making the entry. At the end of each workday, logbook pages will be signed and dated by the person. Unused portions of logbook page will be crossed out, signed and dated.

If it is necessary to transfer the logbook to alternate personnel during the course of field work, the person relinquishing the logbook to the alternate personnel will sign and date the logbook at the time it is transferred, and the person receiving the logbook will do likewise.

Information recorded in the logbook will include, but not be limited to, the following:

- project name and location
- date and time
- weather information including temperature, wind speed and direction, humidity, precipitation
- work performed
- field parameter observations
- sampling performed, including specifics such as location, type of samples, type of analyses, sample identification
- field analyses performed including results, instrument checks, problems, and calibration records for the field instrumentation
- descriptions of deviations from the WCP
- problems encountered and corrective actions taken including specifics regarding sampling and alternate methods utilized

- identification of primary field and QC samples
- QC activities
- verbal or written instructions

3.2.3 Document Correction

Changes and corrections on any project documentation will be made by crossing out the item with a single line, initializing and dating next to the correction by the person performing the correction. The new information will be written above the crossed-out item. Corrections must be made with indelible ink and written clearly and legibly.

3.3 Sample Tracking Log

Samples collected in the field and sent to the off-site laboratories will need to be identified chronologically on a sample tracking log which is presented in the attached exhibits. The sample tracking log will be maintained by the Project Chemist or Field Sampling Technologist. The tracking log contains the following types of information:

- designated off-site laboratory
- date of sample collection
- COC number
- air bill number/courier information
- OHM Sample ID Number
- sample location
- matrix
- analysis Requested
- weather conditions
- summary of field activities and sample shipping information
- reports of problems, corrective action or verbal/written instructions from the USACE personnel

3.4 Verification of Sample Receipt

The sample receipt will be acknowledged by the laboratory using a "Cooler Receipt Form." This form shall note all problems in sample packaging, COC and sample preservation. The laboratory will supply a facsimile copy of the "Cooler Receipt Form" to the Project Chemist and attach the original to the COC.

Section 4

Data Evaluation

A total of 17 samples will be collected for waste characterization data evaluation: one (1) background sample, 15 samples from inside the contaminated area and one (1) field duplicate sample. The following analytical methods will be performed on the samples:

- Gamma Scan (17 total)
- Gross Alpha/Beta (7 selected)
- TCLP for RCRA 8 Metals (6 selected)
- Reactivity (CN, H₂S) (6 selected)
- Corrosivity (pH) (6 selected)

The results of the gamma spectroscopy will be utilized to complete the Wilcoxon Rank Sum (WRS) Test, the non-parametrical statistical analysis identified in the NUREG 1505. The test identifies the required number of samples necessary to determine the mean gamma activity level with the associated standard deviation that offers a 95 percent level of confidence in the data. This required number of samples will be compared against the 15 samples collected to verify that a sufficient amount of radiological data has been captured. If the minimum number of samples calculated from the WRS Test is greater than 15, additional samples will need to be collected.

The results of the gross alpha/beta analyses will be summarized and compared against the 150 pCi/g regulatory threshold for alpha and beta emission. TCLP for RCRA 8 Metals, reactivity, and corrosivity results will be compared to the guidelines for RCRA hazardous waste.

A letter report documenting sampling activities, analytical results, laboratory certification, and data evaluation will be prepared. The report will include the sampling procedures report, a sample location map, COC documentation, tables of analytical results, statistical worksheets, and analytical laboratory reports and certifications.

Section 5

References

Arizona Radiation Regulatory Agency. August, 1996. *Program Guide for Determination of Regulated Quantities or Concentrations of Radioactive Materials in Bulk or Waste Materials.*

Legaspi, E. 1996, Sanifill letter concerning Disposal of Geothermal Waste.

Nuclear Regulatory Commission. August, 1995. *NUREG 1505. A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys (Draft Report).* Washington, D.C.

U.S. Environmental Protection Agency. 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Third Edition.*

Attachment 1
Sanifill Letter Concerning Waste Disposal



Quality Service with Integrity

Friday, August 2, 1996

VIA FACSMILE
(510) 227-1108

Kevin Spala
OHM Remediation
5731 W. Las Positas Blvd.
Pleasanton, CA 94588

SUBJECT: Disposal of Geothermal Grime from site clean-up

Dear Mr. Spala,

Copper Mountain Landfill (a wholly owned subsidiary of Sanifill, Inc.) is pleased to submit for your consideration the following quote for disposal of your waste material. We believe that our proposal is responsive to the needs of OHM Remediation by offering innovative programs to manage your waste, as well as provide indemnification and financial strength to minimize any potential future liabilities.

Criteria for Acceptance of Waste:

Acceptance of this waste stream (geothermal grime) at the Copper Mountain Landfill will be based on the following:

Acceptance by the Arizona Radiation Regulatory Agency of a suitable site sampling and characterization plan and adherence to the following concentrations of radionuclides:

- Five (5) picocuries per gram or less of radium-226 or radium-228, above background; or
- 150 picocuries per gram of any other NORM radionuclide, provided that these concentrations are not exceeded at any time; and
- Potassium and potassium compounds that have not been isotopically enriched in the radionuclide K-40.

Waste is classified as non-NORM by the Arizona Radiation Regulatory Agency.

DISPOSAL FACILITY: Copper Mountain Landfill, Wellton, AZ

Waste Stream: Geothermal Grime (Non-hazardous Waste Solid)
Disposal Rate: \$ 22.50 per ton (includes all State & Local Disposal Taxes)

Terms and Conditions:

- a. Prices above are valid for 90 days.
- b. The above waste must have an approved profile number prior to entering the landfill.
- c. Surcharge may apply for non-conforming waste. Credit Application must be completed and approved.
- d. The above price estimate is based on the waste volume of 17,000 tons (this information was provided by your organization.)
- e. All waste must be scheduled 24 hours prior to entering the landfill.

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August 2, 1996

Copper Mountain Landfill appreciates your interest and looks forward to assisting you with your waste management needs. If you should have any further questions please don't hesitate to call me directly at 619-469-5437.

Sincerely,

A handwritten signature in cursive script that reads "Edward Legaspi". The signature is fluid and somewhat stylized, with the first name "Edward" being larger and more prominent than the last name "Legaspi".

Edward Legaspi
Southern California Sales Manager

cc: Mark Cooley
cc: Jim Bartak

*Attachment 2
Laboratory Procedures for Gamma
Spectroscopy and Gross Alpha/Beta Analyses*

*Attachment 3
Lockheed Engineering Services' Arizona
License Documentation*

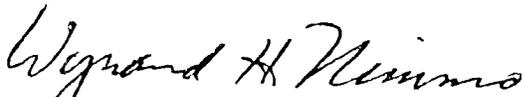
Arizona
Department of
Health Services

ENVIRONMENTAL LABORATORY LICENSE

LOCKHEED ENGINEERING SERVICES COMPANY AZ0358

is in compliance with Environmental Laboratory's applicable standards for the State of Arizona and maintains on file a List of Parameters for which it is certified to perform analysis.

PERIOD OF LICENSURE: FROM October 8, 1995 TO October 8, 1996



Wynard H. Nimmo
Program Manager
State Laboratory Services



Jack Dillenber, D.D.S., M.P.H.
Director
Department of Health Services

Only critical information was scanned.

Entire document is
available upon request - [Click here](#) to email a request.