Standard Operating Procedure

SOP #:	FM-4.0 Rev. 002
Review Date:	04/14/2023
Origin Date:	03/01/2016

Title: Drilling Protocol

1. Purpose/Scope

The objective of this standard operating procedure (SOP) is to prevent damage to subsurface structures (including tanks, product lines, water lines, gas lines, electrical service, etc.) during drilling, Geoprobing/direct push sampling, augering, sampling, or other advancement operations.

This protocol establishes the requirements for on-site drilling operations, addressing the key issues and activities associated with safe drilling and boring operations.

2. References

ASTM D6235-18: Standard Practice for Expedited Site Characterization of Vadose Zone and Groundwater Contamination at Hazardous Waste Contaminated Sites, 2018

ASTM D5434-12: Guide for Field Logging of Subsurface Explorations of Soil And Rock, 2012

ASTM D5781-18: Guide for Use of Dual-Wall Reverse-Circulation Drilling for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices, 2018

ASTM D5782-18: Guide for Use of Direct Air-Rotary Drilling for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices, 2018

ASTM D5783-18: Guide for Use of Direct Rotary Drilling with Water-Based Drilling Fluid for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices, 2018

ASTM D5784-18: Guide for Use of Hollow-Stem Augers for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices, 2018

ASTM D5872-18: Guide for Use of Casing Advancement Drilling Methods for Geoenvironmental Exploration and Installation Of Subsurface Water-Quality Monitoring Devices, 2018

ASTM D5875-18: Guide for Use of Cable Tool Drilling and Sampling Methods for Geoenvironmental Exploration and Installation of Subsurface Water Quality Monitoring Devices, 2018

ASTM D5876-17: Guide for Use of Direct Rotary Wireline Casing Advancement Drilling Methods for Geoenvironmental Exploration and Installation of Subsurface Water Quality Monitoring Devices, 2017

ASTM D6169-21: Standard Guide for Selection of Subsurface Soil and Rock Sampling Devices for Environmental and Geotechnical Investigations, 2021

ASTM D4700-15: Guide for Soil Sampling from the Vadose Zone, 2015

ASTM D1586-18e1: Test Method for Penetration Test and Split Barrel Sampling of Soils, 2018

ASTM D1587-15: Practice for Thin Walled Tube Geotechnical Sampling of Soils, 2016

ASTM D4220-14: Practices for Preserving and Transporting Soil Samples, 2014

ASTM D6001-20: Guide for Direct Push Groundwater Sampling for Environmental Site Characterizations, 2020

3. Responsibilities

3.1 Project Manager

The Project Manager (PM) will be responsible for fulfilling the objectives of this protocol by ensuring that this procedure is carried out by all of the employees, subcontractors, and any other person acting on behalf of Groundwater & Environmental Services, Inc. (GES). The PM will also ensure that the Loss Prevention System (LPS) is implemented during the drilling project that will include but not be limited to: ensuring staff understand the need to conduct Loss Performance Self Assessments (LPSAs), review and understand activity-specific Job Loss Analysis (JLA) forms, and schedule Loss Prevention Observations (LPOs) as necessary.

The PM will ensure that all individuals working on drilling projects are adequately trained and supervised.

3.2 Site Supervisor

The Site Supervisor will practice sound investigation and drilling practices and employ all necessary measures to avoid damage to subsurface product systems and structures. The supervisor will also be responsible for ensuring that each appropriate JLA is reviewed by the

project staff prior to project activities each day and immediately following the lunch-time break.

A LPO must be conducted by the PM on the individual who is providing oversight for the first time during the first or second day of the project. Depending on the outcome of the LPO, additional LPOs may be necessary.

The PM will be the point of contact for the Site Supervisor in the event an exception to this protocol is requested.

3.3 Case Manager

The Case Manager (CM) is responsible for providing field personnel with a sampling work plan and schedule. In addition, the PM or CM will provide field personnel with enough information to perform the work safely and correctly. This information should include the operational and safety procedures that are applicable to the work being performed.

4. Equipment/Materials

- Drilling rig appropriate to investigation goals and site conditions.
- Drilling tools required to complete borehole of required depth and diameter.
- Pavement saw or jackhammer to cut asphalt or concrete, if required.
- Hand tools required to clear drilling location.
- Air knife and air compressor to hand clear drilling location, if applicable.
- Minimum personal protective equipment (PPE): Steel-toed safety shoes, safety glasses, hard hat, reflective vest or safety orange or yellow clothing, gloves (leather work gloves, Kevlar gloves, latex or nitrile gloves).
- Plastic sheeting or steel drums to stage drill cuttings.
- Plastic trash bags for refuse.
- Cones, flags, caution tape, and signage appropriate for site control.
- Apparatus and materials required for the completion of split-spoon soil sampling (see SOP FM-9.2).
- Decontamination equipment (potable water, pressure washer, steam cleaner, scrub brushes, detergent, wash buckets) as appropriate.
- Sand, bentonite, grout, or materials appropriate for borehole abandonment.

- Cold patch asphalt, concrete, or materials appropriate for pavement restoration, if required.
- Materials required for proper soil sample management (see SOP FM-13.5).

5. Preparation

- Review site-specific Work Plan and field work directive with PM.
- Obtain client approval of selected soil boring locations, if applicable.
- Notify One-Call system or appropriate agency to mark-out utilities a minimum of 72 hours in advance.
- Conduct site visit, if appropriate, to check proposed drilling locations, map utilities, establish traffic control plan, and notify site personnel of upcoming work.
- Notify property owner, site manager, or appropriate site personnel at least 24-hours in advance of completing field activity.
- Locate all subsurface utilities according to GES' Subsurface Clearance Protocol.
- Locate all overhead utilities.
- Workers shall wear appropriate PPE as specified in the site specific Work Plan. Additional PPE may be required based on air monitoring results, contaminants of concern, or site-specific conditions.
- The work area shall be appropriately secured according to the practices outlined in SOP FM-1.3.
- The Site Supervisor shall conduct air monitoring in accordance with the site-specific Health and Safety Plan (HASP).
- If drill cuttings are expected to be generated, set up a staging area for drums or build a containment pad for a cuttings pile with plastic sheeting. All soil piles shall be covered with plastic sheeting at the end of each work day. Refer to SOP FM-14.1.

6. Procedure

6.1 Pre-Drilling Procedure

6.1.1 Preparation Tasks

The Site Supervisor is responsible for reviewing the site-specific Work Plan and field work directive with the PM.

6.1.2 Obtain Permits

The PM is responsible for following all local, state, and federal laws, obtaining all necessary permits and utility clearances, and securing site access permission.

6.1.3 Obtain Site Plans

The PM or CM shall obtain as-built drawings and/or site plans as available.

> *Note: As-built drawings may not accurately depict the locations of improvements and subsurface features should therefore not be solely relied upon to determine drilling locations. Visually check positions when drilling near sewers. Personnel should also be alert to the presence of additional piping if the plans are outdated.*

6.1.4 Mark-outs

The PM is responsible to ensure the One-Call system or appropriate agency is notified to mark-out utilities a minimum of 72 hours in advance.

The Site Supervisor must conduct a walkthrough of the site to locate all main electrical, gas, telephone, and all other subsurface utilities. A Site Walkthrough Utility and Service Line Determination Record (Attachment A) was developed to assist the Site Supervisor in identifying above ground and subsurface utilities. On third party sites, close coordination with the site owner's representatives for mark-outs, review of as-builts, and other information reviews should be conducted prior to work.

A private utility mark-out company should be contracted prior to performing subsurface activities so that the approximate location of any potential subsurface utility line is identified near the areas to be drilled. For any utility line identified, a “soft-dig” contractor should be utilized to verify the location and depth of the lines, as well as the size and type of line.

> *Note: If subsurface improvements are identified within an area, the method utilized during the private utility mark-out must be adequate to identify the utility prior to any subsurface activities (e.g., GPR survey).*

6.1.5 Pre-Drilling Meeting

Prior to the start of the project, a pre-drilling meeting must be held onsite that includes the local Operations Manager (OM) or their designee (i.e., PM), the Regional Health and Safety Officer (RHSO), designated site supervisor, and the subcontractor(s) procured to perform the work. The property owner, site manager, or appropriate site personnel is to be notified at least 24-hours in advance of completing any field activity.

The pre-drilling meeting activities shall include but not be limited to: a site walk to delineate and determine all above ground utility and service lines, review project health and safety requirements, review planned drilling or boring locations, discuss the anticipated project schedule and other pertinent project information.

6.1.6 Utilities

The locations of the following should be determined:

- Electrical lines, control boxes, and appliances
- Electrical breaker boxes
- Gas lines
- Pipelines
- Fiber optic lines
- Steam lines, water lines
- Sanitary and storm-water sewer lines
- Pressurized airlines
- Underground storage tanks and associated vent and dispensing lines
- Cable lines

  Note: Drill Rigs and vehicle super structures shall be a minimum of 10 feet from overhead electrical lines for lines rated 50 kV or below. For lines over 50 kV the clearance must be 10 feet PLUS 0.4-inches for each 1 kV over 50 kV (1926.550(a)(15)(i&ii) Subpart N).

6.1.7 Product Systems

If possible, speak with someone with historical site knowledge to gain information about the site (locations of former tanks, lines, etc.).

6.1.8 For Underground Storage Tank (UST) systems

- When possible, inspect for the presence of a dispenser pan and determine whether piping is rigid or flexible.
- Visually inspect the location of the tank field, observation wells (if present), dispensers, and vent stack(s).
- Document the orientation, arrangement, location, sizes, etc. of the tanks and manholes. Determine the burial depth of the tank field.
- Observe paving scars (i.e., fresh asphalt/concrete patches, scored asphalt/concrete).

Note: This may indicate the location of product piping or other utilities.

- Document the location of the emergency shut off switch to the dispensers and become familiar with its use.

6.1.9 Existing Remediation Systems

- Visually inspect the location of above ground components.
- Document the location of well manholes, sparge points, etc.

6.2 Selection of Drilling Locations

Document, communicate and review the selected drilling locations.

6.2.1 Define Critical Zones

A critical zone is defined as an area within:

- 10 feet of the perimeter of the UST area,
- 10 feet of the drip line of the dispenser/rack canopy,
- 10 feet of product/vent/instrument lines, gas lines, electrical conduits, sewer lines, water supply lines, telecommunications lines,
- All areas between the UST and the dispensers, between the dispensers/rack and the store/office building and within street utility corridors (typically within a right-of-way easement).

6.2.2 The Site Supervisor shall establish the following drilling critical zones

- 10 feet from the furthest edge of any operating tank
- 10 feet surrounding operating dispenser islands
- 10 feet surrounding marked or know utility locations
- At active service station sites, the entire area between the tank field and the dispenser islands and the area between two or more dispenser islands

The Site Supervisor should utilize the information collected to this point in combination with regulatory requirements and investigation objectives to select drilling locations. If possible, the Site Supervisor should avoid selecting locations within the critical zone.

Review Selected Locations with the Client and with the PM.

Note: The Site Supervisor must not proceed with the investigation until the plan has been discussed with the client and approval to proceed has been granted. If relocation of a boring is necessary at any time and for any reason outside approved limits, the Site Supervisor must contact the client and GES PM prior to proceeding.

6.2.3 Required Notifications

Notify affected parties of planned work and avoid scheduling conflicts with other remediation or facility activities at the site. The Site Supervisor will notify the following persons as applicable:

- PM
- Site Manager/Operator for active locations
- Property Owner for private properties, when possible

6.3 Procedure for On-Site Drilling

Identify, to the fullest extent possible, any improvements present in the subsurface prior to advancing drilling tools in order to prevent damage to the improvements.

6.3.1 Safety

- A HASP must be available onsite at all times and all employees and subcontractors must be familiar with attached JLAs and other information.
- All work areas shall be secured with safety cones, safety tape, construction fence, other barriers, or signs as appropriate. If construction of the drilling water containment is necessary, it must be completed in accordance with guidance provided in **Attachment C**.
- The Site Supervisor should locate the emergency shut off switch for the dispensers and shall ensure all site personnel are familiar with their use.
- A fire extinguisher and "No Smoking" signs must be present at all times.
- The Site Supervisor shall complete the Drilling Protocol Checklist (**Attachment B**) prior to commencing drilling operations.

6.3.2 Supervision

- The Site Supervisor will be responsible for drilling operations and must have a copy of the Drilling Protocol on-site.
- All surface removal, hand auger digging, and drilling will be performed, observed, or supervised by the Site Supervisor at all times.

- The Site Supervisor will ensure that the work is performed with due caution and will be alert for warning signs that could indicate the presence of underground lines or other subsurface structures (i.e., tanks).
- If any such indications arise, the work should immediately cease in the area and the PM shall be contacted.

6.3.3 Warning Signs

The following warning signs may indicate the presence of subsurface structures (i.e., tanks/lines):

- Pea Gravel, Sand, or other fill material.
- The absence of soil recovery in the hand auger. This could indicate pea gravel that has spilled out of the auger.
- Any unexpected departure from the native soil conditions as established in other onsite excavation/trenching digging.
- If any of the above warning signs or a suspicious condition is encountered, drilling in this area should immediately cease and the PM shall be contacted.

6.3.4 Drill Boring Sequence

- If possible, the boring sequence should be planned such that the boring furthest from any suspected underground improvements is carried out first. This is done to determine the natural subsurface conditions and to allow the Site Supervisor to recognize fill conditions.
- Least impacted locations should be completed first if possible to prevent possible cross contamination.

6.3.5 Surface Removal for Paved Areas - Paving Removal

- Sufficient paving or surface improvement should be removed to allow clear visibility of the subsurface conditions during hand augering and/or air knifing.
- Drilling in an area of high risk may warrant a larger pavement opening.
- Monitoring Well Installations: 2ft x 2ft minimum removal is suggested.
- Soil Borings/Push Type Samplers: 8 inches minimum removal is suggested.

6.3.6 Surface Removal Technique

The technique used should not pose a threat to subsurface structures. The only approved methods for completing holes within a paved area shall be to neatly saw-cut or core unless otherwise directed by the Client.

6.3.7 Subsurface Evaluation

Ensure that no subsurface improvements exist where drill or auger will penetrate.

- In critical zones, a minimum evaluation to a depth of 8 feet utilizing a non-destructive method such as hand clearing or vacuum digging is required.
- In non-critical zones, a minimum evaluation to a depth of 5 feet utilizing a non-destructive method such as hand clearing or vacuum digging is required.
- Areas where utility or service lines have been identified or within site critical zones, a minimum evaluation to a depth of 8 feet shall be completed utilizing a non-destructive method such as hand clearing or vacuum digging.

  Note: Client-specific specifications must always be satisfied with regard to hand clearing requirements. Therefore, the most conservative approach either GES or our client's requirement must be implemented.

6.3.8 Approach

The method used to identify the subsurface should be compatible with the inherent risk associated with the type of facility / property, and the location of the drilling. Only tools approved shall be used for probing, and digging.

Note: The Site Supervisor should discuss tool requirements with the Client. Also, no subsurface activities are permitted within a critical zone until the client and the GES client Program Manager is notified of the planned activity.

- Vacuum Digging: Vacuum digging has proven to be a very effective and safe means of digging and should be used unless the soil or other material prevents the use of a vacuum digging device.
- Probing: If probing is necessary, it should occur by using a blunt or rounded tip and should be advanced by hand without excessive force. Digging bars, pry bars or other digging tool that may result in damage to subsurface utilities are not permitted.
- Hand Digging: Should be performed with a small spade shovel.
- Hand Augering: The auger is to be turned slowly and not forced through the soil. It is recommended that an auger without sharp points (some augers have rounded edges) be used.

- Post Hole Digging: Can be used for soil removal only in soil that has been probed and cannot be used to advance the hole beyond the depth or width of probing.

  Note: In the event a drilling location is selected where it's apparent that additional soil or other fill material has been placed/added to the original ground surface level where utility or service lines have been identified (i.e., sloped area next to an existing building, landscaped area, etc.), the depth of the added soil will need to be taken into account or added to the required hand clearing depth.

Approval to deviate from this work scope may be granted on an exception basis for specific situations, such as undeveloped land. In addition, the GES Site Supervisor (oversight person) must stop all project activities and discuss the situation with the GES PM or OM when client or GES requirements cannot be implemented or when site conditions result that are not consistent with normal conditions.

Evaluation of the subsurface should ideally be accomplished by probing followed by soil removal using critical and non-critical zone guidelines as a minimum.

Additional exploratory methods (e.g., water drilling, electronic screening), which will achieve at least the same level of precautionary investigation and/ or drilling safety, should be reviewed with the PM prior to implementation.

The First 5 Feet:

The area to be evaluated shall not exceed the diameter of the largest tool (hand auger, drill auger, sampling tube, etc.) to be advanced and sufficiently large to allow for visual inspection of any obstructions encountered.

- The first 1–2 feet can be cleared by hand digging to remove the soil.
- Next, probe throughout the area to ensure that no obstructions exist anywhere near the potential path of the drill auger or push type sampler.
- Probing shall extend as far laterally as possible. Hand auger or vacuum digging can then proceed but only to the depth that has been probed.
- The soil in the area shall be fully removed during this step. Alternate probing with soil removal until the first 5 feet has been evaluated. If subsurface characteristics prohibit effective probing; a hand auger may be carefully advanced past the point of probing.
- In this event, sufficient soil borings must be placed to ensure that the soil in the area is fully removed.

The Last 3 Feet:

- For boring locations outside the critical zone, probing an additional 3 feet is recommended.

- For boring locations inside the critical zone, probing an additional 3 feet is required.
- If probing is met with refusal, then trained personnel should advance a hand auger without excessive force.

6.3.9 Refusal

Where natural subsurface conditions (e.g. cobbles/rocks, fill material, and/or bedrock) may prevent adequate probing and augering, a practical and sensible evaluation by the Site Supervisor will be the basis for determining if continuation of probing and augering is feasible.

In all cases the Site Supervisor must employ all means necessary to prevent damaging subsurface product lines and tanks.

When conventional means of probing and augering cannot be utilized or the Site Supervisor feels that additional probing/augering is not feasible, they must cease work in that specific area and contact the PM to discuss the matter.

6.3.10 Event Notification

If any portion of a utility or other subsurface structures is encountered or if there is suspicion that one has been encountered, all work shall be halted, emergency conditions secured, and the client notified immediately.

If there is suspicion that the structure has been damaged, the emergency shut-off switch should be activated if applicable, and the PM should be notified immediately.

The client should decide if additional hand clearing is required. If it is confirmed that utilities have been encountered, the client should be consulted to determine what actions should be taken, such as performing a tightness test(s).

> *Note: Under no circumstance is the area to be backfilled without notifying the client and receiving an approval to proceed.*

6.3.11 Scheduling

Since evaluating the subsurface may be time-consuming, it may be appropriate to perform it prior to the drill rig's arrival on-site.

If these activities are conducted prior to the actual drilling day, the augered holes must be adequately covered with road plates and/or backfilled. Care must be taken to prevent settlement of the material used to cover the holes.

In remote, idled, or access controlled sites, augered/probed holes can be left open during fieldwork. A red hazard cone shall be placed over each penetration that will not be drilled the same day.

7. Disposal of Contaminated Materials

All materials and equipment used for decontamination must be disposed of properly as outlined in the Sampling and Analysis Plan (SAP). Clothing (PPE), tools, buckets, brushes, and all other equipment that cannot be reused will be disposed of as discussed in the SAP.

8. Records

8.1 Field Notes

The field notes must document all the events, equipment used, and measurements collected during the activities. The field notes must be legible and concise so that the entire sample event can be reconstructed later for future reference.

Record field notes in a standard bound survey-type field book issued for general note taking/field records and available from all GES equipment administrators. Make all field book entries black ink and make any changes/corrections with a single strikethrough line. Initial and date to indicate who made the change/ correction and when it was made.

9. Follow-Up Activities

Perform the following once field activities are complete.

- Clean and return equipment to the equipment administrator and sign and date the appropriate form.
- Complete purge water and cleaning fluid disposal requirements per the Work Plan.
- Complete the appropriate forms and data sheets. Send a copy to file, along with any field notes.
- Return site/well keys.

Attachments

Attachment A – Site Walkthrough: Utility and Service Line Determination Record

Attachment B – Drilling Protocol Checklist

Attachment C – Containment Construction

Attachment A – Site Walkthrough: Utility and Service Line Determination Record

Name of Person Performing Walkthrough:_____

Project / Site Location:_____ Date:_____

Utility	Description of Location Found Onsite	Approximate Depth Below Ground Surface	Method Used to Determine Location
Electrical lines			
Gas lines			
Pipelines			
Stream lines			
Water lines			
Sanitary and Stormwater Sewer lines			
Pressured air lines			
Tank vent lines			
Optical fiber lines			
Underground Storage Tanks			
Other			

Attachment B – Drilling Protocol Checklist

Site Supervisor:_____ Date:_____

Prior To Site Visit:	YES	NO	N/A
Obtained necessary permits			
Obtained Site Plans			
Visually inspected location of above ground components			
Note location well manholes, sparge points, etc.			
Document selection of drilling locations			
Define the “Critical Zones”			
Review selected locations with PM			
Conduct Utility Mark Out			
Site Visit:			
Note location of utility mark-outs and above ground utilities (Complete Walkthrough Record)			
Compared Site Plan to actual conditions			
Updated Site Plan, if necessary			
UST Systems:			
Inspected for presence of dispenser pan			
Inspected location of tank field			
Noted orientation, arrangement, location of tanks, manholes			
Noted location of Emergency Shut Off Switch			
Determined burial depth of tank field			
Noted paving scars			
Existing Remediation Systems:			
Visually inspected location of above ground components			
Note location well manholes, sparge points, etc.			
Document selection of drilling locations			
DEFINE THE “CRITICAL ZONES”			
Notified all affected parties of planned work			
Copy of Pre-Drilling Protocol available for site			

HASP available for site			
Fire extinguisher and First Aid Kit available for site			
“No Smoking” signs available for site			
Safety Cones, Safety Tape, Construction Fence, other barriers available for site			
Developed Scope of Work and reviewed with all concerned			

Attachment C – Containment Construction

JOB LOSS ANALYSIS	DATE 7-22-05	☒ NEW ☐ REVISED	PAGE 1 of _____

JLA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (DESCRIPTION)
Monitoring well drilling	Well Construction Preparation	Containment Cell Construction

Development team	Position / Title	Reviewed By:	Position / Title
D. Demko	Project Coordinator		
T. Baylis	Director of Health & Safety		

Required and / or Recommended Personal Protective Equipment

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES _____
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER _____
☐ LIFELINE/BODY HARNESS	☐ HEARING PROTECTION	☐ PPE CLOTHING _____	
☒ SAFETY GLASSES	☒ SAFETY SHOES _____		

[1]Job Steps	[2]Potential Hazards	[3]Critical Actions
Determine type of drilling to occur at job site (ie: air rotary, auger etc.)	None	Review with drilling contractor type, method and needs of drilling technique to be used.
Review background geology and anticipated contaminant to be encountered at job site. Inspect job site location.	None	Collection of accurate data on site specific hydrogeology and contaminants for analysis.
Define the management and disposal process for collection and removal of drilling returns	None	Set up containment, transportation and storage logistics for management of drilling returns.
Assess site specific location for containment cell construction	Hazards relative to the proposed drilling location	Assess topographic slope and land surface features; assess potential receptors in area of activity

Design containment cell to hold the desired volume of drilling fluids; select appropriate materials to maintain cell integrity and install containment cell	Hazards associated with handling materials, working with building tools.	Must design the containment cell to hold sufficient volume of fluids for rate of drilling fluids return/collection; must select the proper materials for cell construction based on cell volume and cell location.
Ready the components of fluid removal from the cell, transport and storage/disposal locations to ensure adequate capacity	Hazards associated with equipment movement and handling of drilling return materials.	Proper assessment and inspection of the containment cell construction and review of transport/storage elements for fluids management prior to drilling startup.
Preparation of a contingency and response plan based on containment cell failure	Loss of cell contents may pose hazard to personnel working near the cell structure.	Assess risk to personnel and the environment based on cell location and potential migration of contents from a loss scenario.
Develop a communication protocol between the driller and site geologist to cease drilling when a pre-determined level of fluids in containment cell is reached.	Hazards associated with monitoring well construction and operation around a drilling rig.	Must determine an appropriate level for cell volume liquid containment/storage based on cell construction characteristics and placement location.

[1]Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2]A hazard is a potential danger. Break hazards into five types: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress / ergonomics / lifting techniques; **Exposure** - inhalation/skin hazards.

[3]Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".