SOP-13
Soil Excavation

Yerington Mine Site
Standard Operating Procedure

Revision 0
Revision Date: June 6, 2006

SOP-13
SOIL EXCAVATION

TABLE OF CONTENTS

1.0 OBJECTIVE

The objective of this standard operating procedure (SOP) is to establish consistent methods for conducting soil excavations for the purposes of:

- Interim remedial action which may be necessary to lessen immediate impacts of a contaminant to receptors or to control the spread of contamination;
- A final remedy for site mitigation; and
- In some instances, determining the extent of impacted soil through trenching or potholing.

Interim remedial action can occur any time during an environmental investigation with concurrence from applicable regulatory agency(s).

2.0 DEFINITIONS

Cave-in. The separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

Excavation. Any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Face or sidewall. The vertical or inclined earth surfaces formed as a result of excavation work.

Failure. The breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Hazardous atmosphere. An atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Kickout. The accidental release or failure of a cross brace.

Protective system. A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp. An inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Sheeting. The members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system

Shoring (Shoring system). A structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Trench (Trench excavation). A narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet. If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet or less, (measured at the bottom of the excavation), the excavation is also considered to be a trench.

3.0 APPLICABILITY

This general procedure will be used in planning and implementing soil excavation projects. These procedures are subject to modification to accommodate differing methodology employed by different excavation subcontractors, or client-specific requirements and requirements identified in site-specific work plans and Field Sampling Plan (FSP).

These procedures are general minimum standards. With concurrence from BC's Quality Manager, these procedures may be modified or supplemented for a specific project by site-specific workplans or health and safety plans.

4.0 RESPONSIBILITY

The *Project Manager*, or designee, will have the responsibility to oversee and ensure that these soil excavation procedures are implemented in accordance with this SOP and any site-specific planning documents such as a workplan, remedial action plan (RAP), field sampling plan (FSP), quality assurance project plan (QAPP), and site-specific health and safety plan (HSP).

The *field personnel* will be responsible for the understanding and implementation of this SOP and related SOPs during all field activities, as well as, obtaining the appropriate field logbooks, forms and records necessary to complete the field activities.

5.0 REQUIRED MATERIALS

The equipment and supplies required for field personnel for this SOP include the following:

- White spray paint or other materials such as stakes, concrete nails, flagging, etc., to mark the excavation limits;
- Traffic cones and barrier tape to delineate work area;
- Field notebook;
- FID or PID or equivalent direct reading instrument; and
- Personnel Protective Equipment (PPE) as specified in the SHSP.

6.0 METHODS

Planning and implementation of soil excavation work for the purposes described above is comprised of four (4) general steps:

1) Excavation Design;
2) Pre-field Activities (subsurface clearance/permits);
3) Establishment of Site Controls;
4) Soil Excavation.

In addition several other steps are often part of soil excavation work, including confirmation sampling, waste Characterization, and site restoration.

6.1 Excavation Design

Design of a trenching or excavation project associated with potentially hazardous materials will be determined by the objective(s) of the work, the site specific geology and hydrogeology, contaminant characteristics, suspected source, and regulatory requirements. The excavation design should account for each of these criteria by specifying work items such as shoring requirements, dewatering requirements, stockpile management, and air monitoring requirements. Baseline drawings of the site should be prepared to allow for the preparation of demolition and remediation plans. Accurate drawings are also required for the specification packages used to procure and manage demolition and remediation contractors. At a minimum, the drawing(s) should show the site structures, site boundaries, areas to be protected (i.e., survey benchmarks, wells, and any site feature to remain undisturbed), and utilities and termination points.

Utility locations and termination points must be determined early in the planning process to avoid delays associated with utility disconnection and the removal of utility-owned equipment. Representatives of the local water district, gas & electric company, and telephone should be consulted to determine their needs for utility disconnection and equipment removal. Furthermore, early coordination with the utility companies will ensure that utility disconnection activities are properly scheduled and specified to avoid construction delays. Water service should remain intact to provide fire protection and construction water until demolition and soil mitigation is complete.

6.2 Pre-Field Activities

Prior to implementation of any excavation project, all applicable permits and notifications shall be submitted and approved. Besides approval from oversight agencies, permits or notifications may be required with the following agencies:

- City Building & Planning Departments
- Air Pollution Control Districts

- Local Fire & Safety Departments
- Regional Water Quality Control Boards or Wastewater Departments (in the case of dewatering activity)

A Public Notification Program and/or Community Health and Safety Plan may be required by the oversight agency.

It is essential that the excavation areas be cleared for utility and other subsurface obstructions. At a minimum, current facility drawings shall be obtained, and in some cases written sign-off by a responsible person from the facility shall be obtained. Be aware that these records may not be accurate. The obstructions revealed by facility drawings should be physically located, and either removed or protected from damage. In addition, Underground Service Alert (U.S.A.) or equivalent utility search service shall be notified in accordance with local regulations. In Nevada, it is required to mark the digging location in white paint and to notify U.S.A. a minimum of 48 hours in advance of digging.

6.3 Establishment of Site Controls

Mobilization activities should include the establishment of site controls needed for excavation activities and may include some or all of the following tasks:

- Establishment of site control measures including temporary fencing to secure the site and equipment/materials storage area, site access/egress points, signs and barricades for on-site traffic control and warning tape for prohibited areas (i.e., the contaminated soil excavation, treatment and stockpile areas);
- Mobilization of office trailers, equipment trailers, equipment/materials storage area and connect to temporary utilities and communication lines (phone and fax);
- Establishment of a water distribution system from existing water lines/fire hydrants, irrigation system to critical work areas;
- Establishment of equipment/personnel decontamination areas and work zones; and
- For long term projects, provide sanitary facilities for site workers and visitors.

6.4 Soil Excavation

The excavation process is generally conducted using conventional earth moving equipment such as excavators, front-end loaders, and dump trucks. The remediation subcontractor chosen for any excavation work involving hazardous or non-hazardous waste remediation or investigation projects in Nevada shall, at a minimum, maintain to following contractors licenses:

Class A – General Engineering Contractor. A general engineering contractor is a contractor whose principal contracting business is in connection with fixed works requiring specialized engineering knowledge and skill.

C-12 – Earthwork and Paving. An earthwork and paving contractor digs, moves, and places material forming the surface of the earth, other than water, in such a manner that a cut, fill, excavation, grade, trench, backfill, or tunnel (if incidental thereto) can be executed, including the use of explosives for these purposes. This classification includes the mixing, fabricating and placing of paving and any other surfacing materials.

HAZ – Hazardous Substance Removal. No contractor shall engage in a removal or remedial action unless the qualifier for the license has passed an approved hazardous substance certification examination.

OSHA Excavation Safety Standards must be followed for during excavation work in Nevada. General Requirements for excavations include requirements for surface encumbrances, UST removals and installations, exposure to falling loads, warning system for mobile equipment, hazardous atmospheres[1], and protection from hazards associated with water accumulations.

Shoring/Sloping Requirements. If for any reason, subcontractors, clients, agency representatives, or BC personnel enter the trench or excavation, shoring or sloping is required if there is any doubt about the soil stability or if any of the following conditions apply:

1. **Depth of trench.** If the trench is five (5) feet deep or more (if there is a possibility of soil movement, even shallower trenches should be shored).
2. **Soil Classification.** The more liquid the soil, the more you need to protect yourself against cave-in.
3. **Changing weather conditions.** Trenches or excavations which are safely sloped or shored in dry weather can become unstable from changing weather conditions (e.g., hardpacked soil can quickly become soupy and unstable after rain and thawing soil can also become unstable).
4. **Heavy loads in area.** Heavy equipment next to a trench. Nearby structures such as buildings, curbs, trees and utility poles exert stress on trenches and excavations.
5. **Vibration.** If digging a trench near a roadway or where other operations create vibration, make certain the shoring/sloping design reflects these conditions.

Stockpile Management. In general, there are four criteria for segregation of soil and debris (consult the workplan):

- Debris and rubble (i.e., bricks, concrete, asphalt, cobbles, boulders, and timbers) suitable for disposal as non-hazardous waste;
- Contaminated debris and rubble that is inappropriate for replacement should be stockpiled separately or put in holding bins for treatment and off-site disposal;

[1] Every trench is a possible trap for hazardous atmospheres.

- Excavated overburden and soils that test below project cleanup goals should be left in place, or used as backfill material; and
- Soils that are above cleanup levels should be stockpiled separately for treatment or offsite disposal.

Soil stockpiles containing contaminants, particularly VOCs, shall be sprayed regularly with water to minimize dust and/or vapor emissions during stockpiling activities. Heavy plastic sheeting should be used to cover the stockpiles to provide additional dust and/or vapor control. The sheeting should be secured in place with sandbags or boulders. Surface water runoff resulting from rain must be diverted around the covered stockpiles to ensure that soil is contained within the stockpile perimeter. If the stockpile is placed in an area without concrete or asphalt surface cover, the stockpile should be placed on minimum 30-mil polyethylene film.

6.5 Other Aspects

Several other considerations often are examined and addressed in any site specific planning documents associated with soil excavation. While not every excavation project will include these aspects,. many often do include one or more. These other aspects to be considered include confirmation sampling, waste characterization, and site restoration. Details of these activities should be provided in the site specific planning documents. The Subsections below are meant to provide general guidance regarding these associated aspects of soil excavation projects.

6.5.1 Confirmation Sampling

During the excavation process, samples are often collected at the base and perimeter of the excavation and analyzed using appropriate analytical methods as described in the work plan. The purpose of such samples is to document whether an excavation has been completed, or to document the degree to which removal occurred. In some cases confirmation sampling is done with a mobile laboratory providing real-time results for field decision making based on cleanup goals as defined in the project specific planning documents. In other cases a pre-determined area and depth of soil is defined, and not exceeded in the field.

In the first case above, if analyte concentrations exceed cleanup levels in any sidewall or base sample, the excavation process would continue in that direction to remove the additional soil. This sampling process is generally repeated until all the soil with constituent concentrations greater than action levels is removed or as specified in the work plan.

The samples should be collected either directly from the excavation floor and sidewalls or from the excavator bucket when raised from the excavation floor or sidewall sampling location. Sampling, Quality Assurance/Quality Control procedures for excavated soil will follow the Soil Sampling SOP.

Field Quality Assurance/Quality Control Samples. Quality Assurance/Quality Control samples shall be collected and analyzed to establish support of the analytical data. The work plan or project QAPP will specify the number and/or frequency of the QA/QC samples. At a minimum, equipment blanks, and for volatile organic (VOC) analysis, trip blanks (for off-site analysis) shall be included in the QA/QC sample set.

Record Keeping. Observations made during field operations will be recorded daily on field forms and in bound field notebooks to produce a permanent record of all the field activities. Field documentation shall be in accordance with BC's SOP for Field Notes and Documentation. In addition, soil sample locations will be plotted on excavation drawings. These drawings will be modified as needed to reflect the full dimensions of the excavation with regard to area and depth. Mobile laboratory results will also be plotted on excavation drawings as data became available. Other information to be documented that is specific to the soil excavation or trenching projects includes:

- Soil type and sidewall observations;
- Trench and/or excavation measurements;
- Measured sample locations to the nearest vertical and lateral location to within 1 foot and identification;
- Surface encumbrances;
- Potentially dangerous atmospheric conditions;
- Protective systems (i.e., shoring, sloping, etc.);
- Utility protection (Gas, Water, Sewer, Electric); and
- Confirmation sampling methods

A competent person must make a daily inspection of the trench and protective systems as the work progresses. Competent person is defined as one who must demonstrate:

- Knowledge of the new provisions pertaining to excavations, trenches and earthwork;
- Knowledge of soil analysis as required in the new provisions pertaining to excavations, trenches and earthwork;
- Knowledge of the use of protective systems;
- Authority to take prompt corrective action on the job as conditions warrant; and
- Ability to recognize and test for hazardous atmospheres.

6.5.2 Waste Characterization

Another aspect of soil excavation that is often but not always part of an excavation project is defining the characteristics of the investigation derived waste. Usually waste from excavation projects is stored as a stockpile on site, until final disposition can be determined. Any stockpile sampling required by the site specific planning documents should be performed per Chapter 9, Part III of the United States Environmental Protection Agency (USEPA) SW-846 guidelines. SW-846 provides guidance for the development and implementation of a scientifically credible

sampling plan. The site-specific planning documents should provide details for the quantity and analysis of samples collected from soil stockpiles.[2]

6.5.3 Site Restoration

Often, but not always, the final aspect of a excavation project includes site restoration. Site restoration usually follows confirmation sampling and analysis. If site restoration is required, imported soil, and if suitable for compaction requirements, excavated overburden and soils that tested below project cleanup goals can be placed into the excavation. The soil should be replaced in one-foot lifts and compacted using a vibratory sheepsfoot roller or comparable compaction device. The excavation should be brought to rough grade at a minimum compaction of 90 percent. Soil compaction testing should be conducted and a report prepared by a qualified geotechnical firm.

Site improvements such as asphalt drives, walkways, planter curbs, drive curbs, and crash posts may also be required as part of site restoration and may be restored to original condition depending on the proposed future use of the property. Photo documentation should be conducted upon completion of site restoration activities.

7.0 REFERENCES

United States Environmental Protection Agency (USEPA), 1997. SW-846 Update III, Chapter 9, Part III.

Rast, R.R., 1997. Environmental Remediation Estimating Methods, R.S. Means Company, Inc., Kingston, MA, 594 p.

8.0 ATTACHMENTS

None

[2] Sampling frequency and analysis of soil stockpiles may also be dictated by the chosen disposal facility.