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January 25, 2018 **VIA OVERNIGHT CARRIER**

Mr. James R. Carroll
Program Administrator
Land Restoration Program
Land Management Administration
Maryland Department of the Environment
1800 Washington Road, Suite 625
Baltimore, Maryland 21230

Re: Transmittal of the 2018 Frog Mortar Creek Surface Water Sampling Work Plan
Martin State Airport, 701 Wilson Point Road, Middle River, Maryland

Dear Mr. Carroll:

For your review, please find enclosed two hard copies with CDs of the above-referenced document. This work plan addresses the surface water sampling to be conducted within 10 transects in Frog Mortar Creek and four additional western shore samples off the Martin State Airport in Middle River, Maryland.

We respectfully request to receive MDE’s comments or approval by March 8, 2018.

If you have any questions or require any additional information please contact me by phone at 301-548-2223, or via e-mail at charles.trione@lmco.com.

Sincerely,

Charles Trione
Project Lead, Environmental Remediation
Lockheed Martin Corporation

cc: (via email without enclosure)
Anuradha Mohanty, MDE
Christine Kline, Lockheed Martin
Norm Varney, Lockheed Martin
Paul E. Calligan, Lockheed Martin
Michael Martin, Tetra Tech
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cc: (via shipping courier; with enclosures)
Mark Williams, Maryland Aviation Administration
Al Pollard, Martin State Airport

cc: (via mail with CD enclosure)
Jann Richardson, Lockheed Martin
Pete Lekas, EA Environmental

2018 FROG MORTAR CREEK
SURFACE WATER SAMPLING WORK PLAN
MARTIN STATE AIRPORT
701 WILSON POINT ROAD
MIDDLE RIVER, MARYLAND

Prepared for:
Lockheed Martin Corporation

Prepared by:
Tetra Tech, Inc.

January 2018

Approved by:
Lockheed Martin, Inc.

Revision: 0

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Regional Manager

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ACRONYMS AND ABBREVIATIONS

AWQC	ambient water quality criteria
cis-1,2 DCE	*cis*-1,2-dichloroethene
COC	chain of custody
DRA	Dump Road Area
GIS	geographic information system
EGIS	environmental geographic information system
HASP	health and safety plan
IDW	investigation-derived waste
Lockheed Martin	Lockheed Martin Corporation
MAA	Maryland Aviation Administration
µg/L	micrograms per liter
MDANG	Maryland Air National Guard
MDE	Maryland Department of the Environment
mL	milliliter
MSA	Martin State Airport
PCB	polychlorinated biphenyl
PDF	portable document format
PM	project manager
PPE	personal protective equipment
RI	remedial investigation
SVOC	semi-volatile organic compound
TCE	trichloroethene
Tetra Tech	Tetra Tech, Inc.
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
VOC	volatile organic compound

SECTION 1
INTRODUCTION

On behalf of Lockheed Martin Corporation (Lockheed Martin), Tetra Tech, Inc. (Tetra Tech) has prepared this 2018 surface water sampling work plan for the Dump Road Area (DRA) at Martin State Airport (MSA) in Middle River, Maryland (see Figure 1-1). This work plan addresses the surface water sampling to be conducted within 10 transects in Frog Mortar Creek and four additional western shore samples (SW46A-SW49A) between the transects where the highest concentrations of volatile organic compounds (VOCs) have typically been detected. Sampling at SW46A-SW49A was added to the 2015, 2016, and 2017 sampling programs, and will continue in 2018 to assess potential localized seepage of contaminated groundwater to surface waters of the creek between the established transects, which are approximately 300 feet apart.

Exceedances of United States Environmental Protection Agency (USEPA) ambient water quality criteria (AWQC) and site-specific criteria were detected in surface water samples collected during 2017 and previous monitoring programs. The sampling objectives are to:

- provide additional surface water quality data to determine the concentrations and spatial distributions of volatile organic compounds and other chemicals of potential concern in Frog Mortar Creek that may be emanating from a groundwater plume at the Dump Road Area of Martin State Airport

- provide data to evaluate the interaction between shallow groundwater and Frog Mortar Creek for numerical modeling

- provide information that can be used to assess ecological risks to aquatic and benthic organisms and human health risks for recreational users of Frog Mortar Creek

This work plan is organized as follows:

Section 2—Site Background: Briefly describes the site and where detailed background information and reports of previous investigations can be found.

Section 3—Investigation Approach and Methodology: Presents the technical approach to surface water sampling and describes the field methodology to be employed.

Section 4—Project Deliverables: Describes requirements of the reports that will summarize the investigation findings.

Section 5—References: Cites references used to compile this work plan.

SECTION 2
SITE BACKGROUND

2.1 DUMP ROAD AREA

Martin State Airport (MSA), located at 701 Wilson Point Road in Middle River, Maryland, is bounded by Frog Mortar Creek to the east and Stansbury Creek to the west (Figure 2-1); both are tidal tributaries of Chesapeake Bay. The area under investigation is Frog Mortar Creek, which is east of and adjacent to the Dump Road Area (DRA) site at MSA (Figures 2-1 and 2-2). The DRA currently consists mostly of open meadows, mowed grass, and heavily wooded areas; however, it also includes a portion of Taxiway Tango and extends to the airport runway. Taxiway Tango is a concrete and asphalt taxiway currently used by the Maryland Air National Guard (MDANG) for military aircraft operations. The airport runway is also used by state-owned and private aircraft.

Construction of an extraction and treatment system for DRA groundwater was completed in December 2017. The system consists of 16 groundwater extraction wells, underground piping, and a building that houses components to treat groundwater that contains volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals at concentrations above the Maryland Department of the Environment (MDE) groundwater standards. The wells and underground piping pump groundwater from the surficial aquifer to the above-ground treatment building, creating a "hydraulic barrier" that captures groundwater and prevents its contaminants from migrating offsite. The treatment building is 60 feet wide and 170 feet long (10,200 square feet), and was constructed near Frog Mortar Creek in the east-central portion of the DRA (Figure 2 2). Treated groundwater is tested routinely and subsequently discharged to Frog Mortar Creek via an MDE-permitted outfall.

Environmental investigations of the DRA began in 1989 when the MDE conducted a preliminary assessment of MSA. Between the 1930s and 1950s, the Glenn L. Martin Aircraft Company reportedly used a sand pit under the current Taxiway Tango to dump spent battery acid, acid type strippers and other acidic solutions, dredge spoils, and construction debris. The United States

Environmental Protection Agency (USEPA) concluded, after a review of the preliminary assessment of the area, that no signs of waste disposal were apparent, and the site was classified as “No Further Remedial Action Planned.”

In July 1991, four drums containing dried zinc-chromate paint were uncovered during installation of underground electric cables adjacent to Taxiway Tango (see “Area of Four Excavated Drums” west of Taxiway Tango, on Figure 2-2). The discovery of these four drums prompted MDE to order the Maryland Aviation Administration (MAA, acting for MSA owner, the State of Maryland) to perform additional studies (MDE, 1992 and 1997). The MAA conducted additional studies from 1991-1998, which included geophysical surveys to locate and identify buried materials, and sampling and chemical analyses of soil, groundwater, surface water, and sediment. These early investigations identified four areas of concern: (1) the Taxiway Tango Median Anomaly Area, (2) the Drum Area, (3) two ponds (Pond 1 and Pond 2), and (4) the Petroleum Hydrocarbon Area (Figure 2-2). These four areas became the focus of subsequent studies when chemical constituent impacts to soil, pond sediment, and groundwater became apparent.

Trichloroethene (TCE) and TCE-degradation daughter products were detected throughout the investigation area, with the highest concentrations appearing in the upper and intermediate surficial aquifer. Previously detected groundwater concentrations of TCE at MSA range from 0.5 micrograms per liter (µg/L) to more than 100,000 µg/L. 1,4-Dioxane, typically co-located in groundwater with chlorinated solvents, is also considered a chemical of concern. TCE-degradation daughter products (e.g., dichloroethenes and vinyl chloride) are typically co-located with TCE at MSA.

Lockheed Martin Corporation (Lockheed Martin), the successor firm of the Glenn L. Martin Aircraft Company, conducted a remedial investigation (RI) [Tetra Tech, 2012a] from 1999–2009, and supplemental work at the DRA from 2010 through the present, to further delineate the extent of soil, groundwater, and pond sediment chemical impacts indicated by earlier studies.

Through geophysical surveys, membrane interface probes, test pits, soil borings, and chemical analyses of soil and pond sediment samples, the RI identified large areas of buried fill and debris, and surface and subsurface soil contamination in and around the buried fill material and in pond sediment. Buried fill and debris were estimated to be present over approximately 25 acres of the DRA (see Figure 2-2). The fill material consists of soil, stained soil, and debris, the latter of which is comprised of concrete rubble and disposed industrial items (e.g., batteries, decomposed drums, tires, paint cans, burned items, sludge, buckets, glass, and wood).

VOCs, SVOCs, polycyclic aromatic hydrocarbons, and several metals were detected in soil at concentrations exceeding human health-risk screening levels. Chlorinated VOCs (TCE and its degradation products), petroleum VOCs (e.g., benzene), and metals have been found in surficial aquifer groundwater at concentrations exceeding Maryland groundwater and drinking water standards.

Site background and history, including details describing previous environmental investigations and discussions of contaminant source areas at the Dump Road Area (DRA) site, are provided in the DRA *Remedial Investigation Report* (Tetra Tech, Inc. [Tetra Tech], 2012a) and *Dump Road Area Characterization of Possible Source Areas Report* (Tetra Tech, 2014a), and therefore are not repeated herein. A detailed chronological discussion of investigations conducted at the DRA from 1985-2012 is provided as Appendix A of *Dump Road Source-Areas Investigation Work Plan* (Tetra Tech, 2012b).

2.2 FROG MORTAR CREEK

Frog Mortar Creek is hydraulically downgradient of the DRA and directly receives groundwater discharging from the DRA. Therefore, chemical constituents dissolved in groundwater at the DRA can be introduced directly to Frog Mortar Creek. TCE, *cis*-1,2-dichloroethene (*cis*-1,2-DCE), vinyl chloride (VC), benzene, toluene, xylenes, and several metals have been detected in surface water samples collected from Frog Mortar Creek. Surface water samples have been collected from Frog Mortar Creek since 1997, and multiple rounds of samples have been collected annually since 2010. Summaries of studies conducted at Frog Mortar Creek from 1997–2016, and details of the area’s physical setting, land use, physiography, and surface/subsurface conditions (i.e., soils, hydrology, and geology) are in the *2016 Annual Surface Water Sampling Report for Frog Mortar Creek* (Tetra Tech, 2017), and are therefore not repeated herein.

As a part of the July 2010 groundwater and surface water sampling program for MSA, three surface water samples were collected along the western shoreline of Frog Mortar Creek near the DRA (Tetra Tech, 2010). Sample MSA-SW38 was collected near the center of the DRA VOC plume. Samples MSA-SW37 and MSA-SW39 were collected north and south, respectively, of the DRA site. Sample MSA-SW38 reflects near-shore surface water quality in a locale hydraulically downgrade of the DRA VOC plumes. Primary site groundwater contaminants (TCE, *cis*-1,2-DCE, VC, and 1,4-dioxane) were detected in sample MSA-SW38, as well as low concentrations of three other DRA groundwater VOCs (1,2,4-trichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene). These results indicated that VOC-impacted groundwater from the DRA discharges to Frog Mortar Creek. Other site VOCs, such as benzene, toluene, ethylbenzene, xylene, chlorobenzene, and other chlorobenzene isomers, were not detected in the Frog Mortar Creek samples.

A more extensive surface water sampling program was implemented in 2011 to collect additional surface water samples to assess the effects of the DRA groundwater constituents on the water quality of Frog Mortar Creek (Tetra Tech, 2012c). The first quarterly round of surface water samples was collected in March 2011 from five locations along the western shoreline of Frog Mortar Creek. Each sample was collected from approximately one foot below the water surface. After reviewing the March data, the sampling network for subsequent quarterly rounds was expanded to include nine transects, spaced approximately 350 feet apart, with three samples per transect, for a total of 27 sampling locations. Along each transect, one sample was collected near the shoreline (“A” sample), one was collected approximately 50 feet from the shoreline (“B” sample), and one was collected approximately 100 feet from the shoreline (“C” sample). Each sample was collected from approximately one foot below the water surface. Samples from these same 27 locations were collected in June, September, and December 2011.

Two additional rounds of surface water samples were collected on a single day in August 2011 along five transects (SW38, SW40, SW41, SW42, and SW43). The August 2011 sampling locations coincide with 15 of the quarterly sampled locations. These samples were collected at various depths in the water column during both high and low tides to assess VOC concentrations during a time of expected higher recreational use (i.e., summer) and to determine if concentrations were influenced by high or low tides. On August 16, 2011, 60 samples were collected within approximately two hours of both the peak high and low tides (Tetra Tech, 2012c).

At the near shore location ("A"), a single surface water sample was collected from one foot below the water surface. At the middle point in each transect ("B"), two surface water samples were collected: one was collected at one foot below the water surface, and a second was collected one foot above the creek bed. At the point farthest from the shore ("C"), samples were collected at three depths: one was collected at one foot below the water surface; a second was collected at the mid-point of the water column; and a third was collected at one foot above the creek bed (if the water depth was at least four feet deep). The results of this study showed that the tidal phase relative to the time of collection appears to have some influence on detected VOC concentrations, particularly in the samples collected 50 feet from the shore. In general, VOC concentrations in "B-series" samples (at a distance of 50 feet from the shore) were greater at low tide than at high tide, irrespective of sampling depth. Thereafter sampling programs have been conducted during low tide on Frog Mortar Creek.

A review of the 2011 surface water sampling data for Frog Mortar Creek supported additional investigations to assess the extent to which surface water is affected by groundwater discharge from the DRA, and to evaluate chemical concentrations with respect to USEPA or MDE screening levels and USEPA ambient water quality criteria (AWQC) [Tetra Tech, 2012c]. At the conclusion of the 2011 monitoring program, MDE issued a swimming advisory for a segment of Frog Mortar Creek adjacent to the DRA to take effect in 2012. Lockheed Martin developed site-specific screening levels for TCE, *cis*-1,2-DCE, and VC based on a summer-season swimming-exposure scenario, and the 2012 surface water sampling results were compared to these screening levels in addition to the USEPA and MDE surface water criteria (Tetra Tech, 2013).

The sampling program was expanded in 2012 to assess conditions on the eastern shore of Frog Mortar Creek in addition to the western shore samples. Three surface water samples were collected in January 2012 along one sampling transect from the eastern shoreline of Frog Mortar Creek near 3301 Edwards Lane. The samples were collected at one foot below the water surface and were analyzed for VOCs. Following the January 2012 sampling, the surface water sampling programs conducted in 2012-2016 (Tetra Tech, 2013, 2014b, 2014c, 2015, 2017) each included six rounds of surface water sampling events in Frog Mortar Creek. The six sampling events conducted each year were comprised of 40 surface water samples collected from 10 sampling transects (i.e., four samples per transect). The transects along the western shoreline of Frog Mortar Creek near the DRA were designated as SW37, SW38, SW39, SW40, SW41, SW42, SW43, SW44, and SW45, and the transect along the eastern shoreline of Frog Mortar Creek near 3301 Edwards Lane was designated EL-SW01. Samples (-A, -B, -C and -D) were collected from four locations along each of the 10 transects, which were oriented perpendicular to each shoreline. The samples were collected adjacent to the shoreline (the "A" sample), approximately 50-feet from the shoreline (the "B" sample), approximately 100-feet from the shoreline (the "C" sample), and approximately 200-feet from the shoreline (the "D" sample). The 2012-2017 surface water sampling rounds were conducted during the months of March, June, July, August, September, and December. All samples were analyzed for VOCs by SW846 Method 8260C; metals (filtered) by SW846 Methods 6010C/7470A; and hexavalent chromium by USEPA Method 218.6, with the exception of the four samples from the transect along the eastern shoreline of Frog Mortar Creek near 3301 Edwards Lane, which were only sampled for VOCs.

In July 2015, the following samples were added to the monitoring program:

- monitoring of potential upgradient sources (Pond 2, and the stream emanating from Pond 2) that discharge through the swale in the Maryland Air National Guard (MDANG) Munitions Area into Frog Mortar Creek (four samples for VOCs)
- four western shore samples (SW-46A, SW-47A, SW-48A, and SW-49A) between transects SW42 and SW40, SW40 and SW38, SW38 and SW41, and SW41 and SW43, respectively (four samples for VOCs)
- three samples (SW38A, SW40A, and SW41A) for polychlorinated biphenyls (PCBs) analysis by Method 680, unfiltered.

The four additional VOC samples collected to monitor potential upgradient sources and the stream emanating from Pond 2 were collected from the following locations: 1) at the culvert on Lynbrook Road (this culvert takes drainage from the Jet Engine Test Area); 2) in the drainage swale from Pond 2 to capture a sample from water as it leaves the pond; 3) near the point where the channel enters the Munitions Area (which is below the confluence of the Pond 2 drainage and the Jet Engine Test Area drainage); and 4) in the middle of the channel that transects the MDANG Munitions

Area near its confluence with Frog Mortar Creek (but sufficiently inland to be unaffected by creek dilution or contamination).

The four additional western shore VOC samples (SW46A, SW47A, SW48A, and SW49A) between existing transects were added to the sample program to assess possible localized seepage of contaminated groundwater to surface waters of the creek.

The July 2015 data for the additional samples collected to monitor potential upgradient sources and the stream emanating from Pond 2, along with the three additional PCB samples, did not warrant any further sampling; however, elevated VOC concentrations were detected in the four western shore samples added between existing transects (i.e., SW46A, SW47A, SW48A and SW49A). Maximum (respective) concentrations of TCE and VC were detected at sample locations SW38A (7.3 µg/L and 44 µg/L), and SW48A (24 µg/L and 56 µg/L). Location SW48A (24 µg/L) was the only sample to exceed the TCE swimming screening value of 10 µg/L.

Despite the lower concentrations detected during the follow-on sampling event in August 2015, and based on the elevated results detected in July 2015, the sampling of SW46A, SW47A, SW48A, and SW49A was continued in subsequent rounds in 2015, 2016, and 2017, and will continue in 2018.

SECTION 3
INVESTIGATION APPROACH AND METHODOLOGY

A review of the 2017 surface water chemical data for Frog Mortar Creek supports additional sampling to assess the extent to which surface water is affected by groundwater discharge from the Dump Road Area (DRA). This sampling will be conducted to evaluate chemical concentrations with respect to United States Environmental Protection Agency (USEPA) or Maryland Department of the Environment (MDE) screening levels, USEPA ambient water quality criteria (AWQC), and site-specific screening levels. The surface water sampling described in this work plan will be conducted in Frog Mortar Creek near Martin State Airport (MSA).

3.1 SURFACE WATER SAMPLING

Before all field tasks, appropriate Tetra Tech, Inc. (Tetra Tech) personnel will become familiar with the site-specific health and safety plan (HASP) and the respective safe work permits and emergency response plan included in the HASP. Tetra Tech will conduct a mandatory health and safety tailgate meeting before each day's field activities. The Tetra Tech site health and safety officer will document the topics covered and personnel attending these meetings. Safety requirements are addressed in detail in the site-specific Tetra Tech HASP, included as Appendix A.

3.1.1 Surface Water Sampling and Analyses

In each of six sampling rounds to be conducted at Frog Mortar Creek in 2018, 40 surface water samples will be collected from the 10 sampling transects (i.e., four samples per transect), and four additional western shore samples (SW46A, SW47A, SW48A, and SW49A) will be collected at near-shore locations between transects SW42 and SW40, SW40 and SW38, SW38 and SW41, and SW41 and SW43. Sample collection times will be coordinated to coincide with low tide.

The transects along the western shoreline of Frog Mortar Creek near the DRA are designated as SW37, SW38, SW39, SW40, SW41, SW42, SW43, SW44, and SW45, and transect EL-SW01 is along the eastern shoreline of Frog Mortar Creek near 3301 Edwards Lane (see Figure 3-1).

Samples (-A, -B, -C, and -D) will be collected from four locations along each of the 10 transects, which will be oriented perpendicular to each shoreline. The samples will be collected adjacent to the shoreline (the "A" sample), approximately 50-feet from the shoreline (the "B" sample), approximately 100-feet from the shoreline (the "C" sample), and approximately 200-feet from the shoreline (the "D" sample). The four additional samples to be collected along the western shoreline are designated as SW46A, SW47A, SW48A, and SW49A. Surface water sampling locations will be surveyed in the Maryland State Plane North American Datum 1983 (in feet) using a handheld global positioning system receiver.

Sampling in 2018 will occur during the following months:

- March
- June
- July
- August
- September
- December

Table 3-1 contains the sampling and chemical analyses program. Western-shoreline transect samples (MSA-SW37 through MSA-SW45) will be analyzed for the following:

- volatile organic compounds (VOCs) by SW846 Method 8260C (including Freon 113 [1,1,2-trichloro-1,2,2-trifluoroethane], Freon 22 [chlorodifluoromethane] and tentatively identified compounds)
- dissolved metals (filtered in the field) by SW846 Methods 6020/7470A
- hardness by USEPA SW846 Protocols
- hexavalent chromium by USEPA Method 218.6

The four between-transect samples collected on the western shore (i.e., samples at SW46A, SW47A, SW48A and SW49A), and samples collected from the eastern shoreline transect (transect EL-SW01) will be analyzed for the following:

- VOCs by SW846 Method 8260C (including Freon 113 [1,1,2-trichloro-1,2,2-trifluoroethane], Freon 22 [chlorodifluoromethane] and tentatively identified compounds)

Surface water samples will be collected as grab samples using direct-fill sampling techniques. All samples will be collected at a depth of approximately one foot below the water surface. VOC samples will be collected using a stainless steel discrete-interval sampler (a bacon bomb sampler). The sampler will be lowered to approximately one foot below the water surface, the check valve will be engaged to allow the sampler to fill, the sampler will then be brought to the surface, and water will be removed through a valve to fill three laboratory-cleaned, hydrochloric-acid-preserved 40-milliliter (mL) sample vials. The discrete-interval sampler will be cleaned after each use by rinsing with distilled water. Equipment will be cleaned after each sample is collected. No decontamination fluids will be collected during the sampling events.

Dissolved-metals samples will be collected using a peristaltic pump and Teflon® tubing, in accordance with USEPA guidance (USEPA, 2007). The tubing inlet will be set at the desired sampling depth (approximately one foot below the water surface) and the tubing will be connected to a peristaltic pump. The sample will be drawn directly from the desired sampling depth through a disposable 0.45-micron filter and collected in a 500 mL plastic bottle preserved with nitric acid.

The hexavalent chromium samples will be collected using a pre-cleaned unpreserved 250 mL bottle that will be submerged approximately one foot below the water surface and allowed to fill. No preservation in the field or the laboratory is required for the hexavalent chromium samples because they will be analyzed within 24 hours (USEPA, 2012). The hexavalent chromium samples will be expedited to the laboratory so they can be analyzed within the 24-hour holding time. If the laboratory is local, hexavalent chromium samples will be delivered to the laboratory the same day as the samples are collected, or when the laboratory opens the next morning. If the laboratory is not local, the samples will be shipped immediately via overnight shipping to allow sufficient time for analyses after the samples are received by the laboratory the next morning. The laboratory will be notified of the imminent hexavalent chromium delivery each day such samples are collected. Samples for hexavalent chromium analyses will not be conducted on Fridays or holidays, to avoid lapsed holding times.

No duplicates will be collected during this investigation. One trip-blank sample per cooler containing VOC samples will be submitted to the laboratory for VOC analysis for quality assurance/quality control. Water quality parameters, including temperature, pH, specific conductance, salinity, turbidity, dissolved oxygen, and oxidation reduction potential will be measured at all surface water sample locations at the time of sampling. In addition, the depth of water at each sampling location and the tidal stage (from the staff-gauge mounted on the dock along the eastern side of Frog Mortar Creek near transect location EL-SW-01) will be recorded at the time of sampling. All information will be documented in a site-specific logbook for transfer to a surface water sample form.

3.1.2 Documentation

A master site logbook will be maintained as an overall record of field activities for the site. Sample documentation will include completed chain of custody (COC) forms and matrix-specific sample-log sheets. The COC forms are standardized to summarize and document pertinent sample information, such as sample identification and type, matrix, date and time of collection, preservation, and requested analysis. Sample custody procedures are designed to document sample acquisition and integrity.

3.1.3 Sample Nomenclature and Handling

Each surface water sample collected during the characterization study will be identified with a unique sample identification tag. Surface water samples will be labeled with the shoreline representation ("MSA" indicating association with the western shore adjacent to Martin State Airport, or "EL" for the eastern shore along Edwards Lane), followed by an "SW" prefix and the sample transect number, including the sample's distance from the shoreline (i.e., -A, -B, -C, or -D), and a six-digit sampling date. For example, a surface water sample collected on March 10, 2018 from approximately 50 feet from the western shoreline at transect SW37 would be labeled MSA-SW37B-031018. Trip blanks will be labeled with a "TB" prefix followed by the blank's six-digit submittal date (e.g., TB-031018).

Sample handling includes field-related considerations concerning the selection of sample containers, preservatives, allowable holding times, and analyses requested. Proper custody procedures will be followed throughout all phases of sample collection and handling. COC protocols will be used throughout sample handling to ensure evidentiary integrity of sample containers. These protocols will demonstrate that the samples were handled and transferred in a manner that would prevent or detect possible tampering.

Sample containers will be released under signature from the laboratory, and will be accepted under signature by the sampler(s) or individual responsible for maintaining custody, until the sample containers are transferred. Transport containers being returned to the laboratory will be sealed with strapping tape and a tamper proof custody seal. The custody seal will include the signature of the individual releasing the transport container, along with the date and time.

3.1.4 Equipment Decontamination

Both dedicated and disposable equipment will be used for surface water sampling to minimize decontamination activities. The sampler will be rinsed with distilled water before and after each use.

3.1.5 Waste Management

No investigation-derived waste (IDW) or personal protective equipment (PPE) will be generated during the surface water sampling. Rinsing of the sampler will be over the surface water body; therefore, no IDW will be generated. Disposable PPE and sampling equipment, including nitrile gloves, tubing, and filters, will be double bagged and disposed of onsite in an approved general trash receptacle.

3.2 DATA MANAGEMENT

Data handling procedures to be followed by the laboratory will meet the requirements of the laboratory subcontract. All analytical and field data will be maintained in project files; files will include copies of the COC forms, sample log forms, sampling location maps, and documentation of quality assurance and data manipulation.

3.2.1 Data Tracking and Control

A tracking system will be used from the beginning to the end of the sampling event. Before field mobilization, the field operations leader will coordinate and initiate sample tracking. Sample jar labels will be handwritten in the field and reviewed to ensure that they are accurate and adhere to work plan requirements. The project manager (PM) will coordinate with the analytical laboratory to ensure that they are aware of the number and type of samples and analyses to expect. When field sampling is underway, the field operations leader will forward the COC forms to the PM (or designee) and the laboratory for each day that samples are collected. The PM (or designee) will confirm that the COC forms provide the information required by the work plan. This will allow for early detection of errors made in the field so that adjustments can be made while the field team is still mobilized.

After all requested analyses are complete, the laboratory will submit an electronic deliverable for every sample delivery group. When all electronic deliverables have been received from the laboratory, the PM or designee will ensure that the laboratory has performed all requested analyses. Ideally, discrepancies will be noted early enough so that all samples can be analyzed within the prescribed holding times.

3.2.2 Sample Information

Data from field measurements will be recorded using appropriate log sheets and summarized in tabular form, as will raw instrument data from the laboratory. The field operations leader will verify field data daily; laboratory data will be verified by the group supervisor and then by the laboratory's quality control/documentation department.

3.2.3 Project Data Compilation

The analytical laboratory will generate an Adobe® portable document format (PDF) file of the analytical data packages, as well as electronic database deliverables. The electronic database will be checked against the PDF file from the laboratory and updated as required, based on data qualifier flags applied during data validation. All data, such as units of measure and chemical nomenclature, will be consistent with the project database.

3.2.4 Geographical Information System

Data management systems consist of a relational database and geographical information system (GIS) used to manage environmental information pertaining to MSA. The relational database stores chemical, geological, hydrogeologic, and other environmental data collected during environmental investigations; the GIS is created from the relational database and contains subsets of the larger data pool. The GIS allows posting of environmental data onto base maps to represent the information graphically. Compiled sample, chemical, and positional data will be incorporated into the GIS.

3.3 DATA REVIEW

Data from the laboratory will be entered into a sample database and evaluated against risk-based criteria. Data validation, consisting of data completeness, holding time, calibrations, laboratory and field blank contamination, laboratory control sample accuracy, and detection limits, will be completed concurrent with the data evaluation. This review will be based on the USEPA *National Functional Guidelines for Organic Superfund Data Review* (USEPA, 2016) and the specifics of the analytical method used.

SECTION 4
PROJECT DELIVERABLES

A technical memorandum summarizing sampling procedures and results will be prepared after each of the first five sampling rounds in 2018. Each memorandum will describe field activities, field procedures, analytical results, and data validation, and will include a brief comparison of data results against screening criteria. The 2018 *Annual Surface Water Monitoring Report* will be completed and issued after the sixth sampling event in December 2018 has been completed. This report will include December sampling results, a comprehensive summary of all six sampling events performed in 2018, and figures depicting the extent of surface water impacts. Data from these reports will be entered and maintained in the Martin State Airport (MSA) environmental geographic information system (EGIS).

SECTION 5
REFERENCES

Maryland Department of the Environment (MDE), 1992. Letter from Ms. Arlene G. Weiner, MDE, Baltimore Maryland to Maryland Aviation Administration: "Subsurface Investigations." Martin State Airport, Middle River, Maryland. January 6.

Maryland Department of the Environment (MDE), 1997. Letter from Mr. Arthur O'Connell, MDE, to the Maryland Aviation Administration, Martin State Airport, Middle River, Maryland. January 24.

Tetra Tech (Tetra Tech, Inc.), 2010. *Groundwater Monitoring Report-July 2010, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. December.

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Tetra Tech, Inc. (Tetra Tech), 2014a. *Dump Road Area Characterization of Possible Source Areas Report, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland.* Prepared by Tetra Tech, Inc. for Lockheed Martin Corporation, Bethesda, Maryland. April.

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Tetra Tech, Inc. (Tetra Tech), 2014c. *2014 Surface Water Sampling Work Plan, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland*. Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin Corporation, Bethesda, Maryland. January.

Tetra Tech (Tetra Tech, Inc.), 2016a. *2015 Annual Surface Water Sampling Report, Frog Mortar Creek, Martin State Airport, 701 Wilson Point Road, Middle River, Maryland.* Report prepared by Tetra Tech, Inc., Germantown, Maryland for Lockheed Martin, Bethesda, Maryland. May.

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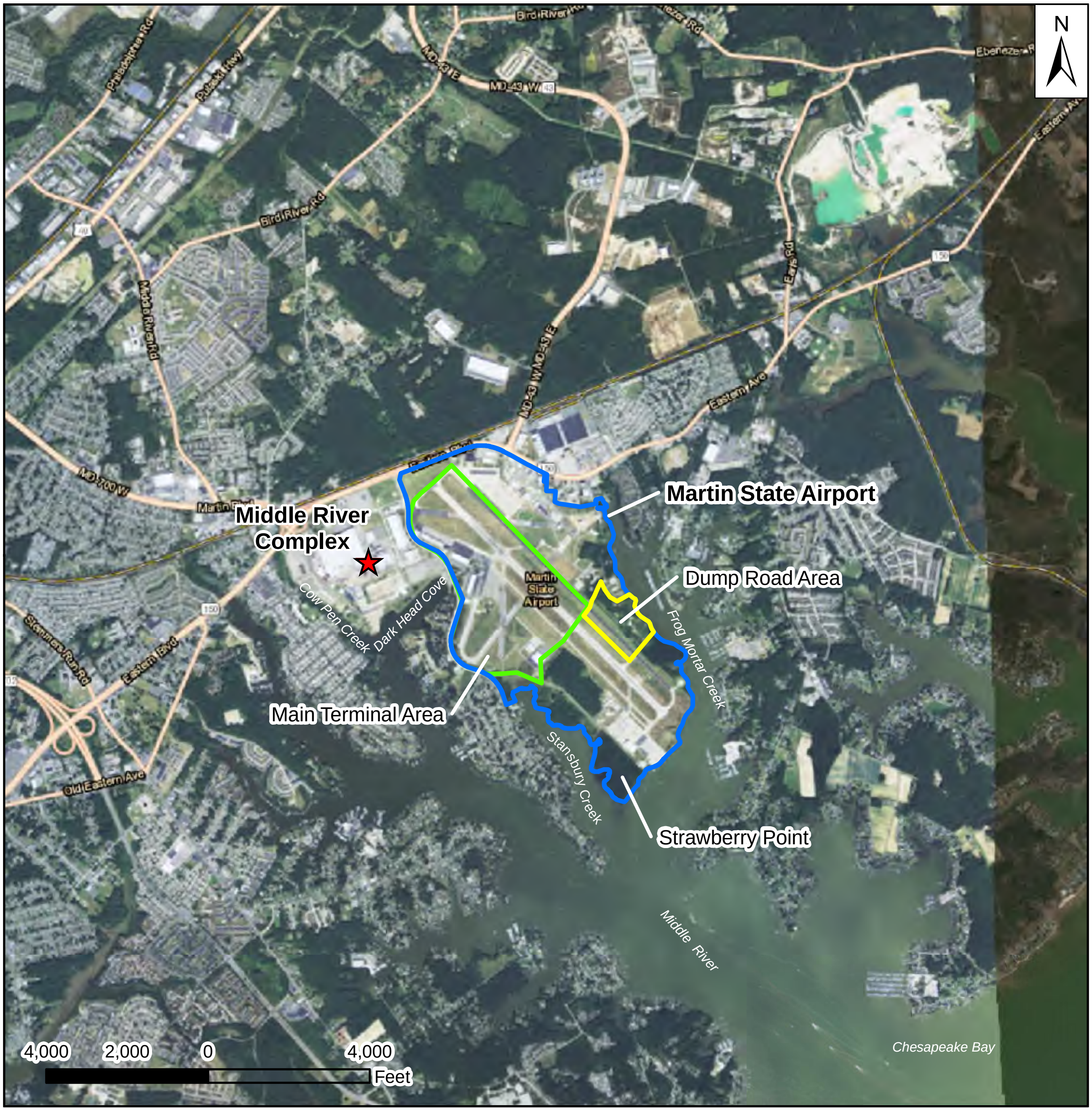
FIGURES



Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2013 ESRI and its data suppliers).

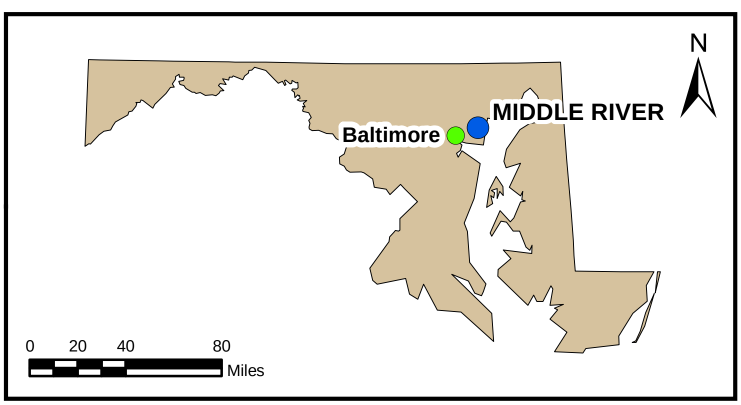


FIGURE 1-1

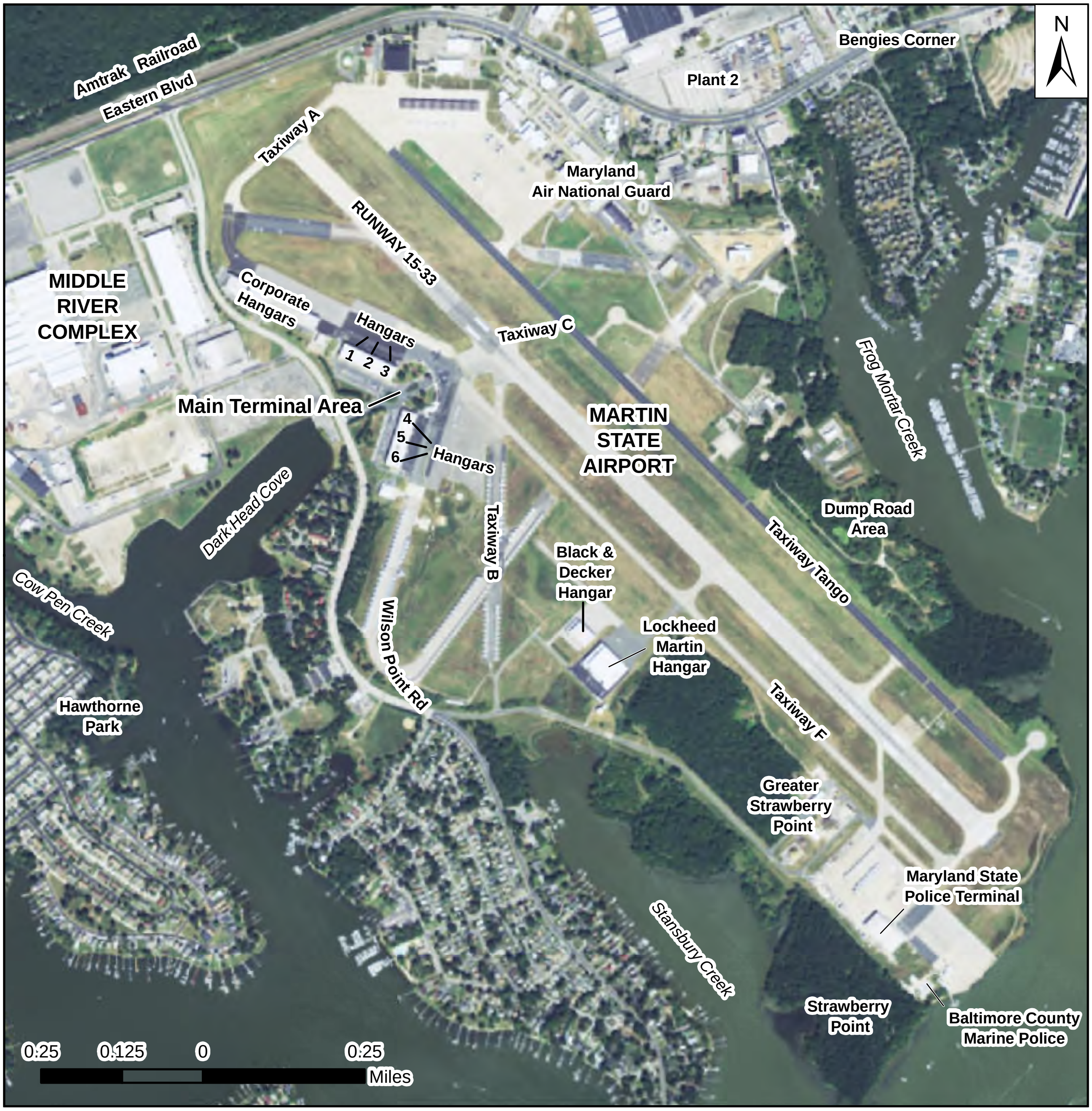
MARTIN STATE AIRPORT
SITE LOCATION MAP

Lockheed Martin, Martin State Airport
Middle River, Maryland

DATE MODIFIED: 12/16/15	CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\msa_overview_dec2015.mxd)
12/16/15 -- JEE



Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2013 ESRI and its data suppliers).

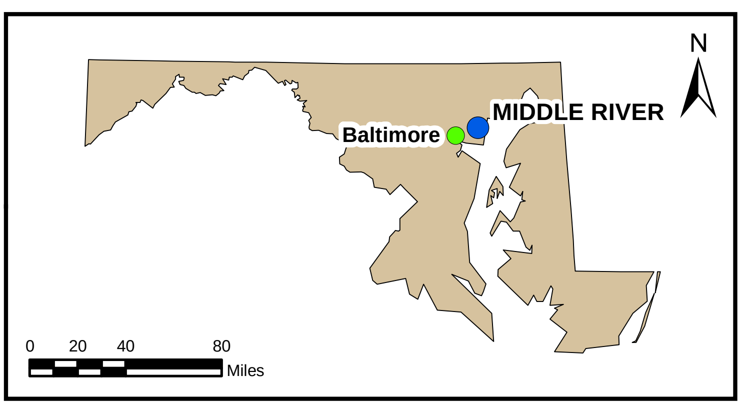


FIGURE 2-1

MARTIN STATE AIRPORT AND SURROUNDING FEATURES

Lockheed Martin, Martin State Airport
Middle River, Maryland

DATE MODIFIED: 08/27/15	CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\msa_features_sitemap_jul2015.mxd)
08/27/15 -- JEE

Numbered Former Features from 2013 Aerial Photograph Study	
#2	Pit
#15	Burn Area
#20	Bunker
#26	Bunker
#42	Pond/Pit
#43	Acid Pit
#44	Pit
#45	Burn Area

FIGURE 2-2

SITE FEATURES AND AREAS OF CONCERN DUMP ROAD AREA

LEGEND

- MARYLAND AIR NATIONAL GUARD BOUNDARY
- FORMER AMMUNITION BUNKER
- FORMER OPEN BURNING AREA
- FORMER POND/PIT
- FORMER POND
- EXTENT OF UNSATURATED CONTAMINATED SOIL AND LANDFILL MATERIAL
- POND
- **#20** FORMER FEATURE NUMBER (FROM 2012 AERIAL PHOTOGRAPH STUDY)

2014 aerial photograph provided by U.S. Geological Survey.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 100 200 Feet

N

DATE MODIFIED: 10/28/16

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\dra_study_areas_features_aug2014_v2.mxd)
10/28/16 -- JEE

FIGURE 3-1

2018 PROPOSED SURFACE WATER SAMPLING LOCATIONS FROG MORTAR CREEK

LEGEND

- SURFACE WATER SAMPLE LOCATION
- GROUNDWATER MONITORING WELL
- ABANDONED WELL
- OUTLINE OF FORMER COVE
- MARYLAND AIR NATIONAL GUARD BOUNDARY
- EXTENT OF UNSATURATED CONTAMINATED SOIL AND LANDFILL MATERIAL - DUMP ROAD AREA
- POND

2014 aerial photograph provided by U.S. Geological Survey.

Lockheed Martin, Martin State Airport
Middle River, Maryland

0 150 300 Feet

N

DATE MODIFIED: 10/28/16

CREATED BY: JEE

TETRA TECH

Map Document: (P:\GIS\Lockheed_MSA\MapDocs\MXD\fmc_sw_samplocs_prop2017.mxd)
10/28/16 -- JEE

TABLES

Table 3-1 2018 Surface Water Sampling Analytical Protocol

Table 3-1

2018 Surface Water Sampling Analytical Protocol
Frog Mortar Creek
Lockheed Martin, Martin State Airport
Middle River, Maryland

Surface water sample location/ Transect No.(1)	Analytical Requirements			
	Volatile organic compounds	Dissolved metals(2)	Hardness(3)	Dissolved hexavalent chromium(4)
	(USEPA 8260C)	(6020B/ 7470A)	(SM 2340B)	(USEPA 218.6)
	3x40 mL vials with hydrochloric acid	500 mL filtered with nitric acid(3)		(4)250 mL plastic unpreserved, filtered
MSA-SW37	X	X	X	X
MSA-SW38	X	X	X	X
MSA-SW39	X	X	X	X
MSA-SW40	X	X	X	X
MSA-SW41	X	X	X	X
MSA-SW42	X	X	X	X
MSA-SW43	X	X	X	X
MSA-SW44	X	X	X	X
MSA-SW45	X	X	X	X
MSA-SW46	X			
MSA-SW47	X			
MSA-SW48	X			
MSA-SW49	X			
EL-SW01	X			

1 Four samples will be collected from each transect location with the exception of sample locations SW46, SW47, SW48, and SW49 where only western shore “A” samples will be collected. See Section 3.1.3 for sample nomenclature/sample ID.
2 Samples for dissolved metals will be filtered and preserved with nitric acid in the field.
3 One 500 mL bottle is sufficient for hardness and dissolved metals analyses.
4 Samples for dissolved hexavalent chromium are to be filtered in the laboratory and will be analyzed within 24 hours of collection. Samples for total (unfiltered) hexavalent chromium will not be collected.

mL – milliliter

SM – standard method

USEPA – United States Environmental Protection Agency

APPENDICES

APPENDIX A—HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN
FOR
LOCKHEED MARTIN CORPORATION

SOIL AND GROUNDWATER CHARACTERIZATION

MARTIN STATE AIRPORT

MIDDLE RIVER, MARYLAND

TETRA TECH, INC.
FOSTER PLAZA 7
661 ANDERSEN DRIVE
PITTSBURGH, PA 15220

JANUARY 2016
REVISION 3

HEALTH AND SAFETY PLAN
FOR
LOCKHEED MARTIN CORPORATION

SOIL AND GROUNDWATER CHARACTERIZATION
MARTIN STATE AIRPORT

701 WILSON POINT ROAD
MIDDLE RIVER, MARYLAND

Submitted by:
Tetra Tech, Inc.
Foster Plaza 7
661 Andersen Drive
Pittsburgh, PA 15220

JANUARY 2016
REVISION 3

PREPARED UNDER THE SUPERVISION OF:	APPROVED BY:
________________________________	________________________________
MICHAEL MARTIN, P.G.	CLYDE SNYDER
REGIONAL MANAGER	PROJECT HEALTH AND SAFETYOFFICER
GERMANTOWN, MARYLAND	PITTSBURGH, PENNSYLVANIA

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been developed to provide the minimum practices and procedures for Tetra Tech, Inc. (Tetra Tech) and subcontractor personnel engaged in the Martin State Airport (MSA) at the Lockheed Martin Corporation (LMC), in Middle River, Maryland.

This HASP must be used in conjunction with the Tetra Tech Health and Safety Standard Operating Procedures (TtSOPs). The TtSOPS can be found on the my Tetra Tech site https://my.tetratech.com/go3/index.php?option=com_wrapper&view=wrapper&Itemid=376 which contains Tetra Tech Health and Safety Standard Operating Procedures (SOPs) referenced in this HASP. This HASP was developed to comply with the requirements stipulated in 29 CFR 1910.120 (OSHA's Hazardous Waste Operations and Emergency Response Standard) and applicable sections of 29 CFR 1926 (Safety and Health Regulations for Construction).

All contractor responsibilities stipulated in Section 1 of the Lockheed Martin Remediation Contractor's ESH Handbook (LM Handbook) will be adhered to. The LM Handbook can be found in Attachment I of this HASP.

Copies of all pertinent environmental, safety and health (ESH) records must be maintained at the job site. This includes, but is not limited to, this site-specific HASP, the Tetra Tech Health and Safety Guidance Manual, personnel training documentation, evidence of enrollment in a medical surveillance program, accident/injury reporting, work area inspections, periodic safety meetings, SDS, air monitoring data, waste container inspections, etc. These records must also be provided electronically to the Lockheed Martin Project Lead.

This HASP has been developed using the latest available information regarding known or suspected chemical contaminants and potential physical hazards associated with the proposed work and site. The HASP will be modified if the scope of work changes or if new information regarding site conditions, hazards, or contaminants of concern becomes available. If deviations are encountered from the field work plan, the contractor shall A) notify to the Lockheed Martin Project Lead and B) suspend work to assess changes to the work plan(s) and the HASP. Changes to the work plan(s) and the HASP shall be reviewed by the Project Lead. Procedures addressing changes to this HASP as described in Section 6 of the LM Handbook (Attachment I) will be followed.

1.1 TETRA TECH SAFETY STATISTICS

Table 1-1 presents safety statistics for Tetra Tech for the last 3 calendar years compared to the national averages for our industry. This comparison uses data collected by the United States Department of Labor, Bureau of Labor Statistics (BLS) for different types of employers, segregated by North American Industry Classification System (NAICS) codes.

TABLE 1-1

**TETRA TECH INCIDENT RATES
COMPARISON OF TETRA TECH AND 2011 BLS DATA FOR
NAICS CODE 541620 (TRIR AND LWDIR CASE RATES)**

	NAICS 541620 Professional and Business Services 2013	Tetra Tech 2012	Tetra Tech 2013	Tetra Tech 2014
Total Recordable Incident Rate (TRIR)	1.00	0.67	0.69	0.51
Lost Workday Incident Rate (LWDIR)	0.40	0.10	0.15	0.12

The data comparison illustrates that Tetra Tech's performance compares favorably with the most-recent national averages for the environmental engineering and hazardous waste services industries. Raw data for these statistics can be found in the Occupational Safety and Health Administration (OSHA) Form 300A attached as Figure 1-1.

Tetra Tech Man Hours Worked

2012	24,904,295
2013	24,812,849
2014	23,586,978

Tetra Tech Experience Modification Rates (Policy Year October 1 - September 30):

2013 - 2014	0.80
2014 - 2015	0.83
2015 – 2016	0.77

1.2 KEY PROJECT PERSONNEL AND ORGANIZATION

This section defines responsibilities for site safety and health for Tetra Tech employees conducting field activities under this field effort. All personnel assigned to participate in the field work have the primary responsibility for performing all of their work tasks in a manner that is consistent with the Tetra Tech Health and Safety Policy, the health and safety training that they have received, the contents of this HASP, and in an overall manner that protects their personal safety and health and that of their co-workers. The following persons are the primary point of contact and have the primary responsibility for observing and implementing this HASP and for overall on-site health and safety.

- The Tetra Tech Project Manager (PM) is responsible for the overall direction and implementation of this HASP.

- The Field Operations Manager (FOL) manages field activities, executes the work plan, and enforces safety procedures as applicable to the work plan.

- The Project Health and Safety Officer (PHSO) is responsible for developing this HASP in accordance with applicable OSHA regulations. Specific responsibilities include:
  - Providing information regarding site contaminants and physical hazards.
  - Establishing air monitoring and decontamination procedures.
  - Assigning personal protective equipment based on task and potential hazards.
  - Determining emergency action procedures.
  - Identifying appropriate emergency contacts.
  - Stipulating training and medical surveillance requirements.
  - Providing standard work practices to minimize potential injuries and exposures associated with hazardous waste site work.
  - Modify this HASP, where and when necessary.

- The Site Safety Officer (SSO) supports site activities by advising the PM on the aspects of health and safety on site. These duties may include the following:
  - Coordinate health and safety activities with the FOL.
  - Select, inspect, implement, and maintain personal protective equipment.
  - Establish work zones and control points.
  - Implements air-monitoring program for onsite activities.
  - Verify training and medical status of onsite personnel status in relation to site activities.
  - Implements hazard communication, respiratory protection, and other associated safety and health programs as necessary.
  - Coordinates emergency services.

- Provides site specific training for onsite personnel.
- Investigates accidents and injuries (see Attachment II Incident Report Form)
- Provides input to the PHSO regarding the need to modify, this HASP, or other applicable health and safety associated documents as per site-specific requirements.

Radiation Site Officer

- Provide direction to Radiation Control Technicians (RCTs) and site workers
- Suspend work if any suspect or unknown radiological hazard is discovered
- Report all potential contamination events.
- Compliance with the requirements of this HASP are monitored by the SSO and coordinated through the Tetra Tech Project Health and Safety Officer (PHSO)

Note: In some cases one person may be designated responsibilities for more than one position. For example, the FOL may also be responsible for the SSO duties. This action will be performed only as credentials, experience, and availability permits.

1.3 STOP WORK

All employees are empowered, authorized, and responsible to stop work at any time when an imminent and uncontrolled safety or health hazard is perceived. In a Stop Work event (immediately after the involved task has been shut down and the work area has been secured in a safe manner) the employee shall contact the Project Manager and the Project Health and Safety Officer. Through observations and communication, all parties involved shall then develop, communicate, and implement corrective actions necessary and appropriate to modify the task and to resume work.

1.4 SITE INFORMATION AND PERSONNEL ASSIGNMENTS

Site Name: Martin State Airport Lockheed Martin

Address: Middle River, Maryland

LMC Contact: Paul Calligan **Phone Number:** (240) 676-5392

Proposed Dates of Work: January 2016 until completion

Project Team:

Tetra Tech Management Personnel:	**Discipline/Tasks Assigned:**	**Telephone**
Michael Martin, P.G.	Regional Manager	(301) 528-3022 (410) 707-5259
Tony Apanavage	Project Manager (PM)	(301)-528-3021 (301)-233-8230
TBD	Site Safety Officer (SSO)	TBD
James Laffey	Tetra Tech NUS Health and Safety Manager	(412) 921-8678
Clyde J. Snyder	Project Health and Safety Officer (PHSO)	(412) 921-8904
Lawson Bailey	Radiation Safety Officer	(706) 830-7530
Amy Stanford	Alt Radiation Safety Officer	(706) 832-7394
TBD	*Excavation Competent Person	TBD

*** MUST BE FILLED OUT PRIOR TO BEGINNING WORK**

Non-Tetra Tech Personnel	**Affiliation/Discipline/Tasks Assigned**	**Telephone**

Hazard Assessment (for purposes of 29 CFR 1910.132) for HASP preparation has been conducted by:

Prepared by: Clyde J. Snyder and Jennifer Carothers, PhD

FIGURE 1-1
OSHA 300 LOGS

.

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year 2014

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	1	4
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	7
(K)	(L)

Injury and Illness Types

Total number of...
(M)

(1) Injury	4	(4) Poisoning	0
(2) Skin Disorder	0	(5) Hearing Loss	0
(3) Respiratory Condition	0	(6) All Other Illnesses	1

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name: Tetra Tech - NUS Operating Unit

Street: 661 Andersen Drive, Foster Plaza 7

City: Pittsburgh State: Pennsylvania Zip: 15220

Industry description (e.g., Manufacture of motor truck trailers): Environmental Consulting

Standard Industrial Classification (SIC), if known (e.g., SIC 3715): ___ ___ ___ ___

OR North American Industrial Classification (NAICS), if known (e.g., 336212): 5 4 1 6 2 0

Employment information

Annual average number of employees: 480

Total hours worked by all employees last year: 999,752

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Mark E. Fortunas
Company executive

President, NUS
Title

(412) 921 8600
Phone

30 JAN 2015
Date

OSHA's Form 300A (Rev. 01/2004)
Summary of Work-Related Injuries and Illnesses

Year 2013

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	2	6
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	3
(K)	(L)

Injury and Illness Types

Total number of...
(M)

(1) Injury	3	(4) Poisoning	0
(2) Skin Disorder	2	(5) Hearing Loss	0
(3) Respiratory Condition	0	(6) All Other Illnesses	3

Establishment information

Your establishment name: Tetra Tech- NUS Operating Unit

Street: 661 Andersen Drive, Foster Plaza 7

City: Pittsburgh State: Pennsylvania Zip: 15220

Industry description (e.g., Manufacture of motor truck trailers): Environmental Consulting

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

OR North American Industrial Classification (NAICS), if known (e.g., 336212): 5 4 1 6 2 0

Employment information

Annual average number of employees: 480

Total hours worked by all employees last year: 974,205

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Mark T. [signature] — Company executive — President (Title)

(412) 921-7217 — Phone — 30-Jan-13 (Date)

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year 2012

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	1	0	5
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
-	0
(K)	(L)

Injury and Illness Types

Total number of...
(M)

(1) Injury	4	(4) Poisoning	0
(2) Skin Disorder	2	(5) Hearing Loss	0
(3) Respiratory Condition	0	(6) All Other Illnesses	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name: Tetra Tech, NUS Operating Division

Street: 661 Andersen Drive, Foster Plaza 7

City: Pittsburgh State: Pennsylvania Zip: 15220

Industry description (e.g., Manufacture of motor truck trailers): Environmental Consulting

Standard Industrial Classification (SIC), if known (e.g., SIC 3715): __ __ __ __

OR North American Industrial Classification (NAICS), if known (e.g., 336212): 5 4 1 6 2 0

Employment information

Annual average number of employees: 446

Total hours worked by all employees last year: 934,740

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate and complete.

Mark T. Perry
Company executive

President
Title

(412) 921 7217
Phone

28-Jan-13
Date

2.0 EMERGENCY ACTION PLAN

2.1 INTRODUCTION

This section has been developed as part of a planning effort to direct and guide field personnel in the event of an emergency. In the event of an emergency, the field team will primarily evacuate and assemble to an area unaffected by the emergency and notify the appropriate local emergency response personnel/agencies. Workers who are ill or who have suffered a non-serious injury may be transported by site personnel to nearby medical facilities, provided that such transport does not aggravate or further endanger the welfare of the injured/ill person. The emergency response agencies listed in this plan are capable of providing the most effective response, and as such, will be designated as the primary responders. These agencies are located within a reasonable distance from the area of site operations, which ensures adequate emergency response time.

Tetra Tech personnel may participate in minor event response and emergency prevention activities such as:

- Initial fire-fighting support and prevention
- Initial spill control and containment measures and prevention
- Removal of personnel from emergency situations
- Provision of initial medical support for injury/illness requiring only first-aid level support
- Provision of site control and security measures as necessary

2.2 EMERGENCY PLANNING

Through the initial hazard/risk assessment effort, emergencies resulting from chemical, physical, or fire hazards are the types of emergencies which could be encountered during site activities. To minimize or eliminate the potential for these emergency situations, pre-emergency planning activities will include the following (which are the responsibility of the SSO and/or the FOL):

- Coordinating with Lockheed Martin Martin State Airport and/or local emergency response personnel to ensure that Tetra Tech emergency action activities are compatible with existing emergency response procedures.

- Establishing and maintaining information at the project staging area (support zone) for easy access in the event of an emergency. This information will include the following:
  - Chemical Inventory (of chemicals used onsite), with Safety Data Sheets (SDS).

- Onsite personnel medical records (Medical Data Sheets).
- A log book identifying personnel onsite each day.
- Hospital route maps with directions (these should also be placed in each site vehicle).
- Emergency Notification - phone numbers.

The Tetra Tech FOL will be responsible for the following tasks:

- Identifying a chain of command for emergency action.
- Educating site workers to the hazards and control measures associated with planned activities at the site, and providing early recognition and prevention, where possible.
- Periodically performing practice drills to ensure site workers are familiar with incidental response measures.
- Providing the necessary equipment to safely accomplish identified tasks.

2.3 EMERGENCY RECOGNITION AND PREVENTION

2.3.1 Recognition

Through the hazard assessment, it has been determined that the following potential hazards that could be encountered:

Physical Injury resulting from:

Struck By: High-pressure lines could become disconnected and whip resulting in possible injury. Prevention methods include having locking/ or pinned hose connections and whip checks to prevent disconnection.

Entanglement: Entanglement hazards exist with the conveyor auger and rotating pump components. To minimize these hazards equipment will be inspected to ensure guarding is in place. If the auger conveyor is not equipped with a safety interlock on the lid to the auger, then administration controls will be put in place to control persons accessing an unguarded rotating auger. See the TtSOP SWP 05-36 Drill Rigs Attachment V for additional direction.

Chemical Exposure: The scope of this work involves possible exposure to chemical contaminants site personnel will:

- Reviewed the SDS and will have ready any emergency response measures necessary for response. This includes an eyewash station and safety shower or drench hose if required.

- Locate a hospital that has decontamination capabilities and can provide care to chemical-exposed personnel. If employees are injured due to chemical contamination the nearest medical facility with the capability to decontaminate exposed individuals is John Hopkins Bayview Hospital at 4940 Eastern Ave. Baltimore Maryland (see Figure 2-2 for directions).

Foreseeable emergency situations that may be encountered during site activities will generally be recognizable by visual observation. A clear knowledge of the signs and symptoms of overexposure to contaminants of concern may alert personnel of the potential hazards concerning themselves or their fellow workers.

Tetra Tech will minimize or eliminate exposure to recognized hazardous substances covered by OSHA. OSHA requires that exposure to hazardous materials that are not directly covered be monitored and maintained below the limits set forth by the American Conference of Governmental Industrial Hygiene (ACGIH), National Institute for Occupational Safety and Health (NIOSH), and manufacturers' recommended limits. OSHA and the ACGIH have established required or suggested exposure limits for various chemicals in use today. For materials that have more than one established exposure limit, the most stringent exposure limit will apply when determining exposure limits, monitoring requirements, effective control technologies, employee training, and reporting.

In determining the substances that are in use and the areas of exposure, the SSO will develop a program to monitor the operation. The PHSO will determine the potential for exposure and will monitor appropriately for the determination of hazard levels. In addition, the SSO will make any recommendations deemed necessary for the protection of worker health and safety. When hazards are identified, they will be addressed in accordance with the following prevention measures to eliminate the workplace hazards:

- Whenever possible, engineering controls will be implemented to eliminate or control hazards,
- Followed by administrative controls
- As a last resort, the use of personal protective equipment.

These potential hazards, are discussed in detail in Sections 5.0 and 6.0. Additionally, early recognition will be supported by periodic site surveys to eliminate any conditions that may predispose site personnel or properties to an emergency. These surveys will consist of ensuring:

- Approach paths to monitoring wells are maintained (cleared, mowed, etc.)
- Monitoring well protective casings are cleared of spider and insect nests.
- All equipment is inspected and ready for use looking for items such as guards, connections are pinned or whip checked control potential flailing in the event the connect disconnects.
- Ensure emergency equipment is staged, inspected, and is ready for immediate response.
- Ensure personnel are employing protective equipment as described in this HASP.

The FOL and the SSO will constitute the site evaluation committee responsible for these periodic surveys. Site surveys will be conducted at least once a week during the initiation of this effort. These surveys will be documented in the Project Logbook.

2.3.2 Prevention

Tetra Tech and subcontractor personnel will minimize the potential for emergencies by following the TtSOP's and ensuring compliance with the HASP and applicable OSHA regulations. Daily site surveys of work areas, prior to the commencement of that day's activities, by the FOL and/or the SSO will also assist in prevention of illness/injuries when hazards are recognized early and control measures initiated.

2.3.3 Fire Prevention / Flammable Liquids

Tetra Tech and subcontractor personnel are responsible for fire prevention and protection in all of their work areas at all times during the duration of this field effort (24 hours per day/seven days per week). All site vehicles (both Tetra Tech and contractor vehicles) will be equipped with Fire Extinguishers and First Aid Kits. Since fuels will be maintained on site approved ABC fire-fighting extinguishers must be provided. Tt personnel and subcontractor personnel will only fight fires in the incipient stage (small fires) when there is no danger of injury to personnel. Fire beyond the incipient stage requires immediate site evacuation and notification of the Fire Department.

The Lockheed Martin Project Lead will be notified as soon as possible of any fire, if Tetra Tech or subcontractor personnel use a Lockheed Martin fire extinguisher, and of any and all fires that are extinguished. In case of fire, Tetra Tech and subcontractor personnel will call 9-1-1.

All flammable and combustible liquids must be stored, dispensed and used in accordance with OSHA regulations and the Uniform Fire Code. Bonding and grounding of containers containing flammable liquids will be required.

All fire prevention/flammable liquids safety procedures and requirements stipulated in Section 3.15 of the LM Handbook (Attachment I) will also be adhered to.

2.4 MARINE EMERGENCIES

Many emergency and incident scenarios which occur on land may also occur in the marine environment. The severity and response actions for incidents may be very different when they occur on the water. Marine applications of emergency planning and response have been included in this document, however marine operations can be quite different in the planning and response requirements, and will be dependent on the type of equipment and watercraft being used. Individual vessels may have distinctly different features which cannot be addressed in a single plan, and therefore the cooperation and assistance of all contractors for marine activities is required.

One of the most potentially serious types of marine emergencies that could occur is when a person falls into the water (a “Man Overboard” event, or “MOB” emergency). This is particularly dangerous when ambient temperature and water temperature conditions are low, which is anticipated on this project as the dredging operations will occur during the winter months. This is of particular concern because a person who becomes immersed into cold water and then is removed from the water into a cold environment is susceptible to the risks of severe cold stress, including hypothermia. The procedures and controls that will be in place and followed in the event of an MOB event are addressed in section 5.2.3.2 (“Man Overboard (MOB) Procedures”) of this Plan.

Support vessels consisting of a 30ft. Jack Boat and a Tug Boat will be on scene at all times during dredging operations. These support vessels will be maintained in fueled and fully operational status. They will serve as emergency vessels to be used to evacuate workers from the barges, and to rescue retrieve and transport any field crew to the shore who may need emergency treatment or assistance.

2.4.1 Marine Emergency Equipment

The following additional emergency equipment is required for marine applications.

2.4.1.1 General

- Each watercraft shall carry fire extinguishers (for use in gasoline, oil and grease fires) approved by Underwriters Laboratories (UL). Each fire extinguisher shall be inspected by the owner/operator monthly to ensure that it is sufficiently charged and that the nozzles are free and clear. Discharged fire extinguishers shall be replaced or recharged immediately. Extinguisher requirements are as follows:

Length of Watercraft	Extinguisher Type	Number Required
26 Feet or Less	1-A:10-B:C	1
26 Feet or More	1-A:10-B:C	2

- All watercraft shall carry at least one air horn or similar sound-signaling device.

2.4.1.2 Flotation Devices

<u>Personal</u>

- A USCG approved Personal Floatation Device (PFD) shall be provided to and properly worn by all persons in the following circumstances:
  - On all watercraft, including barges, floating plants, powered and non-powered vessels and boats, floating work platforms, floating pipelines, pontoons, etc.
  - On structures extending over or next to water except where guardrails or safety nets are provided for employees.
  - Any work on or near water where falling into the water is a potential hazard.
  - Working alone at night where there are drowning hazards, regardless of other safeguards provided.
  - Wherever there is a drowning hazard.

- PFDs are required for all marine work.

<u>Life Rings – Watercraft</u>

- Each watercraft shall be equipped with at least one Type IV PFD, designed to be thrown to a person in the water and grasped and held by the user until rescued. A life ring or horseshoe buoy are two common examples of a Type IV PFD. All Type IV PFDs must be approved by the ESS prior to use. Life rings (rope attachment not required) and ring buoys (rope attachment required) shall conform to the requirements of 46 CFR 160 (USCG approval) and shall have at least 70 feet (21 meters) of 3/8 inch (1 centimeter) solid braid polypropylene line, or equivalent, attached. Throw bags may be used in addition to life rings or ring buoys.

- Life rings or ring buoys shall be readily available and shall be provided as follows:
- A minimum of one on each vessel.
- A minimum of one on all motor boats up to 40 feet (12 meters) in length and at least two for motor boats 40 feet (12 meters) in length or longer.
- A minimum of two on any other piece or group of floating plant up to 100 feet (30 meters) in length and one additional for each increase in length of 100 feet (30 meters) or fraction thereof.

Life Rings – Shoreline Locations

- Life rings (Type IV PFD) with at least 90 feet of line, shall be provided and readily available for emergency rescue operations as follows:
- A minimum of one life ring at intervals of not more than 200 feet (60 meters). Examples of applicable locations include: floating pipelines, walkways, wharves, piers, bulkheads, scaffolds, platforms, and similar structures extending over or immediately next to water.

2.4.1.3 MOB “Pike Poles”

These are 20-foot long wooden poles that have a hook affixed on one end. The purpose of the poles is to be used to reach to a person in the water to assist them by pulling them in toward the boat or shoreline. The hook on the end of each pike pole is designed so that it can readily hook onto the loop on the back of a PFD (in the event the person is unconscious or otherwise cannot grab the pole and requires such assistance. If the injured person is unconscious and face down in the water, it s obvious that time is of the essence to affect a rescue. In such a dire emergency, other field team members may jump into the water to aid in assisting their incapacitated co-worker.

2.5 EVACUATION ROUTES, PROCEDURES, AND PLACES OF REFUGE

An evacuation will be initiated whenever recommended hazard controls are insufficient to protect the health, safety or welfare of site workers. Specific examples of conditions that may initiate an evacuation include, but are not limited to the following: severe weather conditions; fire or explosion; monitoring instrumentation readings which indicate levels of contamination are greater than instituted action levels; and evidence of personnel overexposure to potential site contaminants.

In the event of an emergency requiring evacuation, personnel will immediately stop activities and report to the designated safe place of refuge unless doing so would pose additional risks. When evacuation to the primary place of refuge is not possible, personnel will proceed to a designated alternate location and remain until further notification from the Tetra Tech FOL. Safe places of refuge will be identified prior to the commencement of site activities by the SSO and will be conveyed to personnel as part of the pre-activities training session. This information will be reiterated during daily safety meetings. Whenever possible, the safe place of refuge will also serve as the telephone communications point for that area. During an evacuation, personnel will remain at the refuge location until directed otherwise by the Tetra Tech FOL or the on-site Incident Commander of the Emergency Response Team. The FOL or the SSO will perform a head count using the site sign in sheet for accountability to account for and to confirm the location of site personnel. Emergency response personnel will be immediately notified of any unaccounted personnel. The SSO will document the names of personnel onsite (on a daily basis) in the site Health and Safety Logbook. This information will be utilized to perform the head count in the event of an emergency.

Evacuation procedures will be discussed during the pre-activities training session, prior to the initiation of project tasks. Evacuation routes from the site and safe places of refuge are dependent upon the location at which work is being performed and the circumstances under which an evacuation is required. Additionally, site location and meteorological conditions (i.e., wind speed and direction) may dictate evacuation routes. As a result, assembly points will be selected and communicated to the workers relative to the site location where work is being performed. Evacuation should always take place in an upwind direction from the site.

2.6 EMERGENCY CONTACTS

Prior to initiating field activities, personnel will be thoroughly briefed on the emergency procedures to be followed in the event of an accident. Table 2-1 provides a list of emergency contacts and their associated telephone numbers. This table must be posted where it is readily available to site personnel. Facility maps should also be posted showing potential evacuation routes and designated meeting areas.

Any pertinent information regarding allergies to medications or other special conditions will be provided to medical services personnel. This information is listed on Medical Data Sheets filed onsite (see Attachment III). If an exposure to hazardous materials has occurred, provide hazard information from Medical Data Sheet to medical service personnel.

The Lockheed Martin Project Lead shall be contacted immediately in the event of a fatal or serious injury, and unpermitted environmental release, or any ESH incident that is likely to generate significant publicity or an adverse situation for Lockheed Martin. Detailed requirements are describe in Section 1.15 of the LM Handbook (Attachment I).

FIRE PREVENTION AND PROTECTION

In the event of a fire or explosion, procedures will include immediately evacuating the site (air horn will sound for a single continuous blast), and notification of local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

Fire Prevention

The major workplace fire hazards are flammable liquids and fuels, motorized vehicles, and equipment. Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases away from oxidizers.
- No smoking in the EZ or any work area.
- No hot work without a properly executed hot work permit.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.
- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 5 pounds ABC located on all heavy equipment, in the on-site office, and near all hot work activities.
- Monthly inspections of all fire extinguishers.

Fire Protection

A map of all fire extinguisher locations will be developed. The person responsible for the maintenance of fire prevention and/or control equipment is the SSO. The person responsible for the control of fuel source hazards is the SSO.

2.7 OVERT CHEMICAL EXPOSURE

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Safety Data Sheet (SDS) or recommended by the Corporate Medical Consultant will be followed, when necessary. .

- SKIN AND EYE CONTACT: Use copious amounts of water. Rinse affected areas thoroughly, then provide appropriate medical attention. Eyes and skin should be rinsed for 15 minutes upon chemical contamination.
- INHALATION: Move to fresh air. Decontaminate and transport to hospital or local medical provider.

- INGESTION: Decontaminate and transport to emergency medical facility.
- PUNCTURE WOUND OR LACERATION: Decontaminate and transport to emergency medical facility.

In the event of an emergency not requiring 9-1-1, LMC facility personnel should be contacted in the order presented on Table 2-1.

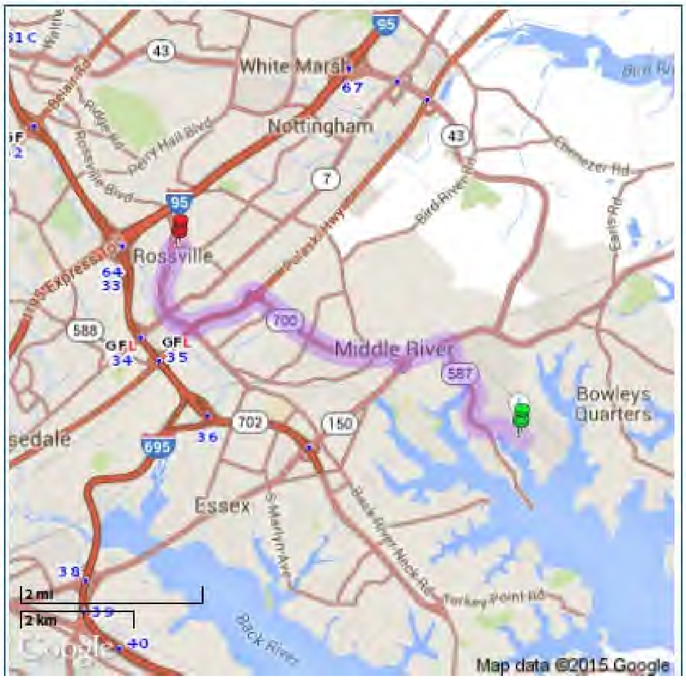
TABLE 2-1

**EMERGENCY CONTACTS
LMC MARTIN STATE AIRPORT
MIDDLE RIVER, MARYLAND**

AGENCY	TELEPHONE
EMERGENCY (Police, Fire, and Ambulance)	**911**
LMC Project Lead, Paul Calligan	(240) 676-5392
Airport Operations Manager Charles M. Baublitz	(410) 682-8831
Airport Director Al Pollard, A.A.E	(410) 682-8800
Mike Musheno	(410) 682-1315 (Office) (610) 656-4012 (Cell)
Maryland Air National Guard Lt Col Peter Loebach	(410) 918-6486
Franklin Square Hospital	(443) 777-7000
John Hopkins Bayview Hospital (Chemical Exposure Decontamination)	(410)-550-0350
Chemtrec	(800) 424-9300
National Response Center	(800) 424-8802
Project Health Physicist (PHP), Lawson Bailey	(803) 641-6326 (Office) (706) 830-7530 (Cell)
Poison Control Center	(800) 222-1222
WorkCare	(888) 449-7787
Regional Manager, Michael Martin	(301) 528-3022
Tetra Tech Health and Safety Manager (HSM), Jim Laffey	(412) 921-8678
Tetra Tech Project Health and Safety Officer (PHSO), Clyde Snyder	(412) 921-8904 (Office) (724) 516-0907 (Cell)
Tetra Tech Radiation Site Officer (RSO), Lawson Bailey or Amy Stanford	(706) 830-7530 or (706) 832-7394
Miss Utility Maryland/DC	1-800-257-7777

2.8 EMERGENCY ROUTE TO HOSPITAL

FIGURE 2-1
ROUTE TO FRANKLIN SQUARE HOSPITAL CENTER



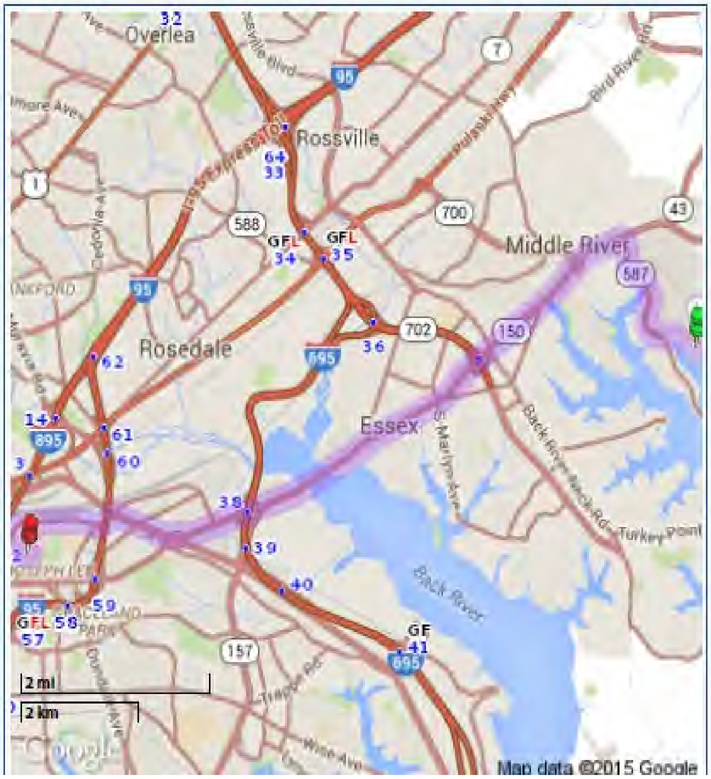
From: **701 Wilson Point Road, Middle River, Maryland, United States**
To: **MedStar Franklin Square Medical Center, Franklin Square Drive, Rosedale, MD, United States**
Total Distance: **6.0 miles (9.7km)**
Total Estimated Time: **0 hr., 11 mins.**

Directions

701 Wilson Point Road, Middle River, Maryland, United States to MedStar Franklin Square Medical Center, Franklin Square Drive, Rosedale, MD, United States
Distance: 6.0 miles (9.7km) Time: 0 hrs., 11mins.

1. Head northwest on Strawberry Point Rd toward Dogwood Dr - Drive for 0.4 miles.
2. Slight right onto Wilson Point Rd - Drive for 1.1 miles.
3. Turn left onto Eastern Blvd - Drive for 0.4 miles.
4. Take the ramp to US 40 - Drive for 0.2 miles.
5. Merge onto Martin Blvd - Drive for 1.7 miles.
6. Keep left at the fork, follow signs for US 40 W and merge onto US-40 W - Drive for 1.0 miles.
7. Turn right onto Rossville Blvd - Drive for 1.1 miles.
8. Turn right onto Franklin Square Dr - Drive for a short distance.

FIGURE 2-2
ROUTE TO JOHNS HOPKINS BAYVIEW HOSPITAL



From: **701 Wilson Point Road, Middle River, MD, United States**
To: **4940 Eastern Avenue, Baltimore, MD 21224, USA**
Total Distance: **9.4 miles (15.1km)**
Total Estimated Time: **0 hr., 18 mins.**

Directions

701 Wilson Point Road, Middle River, MD, United States to 4940 Eastern Avenue, Baltimore, MD 21224, USA
Distance: 9.4 miles (15.1km) Time: 0 hrs., 18mins.

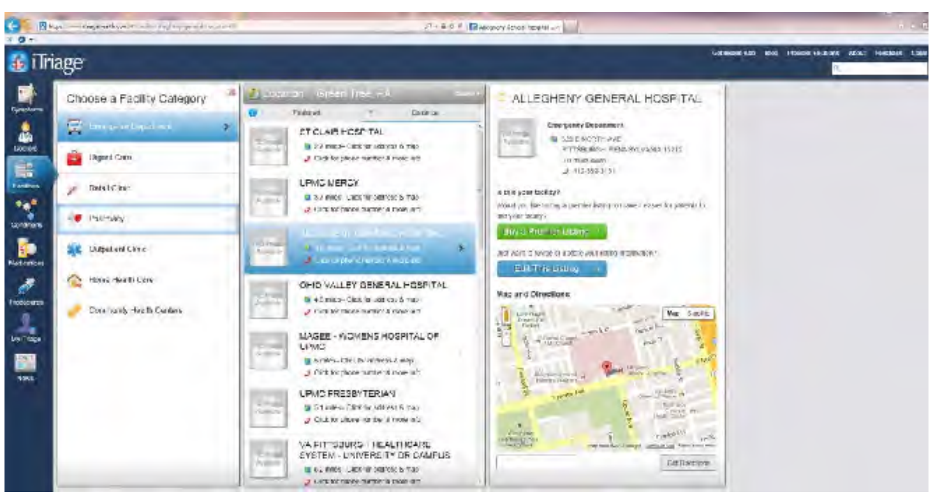
1. Head northwest on Strawberry Point Rd toward Dogwood Dr - Drive for 0.4 miles.
2. Slight right onto Wilson Point Rd - Drive for 1.1 miles.
3. Turn left onto MD-150 W/Eastern Blvd Continue to follow MD-150 W - Drive for 5.5 miles.
4. Merge onto MD-151 N/North Point Blvd via the ramp to Erdman Ave - Drive for 0.8 miles.
5. Turn left onto Kane St - Drive for 0.2 miles.
6. Slight right onto E Lombard St - Drive for 1.0 miles.
7. Turn left onto Bioscience Dr - Drive for 0.3 miles.
8. Turn left onto Nathan Shock Dr - Drive for a short distance.

2.9 EMERGENCY ALERTING AND ACTION/RESPONSE PROCEDURES

Tetra Tech personnel will be working in close proximity to each other at Lockheed Martin MSA. As a result, hand signals, voice commands, and line of site communication will be sufficient to alert site personnel of an emergency.

If an emergency warranting evacuation occurs, the following procedures are to be initiated:

- Initiate the evacuation via hand signals, voice commands, or line of site communication
- Report to the designated refuge point where the FOL will account for all personnel
- Once non-essential personnel are evacuated, appropriate response procedures will be enacted to control the situation.
- Notify Lockheed Martin
- Locate a hospital that has decontamination capabilities and can provide care to chemical-exposed personnel. If employees are injured due to chemical contamination the nearest medical facility with the capability to decontaminate exposed individuals is John Hopkins Bayview Hospital at 4940 Eastern Ave. Baltimore Maryland (See Figure 2-2 for directions).
- Describe to the FOL (FOL will serve as the Incident Coordinator) pertinent incident details.
- If possible, have a smartphone app such as iTriage downloaded on field phones and ensure field crews understand how the app works. Available at: iTriage (https://www.itriagehealth.com)
- iTriage can provide routes to the selected medical facility. A Hospital Map is also provided in Figure 2-1



In the event that site personnel cannot mitigate the hazardous situation, the FOL and SSO will enact emergency notification procedures to secure additional assistance in the following manner:

Dial 911 and call other pertinent emergency contacts listed in Table 2-1 and report the incident. Give the emergency operator the location of the emergency, the type of emergency, the number of injured, and a brief description of the incident. Stay on the phone and follow the instructions given by the operator. The operator will then notify and dispatch the proper emergency response agencies.

2.10 PERSONAL PROTECTIVE EQUIPMENT (PPE) AND EMERGENCY EQUIPMENT

A first-aid kit, eye wash units (or bottles of disposable eyewash solution) and fire extinguishers (strategically placed) will be maintained onsite and shall be immediately available for use in the event of an emergency. This equipment will be located in the field office as well as in each site vehicle. At least one first aid kit supplied with equipment to protect against bloodborne pathogens will also be available on site. Personnel identified within the field crew with bloodborne pathogen and first-aid training will be the only personnel permitted to offer first-aid assistance.

Safety eyewear meeting American National Standards Institute (ANSI) Z87.1 is required in areas designated as “Eye Protection Required” and is also required on all jobs where a potential injury to the eye is possible whether or not the area is posted.

Safety shoes and boots which meet the new ASTM International standards, F 2412, Test Methods for Foot Protection, and F 2413, Specification for Performance Requirements for Protective Footwear, have replaced the former ANSI Z41 standard, Standard for Personal Protection-Protective Footwear, which has now been withdrawn. Both of the new ASTM standards are under the jurisdiction of ASTM Committee F13 on Pedestrian/Walkway Safety and Footwear. The American National Standards Institute’s Z41 Committee on Personal Protection-Protective Footwear has merged into ASTM International’s Committee F13. The new ASTM standards contain minimal changes from the withdrawn ANSI Z41 1999 standard with regard to test methodology. The new standards F 2412 and F 2413 will permit the continued use of safety and performance standards previously provided in the ANSI document, which has been an important part of worker safety since 1967. The new standards continue the long-standing effort to help protect against toe, metatarsal and foot bottom injuries. The new ASTM protective footwear standards are enhanced with expanded information on upper class 50 and class 75 toe protection performance requirements.

Appropriate NIOSH-approved respiratory protective devices must be worn when applicable state and/or federal action levels or OSHA permissible exposure levels are exceeded. Appropriate air monitoring and respiratory protection equipment will be supplied and maintained if inhalation hazards are anticipated and a respiratory protection adhering to all state and federal regulations implemented.

Hearing protection must be worn in all areas posted to indicate high noise level or where employees are exposed to noise levels in excess of the OSHA action level (85 dBA over an 8-hour time-weighted average or a dose of fifty percent).

Protective clothing such as suits, aprons, boots or gloves shall be worn where there is a hazard to the body through dermal contact with chemicals, dusts, heat or other harmful agents or conditions.

Hard hats meeting the ANSI Z89.1 Standard will be worn in all areas where there is danger of impact to the head or hazard from falling or moving objects.

All personal protective clothing and equipment will be used and approved as detailed in Section 3.1 of the LM Handbook (Attachment I).

2.11 HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

Tetra Tech and subcontractor personnel conducting work at Lockheed Martin will adhere to Title 29, Code of Federal Regulations, Section 1910.120 – Hazardous Waste Operations and Emergency Response or the applicable state OSHA standards.

Tetra Tech and/or subcontractor personnel will to perform periodic work area inspections to determine the effectiveness of the site safety and health plan and to identify and correct unsafe conditions in the work area. These inspections shall be documented and available to Lockheed Martin upon request for review.

The requirements and regulations described in Section 3.20 of the LM Handbook (Attachment I) will be adhered to.

2.12 DECONTAMINATION PROCEDURES / EMERGENCY MEDICAL TREATMENT

During any site evacuation, decontamination procedures will be performed only if doing so does not further jeopardize the welfare of site workers. Decontamination will be postponed if the incident warrants immediate evacuation. However, it is unlikely that an evacuation would occur which would require workers to evacuate the site without first performing the necessary decontamination procedures.

Tetra Tech personnel will perform rescue operations from emergency situations and may provide initial medical support for injury/illnesses requiring only "Basic First-Aid" level support, and only within the limits of training obtained by site personnel. Basic First-Aid is considered treatment that can be rendered by a trained first aid provider at the injury location and not requiring follow-up treatment or examination by a physician (for example; minor cuts, bruises, stings, scrapes, and burns). Personnel providing medical assistance are required to be trained in First-Aid and in the requirements of OSHA's Bloodborne Pathogen Standard (29 CFR 1910.1030). Medical attention above First-Aid level support will require assistance from the designated emergency response agencies. Attachment II provides the procedure to follow when reporting an injury/illness, and the form to be used for this purpose.

2.13 WORKCARE INCIDENT INTERVENTION PROGRAM

The WorkCare Incident Intervention program is an injury and illness management tool that provides 24/7 immediate telephone access for Tetra Tech employees to access a WorkCare occupational medical provider. Their clinical staff of nurses and doctors will intervene on behalf of the Tetra Tech employee after a workplace injury and illness. The goal of the program is to help make sure the employee receives proper care with effective outcomes.

When this service is used within the first hour of an incident, known as the “golden hour,” the clinical team has the ability to guide the proper course of action so that medical evaluation and treatment are rendered appropriately. This early intervention service provides the right care, at the right time, in the proper setting.

At the time of a workplace injury or illness, the FOL/SSO calls the WorkCare toll free telephone number – (888) 449-7787. The FOL/SSO then provides information on the type of incident, possible cause, and the scope of the situation.

The WorkCare clinician will provide:

- An evaluation of the incident
- Direction on the appropriate course of action
- Consults with the employees treating physician to design a quality care treatment plan

2.14 INJURY/ILLNESS REPORTING

If any Tetra Tech personnel are injured or develop an illness as a result of working on site, the Tetra Tech “Incident Report Procedure” (Attachment II) must be followed. Following this procedure is necessary for documenting of the information obtained at the time of the incident.

Any pertinent information regarding allergies to medications or other special conditions will be provided to medical services personnel. This information is listed on Medical Data Sheets filed onsite. If an exposure to hazardous materials has occurred, provide information on the chemical, physical, and toxicological properties of the subject chemical(s) to medical service personnel**.**

Tetra Tech personnel will contact the LMC personnel in the order presented in Table 2-1 in the event of a fatality injury, environmental release (spill), near-miss incident, or an ESH incident that is likely to generate significant publicity. A written report of the incident/injury/spill and corrective action(s) must be submitted to LMC personnel within one (1) day of the incident.

Section 8.1 of the LM Handbook (Attachment I) describing the requirements of accident, injury, illness and incident reporting will be addressed.

2.14.1 TOTAL Incident Reporting System

TOTAL is Tetra Tech's online incident reporting system. Use TOTAL to directly report health and safety incidents, notify key personnel, and initiate the process for properly investigating and addressing the causes of incidents, including near-miss events. An incident is considered any unplanned event. It may include several types of near misses, events where no loss was incurred, or incidents that resulted in injuries or illness, property or equipment damage, chemical spills, fires, or damage to motor vehicles.

A copy of the TOTAL incident reporting form is included in Attachment II. TOTAL is an intuitive system that will guide you through the necessary steps to report an incident within 24 hours of its occurrence. TOTAL is a tool helps Tetra Tech to better track incidents, analyze root causes, implement corrective action plans, and share lessons learned.

TOTAL is maintained on the Tetra Tech Intranet site at https://my.tetratech.com/

Once on the "My Tetratech" site, TOTAL can be found under the Health and Safety tab, Incident Reporting section, select "Report an Incident (TOTAL)." This will connect you directly to TOTAL. TOTAL can also be accessed directly from the internet using the following web address: http://totalhs.tetratech.com/

Note: When using the system outside the Tetra Tech intranet system or when operating in a wireless mode, a VPN connection will be required. The speed of the application may be affected dependent upon outside factors such as connection, signal strength, etc. Enter the system using your network user name and password. The user name should be in the following format - TT\nickname.lastname.

2.15 DRILL/INCIDENT AFTER ACTION CRITIQUE

The FOL may conduct a drill or exercise to test the Emergency Action Plan. A critique with the site personnel after each drill or incident will be conducted. This critique provides a mechanism to review the incidents and exercises or drills to determine where improvements can be made. For incidents recorded in TOTAL, the FOL will utilize the Lessons Learned component for the critique.

3.0 SITE BACKGROUND

3.1 SITE HISTORY

The LMC MSA is located at 2323 Eastern Boulevard in Middle River, Maryland. The site consists of approximately 180 acres of land and twelve main buildings. The subject property also includes perimeter parking lots, an athletic field, Lot D (presently a vacant lot with a concrete foundation for former Building D), a trailer and parts storage lot, and a vacant waterfront lot. The site is bounded by Eastern Boulevard (Route 150) to the north, Dark Head Creek to the south, Cow Pen Creek to the west, and Martin State Airport to the east.

The Martin State Airport (MSA) is located at 701 Wilson Point Road in Middle River, Maryland, and is bounded by Frog Mortar Creek to the east and Stansbury Creek to the west. Both creeks join into Chesapeake Bay to the south of the airport. With surface water bodies surrounding most of MSA, the site can be considered a small peninsula.

Historically, MSA was owned and operated by the Glenn L. Martin Company from approximately 1929 to 1975. Glenn L. Martin Company is the predecessor to Martin Marietta; Lockheed and Martin Marietta merged in 1996 to form Lockheed Martin Corporation. Since the 1950’s the Maryland Air National Guard has leased land at the northeastern portion of the airport just north of the MSA site being investigated by LMC. In 1975, the airport was sold to the Maryland Aviation Administration (MAA), an agency within the Maryland Department of Transportation.

Currently, LMC is completing voluntary investigations conducted under the Maryland Department of the Environment (MDE) Environmental Restoration and Redevelopment program on a 50 acre portion of the MSA. This study is in support of the characterization of the 50 acre area.

Martin State Airport is an active airport, operated by the Maryland Aviation Administration. It is comprised of 747 acres, and is described by the MAA as a General Aviation Reliever Airport.

3.2 STRAWBERRY POINT AND GREATER STRAWBERRY POINT FACILITY

Strawberry Point (SP) is located within the confines of the MSA at the southern tip of the peninsula between the confluence of Stansbury Creek and Frog Mortar Creek. SP can be accessed from Eastern Avenue by traveling on Wilson Point Road and entering through a secured unmanned gate. The previously investigated, SP wooded area is located at the southwest termi of the peninsula and covers approximately 25 acres. The wooded area is bounded by earthen berms near the water line with thick brush and trees covering the entire area. Much of the SP wooded area was filled during the 1940’s reportedly from deposition of dredge spoils from Stansbury Creek and Frog Mortar Creek. A locked gate controls the entrance to the wooded area. The remainder of the area is currently being investigated, referred to as GSP, is a cleared and partially developed 75-acre area that houses a seaplane ramp, hangar, tank farm, police building and other maintenance buildings extending from the southern end of peninsula to the northern end bordering Taxiway J and eastward from Stansbury Creek to the Taxiway F. The airport runway is located northeast of the GSP.

Greater Strawberry Point was leased from the Glenn L. Martin Company by the Department of Navy on December 23, 1943. At that time, the Navy used the facility and the supporting structures, including a large hangar, for seaplane maintenance, launching, and recovery operations. During Navy occupancy, the former hangar and surrounding GSP area was known as the Naval Weapons Industrial Reserve Plant No. 148. Beginning on December 16, 1963, the Air Force occupied the facility (Permit No.1-N-MD-714) for a brief period. During the Department of Defense (DOD) usage (Navy and Air Force operations), the southern portion of the GSP near the wooded portion of the site contained more than 10 buildings. These included the Beach House (Building No. 3), the Pumping Station (Building No. 4), the Chlorination Station (Building No. 5), two Power Fence Service Houses (Building No. 6 and No. 9), Solvent Storage (Building No. 7), Equipment Storage Building (Building No. 8), Power Fence Switch House (Building No. 10), Delivery Hangar (Building ND/No. 11), and a general Storage Building (Building No. 12). A tank farm containing aboveground storage tanks (ASTs), used for the storage of aircraft fuels, was located adjacent to the wooded area near the southernmost tip of the developed area.

During the same time period (1940s to 1960s), the northern portion of greater GSP was developed with several improvements related to the Naval weapons research. These structures included the Induction Test Building (Building No. 13), Control House (Building No. 14), Noise Suppression Building (Building No. 15), Jet Test Shed (Building No. 16), Storage Building (Building No. 17), Propulsion Test Building (Building No. 22), Compressor Shed (Building No. 23), Engine Test Building (Building No. 24), and Vibration Slosh Test Building (near location of current ground surface mounding). A missile testing area was located along a straight road northwest of the Propulsion Test Building that included the Hyper-therm Test Facility (Building No. 25), Propellant Storage Shed (Building No. 18), Furnace Building (Building No. 19), Acetylene Storage Shed (Building No. 20), Vanguard Tower (Building No. 21), Block House (Building No. 26), and three Coupon Test Sheds (Building No. 27, No. 28, and No. 29).

Further to the northwest, along a former dirt road connecting Strawberry Point Road to the historic airfield maintenance storage building (Building No. 37), several buildings dedicated to nuclear research and testing were constructed. Two main research buildings were designated as the Critical Test Building (Building No. 36/Building. KC) and the Radioisotope Lab (Building No. 35/Building KJ). These research labs operated under Nuclear Regulatory Commission (NRC) permits. These buildings were decontaminated in the late 1980s and NRC terminated the licenses in 1995. A third building was located just south of the labs and was known as the Liquid Metal Test Facility (Building No. 34). Additional buildings near the nuclear labs included several sheds that were removed by Martin-Marietta Corporation to construct Taxiway J, including an organic material storage shed.

Available records indicate that two underground storage tanks (USTs) were installed during DOD's usage of the southern GSP facilities. A 10,000-gallon, heating oil UST was located adjacent to the hangar (Building ND) to provide fuel to the hangar's heating system. This UST was closed-in-place in 1987 (post-DOD period) as the hangar's heating system was converted from fuel oil to natural gas. Both the lease and permit expired on November 30, 1967.

Just prior to that date, the Glenn L. Martin Company merged with Marietta Corporation to form Martin-Marietta Corporation. On June 30, 1975, MSA was conveyed to the MDOT. The State of Maryland currently uses MSA to house and maintain Medivac Units and Helicopters. The southern portion of GSP is occupied by the Baltimore County Marine Police. Eleven USTs have been removed from MSA since 1983 and no evidence of leakage was reported. The large hangar (designated as Building ND) was demolished in 1989, and another hangar that currently houses the Maryland State Police was constructed in 1989 and 1990. GSP currently contains a tank farm consisting of 12 ASTs containing jet fuel, fuel oil, and gasoline along with a pump house and other ancillary buildings currently used by the airport. In addition, as many as six ASTs present at the tank farm are in use by other tenants. An oil spill was reported during the construction of the new hangar in 1989 and 1990, when a fuel oil return and receiving line to two 12,000-gallon ASTs located in the tank farm was severed.

3.3 DUMP ROAD SITE

Environmental investigations of the Martin State Airport (MSA) Dump Road Area (DRA) began in 1989 when the Maryland Department of the Environment (MDE) conducted a preliminary assessment of MSA. During the 1930s and 1950s, the Glenn L. Martin Aircraft Company reportedly used a sand pit under the current Taxiway Tango to dump spent battery acid, acid type strippers and other acidic solutions, dredge spoils, and construction debris. The United States Environmental Protection Agency (USEPA) concluded, after a review of the preliminary assessment of the area, that no signs of waste disposal were apparent, and the site was classified as "No Further Remedial ActionPlanned.

In July 1991, four drums containing dried zinc-chromate paint were uncovered during installation of underground electric cables adjacent to Taxiway Tango west of Taxiway Tango. The discovery of these four drums prompted MDE to order the Maryland Aviation Administration (MAA) [the owners of MSA at that time] to perform additional studies (MDE, 1992 and 1997). The MAA conducted additional studies from 1991-1998, which included geophysical surveys to locate and identify buried materials, and sampling and chemical analyses of soil, groundwater, surface water, and sediment. These early investigations identified four areas of concern: (1) the Taxiway Tango Median Anomaly Area, (2) the Drum Area, (3) two ponds

(Pond 1 and Pond 2), and (4) the Petroleum Hydrocarbon Area. These four areas became the focus of subsequent studies when chemical constituent impacts to soil, pond sediment, and groundwater became apparent. Trichloroethene (TCE) and TCE-degradation daughter products were detected throughout the investigation area, with the highest concentrations appearing in the upper and intermediate surficial aquifer. Previously detected groundwater concentrations of TCE at MSA range from 0.5 micrograms per liter (μg/L) to more than 100,000 μg/L. 1,4-Dioxane, typically co-located in groundwater with chlorinated solvents, is also considered a chemical of concern. TCE-degradation daughter products (e.g., dichloroethenes and vinyl chloride) are typically co-located with TCE at MSA. Lockheed Martin Corporation (Lockheed Martin), the successor firm of the Glenn L. Martin Aircraft Company, conducted a remedial investigation (RI) [Tetra Tech, 2012a] from 1999–2009 and supplemental work at the DRA from 2010 through the present to further delineate the extent of soil, groundwater, and pond sediment chemical impacts indicated by earlier studies.

4.0 SCOPE OF WORK

This section summarizes the specific tasks that are to be conducted as part of this scope of work and covered by this HASP. Any modifications (additions or substantive changes) to these specified tasks will be a change in scope, which will require a review and appropriate modification of this HASP. In such an event, the PM is responsible for communicating the nature of the change to the HSM prior to the initiation of any onsite activity associated with the scope of work change. The HSM is then responsible for assuring that appropriate changes to this HASP are made.

The planned tasks covered by this HASP include the following:

- Mobilization/demobilization activities
- Soil lithology and groundwater assessment using Cone Penetrometer Testing (CPT) equipped with a Membrane Interface Probe (MIP)
- Confirmatory Direct Push Technology (DPT) soil and groundwater assessment
- Installation and development of groundwater monitoring wells and well points via Direct Push Technology
- Surveying new monitoring wells
- Multi-media Sampling
  - Groundwater Samples
  - Groundwater Levels
  - Aquifer Samples
  - Soil Samples
  - Sediment Samples
  - Storm Water Samples
  - Surface Water Samples
- Wetland Survey
- Dump Road Site
  - Pre-excavation soil/waste profile sampling
  - *In situ* DPT soil sampling
  - Excavation of soils
  - Soil disposal
  - Post-characterization confirmatory sampling
  - Excavation backfilling
  - Passive Flux Meter Grid Deployment and Retrieval
- Concrete Coring
- Passive Soil Gas survey
- Gamma Walk-over survey

- Monitor Gamma Radiation
- Aquifer pump testing
- Geophysical Surveying
- Test pit excavation and soil sampling
- Surface and Landscaping Repair
- Decontamination of heavy equipment and sampling equipment
- IDW Management

For more detailed description of the planned tasks associated with LMC MSA, refer to the Work Plan (WP). Any tasks to be conducted outside of the elements listed here will be considered a change in scope requiring modification of this document. All requested modifications to this document will be submitted to the HSM by the PM or a designated representative.

No other activities are anticipated to be necessary. If it becomes apparent that additional or modified tasks must be performed beyond those listed above, the work is not to proceed until the FOL or SSO notifies the Project Manager and the HSM, so that any appropriate modifications to this HASP can first be developed and communicated to the intended task participants.

5.0 IDENTIFYING AND COMMUNICATING TASK-SPECIFIC HAZARDS AND SAFE WORK PRACTICES

The purpose of this section is to identify the anticipated hazards and appropriate hazard prevention/hazard control measures that are to be observed for each planned task or operation. These topics have been summarized for each planned task through the use of task-specific Activity Hazard Analysis (AHAs), which are to be reviewed in the field by the SSO with all task participants prior to initiating any task. Additionally, potential hazard and hazard control matters that are relevant but are not necessarily task-specific are addressed it the following portions of this section.

Section 6.0 presents additional information on hazard anticipation, recognition, and control relevant to the planned field activities.

In the event of an emergency, not requiring 911, LMC/MSA facility personnel should be contacted in the order presented on Table 2-1.

5.1 GENERAL SAFE WORK PRACTICES

In addition to the task-specific work practices and restrictions identified in the AHA's (Attachment IV) the following general safe work practices are to be followed when conducting work on-site.

- Eating, drinking, chewing gum or tobacco, taking medication, or smoking in contaminated or potentially contaminated areas or where the possibility for the transfer of contamination exists is prohibited.
- Wash hands and face thoroughly upon leaving a contaminated or suspected contaminated area. If a source of potable water is not available at the work site that can be used for hands-washing, the use of waterless hands cleaning products will be used, followed by actual hands-washing as soon as practicable upon exiting the site.
- Avoid contact with potentially contaminated substances including puddles, pools, mud, or other such areas.
- Avoid, kneeling on the ground or leaning or sitting on equipment.
- Keep monitoring equipment away from potentially contaminated surfaces.
- Plan and mark entrance, exit, and emergency evacuation routes.
- Rehearse unfamiliar operations prior to implementation.

- Buddies should maintain visual contact with each other and with other on-site team members by remaining in close proximity to assist each other in case of emergency.

- Establish appropriate safety zones including support, contamination reduction, and exclusion zones.

- Minimize the number of personnel and equipment in contaminated areas (such as the exclusion zone). Non-essential vehicles and equipment should remain within the support zone.

- Establish appropriate decontamination procedures for leaving the site.

- Immediately report all injuries, illnesses, and unsafe conditions, practices, and equipment to the SSO.

- Observe co-workers for signs of toxic exposure and heat or cold stress.

- Inform co-workers of potential symptoms of illness, such as headaches, dizziness, nausea, or blurred vision.

- Prior to any onsite activities, a tailgate meeting will be conducted to discuss the activities and health and safety issues that are relevant to the activities.

5.2 DRILLING (HSA/DPT/LITTLE BADGER UNIT/ROTOSONIC) SAFE WORK PRACTICES

The following Safe Work Practices are to be followed when working near operating drilling equipment.

5.2.1 Before Drilling

- Identify underground utilities, buried structures, and aboveground utility lines before drilling. Tetra Tech, Inc. personnel will use the TtSOP Utility Locating and Excavation Clearance Standard Operating Procedure (Attachment VIII).

- Drill rigs will be inspected by the SSO or designee, prior to the acceptance of the equipment at the site and prior to the use of the equipment. Needed repairs or identified deficiencies will be corrected prior to use. The inspection will be accomplished using the Equipment Inspection Checklist provided in Attachment V. Additional inspections will be performed at least once every 10-day shift or following repairs.

- Check operation of the Emergency Stop/Kill Switch and/or the "Dead Man's" operational controls. These operational checks are required initially as part of the equipment pre-use inspection, and then periodically thereafter. Periodic checks are required at least weekly, or more frequently if recommended by the rig manufacturer.

- Ensure that machine guarding is in place and properly adjusted.

- Block drill rig and use out riggers/levelers to prevent movement of the rig during operations.

- The work area around the point of operation will be graded to the extent possible to remove any trip hazards near or surrounding operating equipment.

- The driller's helper will establish an equipment staging and lay down plan. The purpose of this is to keep the work area clear of clutter and slips, trips, and fall hazards. Mechanisms to secure heavy objects such as drill flights will be provided to avoid the collapse of stacked equipment.

- Potentially contaminated tooling will be wrapped in polyethylene sheeting for storage and transport to the centrally located equipment decontamination unit.

- Prior to each instance of engaging the HSA drill rig, the Driller will look to ensure that the drilling area is clear of personnel and obstructions, and verbally alert everyone in the area that the rig is about to be engaged.

- Prior to the start of boring operations, one individual will be designated at the person responsible for immediate activation of the emergency stop device (if applicable) in the event of an emergency. This individual will be made known to the field crew and will be responsible for visually checking the work area and verbally alerting everyone of boring operations prior to engaging the equipment.

5.2.2 During Drilling

- The Driller will ensure that an individual is constantly stationed at a location were the drill rig emergency stop switch can be immediately engaged.

- Minimize contact to the extent possible with contaminated tooling and environmental media.

- Support functions (sampling and screening stations) will be maintained a minimum distance from the drill rig of the height of the mast plus five feet or 35-feet for Rotosonic/HSA, 25-feet for DPT operations whichever is greater to remove these activities from within physical hazard boundaries.

- Only qualified operators and knowledgeable ground crew personnel will participate in the operation of the drill rig.

- During maintenance, use only manufacturer provided/approved equipment (i.e. auger flight connectors, etc.)

- In order to minimize contact with potentially contaminated tooling and media and to minimize lifting hazards, multiple personnel should move auger flights and other heavy tooling.

- Only personnel absolutely essential to the work activity will be allowed in the exclusion zone.

5.2.3 After Drilling

- Equipment used within the exclusion zone will undergo a complete decontamination and evaluation by the SSO to determine cleanliness prior to moving to the next location, exiting the site, or prior to down time for maintenance.

- Motorized equipment will be fueled prior to the commencement of the day's activities. During fueling operations equipment will be shutdown and bonded to the fuel source.

- When not in use drill rigs will be shutdown, and emergency brakes set and wheels will be chocked to prevent movement.

- The mast will be completely lowered and outrigger completely retracted during movement to decontamination or the next location.

- Areas subjected to subsurface investigative methods will be restored to equal or better than original condition. Any contamination that was brought to the surface by drilling or DPT operations will be removed and containerized. Physical hazards (debris, uneven surfaces, ruts, etc.) will be removed, repaired or otherwise corrected. In situations where these hazards cannot be removed these areas will be barricaded to minimize the impact on field crews working in the area.

5.2.4 Concrete Coring Operations

The following safe work practices will be employed during concrete coring operations:

- Identify underground utilities before commencing any concrete operations.
- Use wetting techniques to minimize dust and friction.
- When applying water to the core bit the operator should apply water until the slurry begins to look like heavily creamed coffee.
- Wear the well-fitting nitrile gloves (rather than cotton or leather gloves) when in coring.

- Wash and dry hands before putting on gloves and every time that you remove your gloves.
- Replace grossly contaminated or worn-out gloves.
- Make sure the coring machine is properly anchored.
- Standing on the machine may cause the bit to bind up in the hole
- Use the manufacturers recommended speed (revolutions per minute) for the diameter of the bit used.
- The coring machine will be inspected to insure housings; plugs; guards are intact, and the coring machine is in good operating order.
- If the power source to be employed is not through a Ground Fault Circuit Interrupter (GFCI) then a temporary GFCI plug extension shall be put in place.
- A shop vac or similar device also connected to the GFCI will be used to collect the water employed during the coring process. All water in the coring area will be cleaned to reduce the potential for slip, trip and falls. Place floor wet signs as necessary from all approach venues.
- The preferred method is to bolt the coring machine to the floor during coring operations. It is however acceptable to utilize sand bags or similar weighted devices to control movement during this activity.
- No open core holes will be permitted after the termination of the shift. All cores will be placed back in the holes or the holes will be fitted for their permanent casings for the sub-slab soil gas vapor monitoring points.
- All core holes finished with protective casings or finished using concrete will be finished to grade again to prevent slip, trips, and/or falls.

5.3 EXCAVATION –SAFE WORK PRACTICES

See Section 16.0 of this HASP.

5.4 PERMANENT SOIL GAS VAPOR MONITORING POINTS WITHIN BUILDINGS

If installation of permanent soil gas vapor monitoring points is conducted within buildings on site, soil gas monitoring points may need to be installed at various locations using a diesel powered DPT rig. If necessary, a gasoline or electric powered concrete coring machine may used if the DPT rig cannot push through the concrete floor.

Operation of diesel/gasoline powered equipment within enclosed areas such as buildings presents unique hazards particularly the inhalation of exhaust gasses, fumes, and dusts generated during concrete coring or soil boring. Additional hazards that may be present during these operations include, increased noise levels, contact with utilities, electrocution hazards (particularly if water is present), and the movement of heavy equipment.

The major gaseous products of both diesel and gasoline fueled engines are carbon monoxide and water, but lower percentages of carbon monoxide, sulfur dioxide, and nitrogen dioxides as well as low molecular weight hydrocarbons and their derivatives are also formed. Submicron-size particles are present in the exhaust emissions of internal combustion engines. The particles present in diesel engine exhaust are composed mainly of elemental carbon, absorbed organic material, and traces of metallic compounds. The particles emitted from gasoline engines are composed primarily of metallic compounds, elemental carbon and adsorbed organic material. However, the composition and quantity of the emissions from an engine depend mainly on the type and condition of the engine, fuel composition and additives, operating conditions, and emission control devices.

Short-term (acute) effects of workers exposed to high concentrations of exhaust gasses/fumes may include irritation of the eyes, nose, and throat; lightheadedness; heartburn; headache; weakness, numbness and tingling in the extremities; chest tightness; wheezing; and vomiting. Although there have been relatively few studies on the long-term health effects of exhaust gasses/fumes, the available studies indicate that they can be harmful to your health. According to the National Institute for Occupational Safety and Health (NIOSH), human and animal studies show that diesel/gasoline exhaust should be treated as a human carcinogen. Exposure to diesel/gasoline exhaust in combination with other cancer causing substances may increase your risk of developing lung or other forms of cancer. Some studies have suggested that workers exposed to diesel/gasoline exhaust are more likely to have chronic respiratory symptoms such as persistent cough and mucous, bronchitis, and reduced lung capacity than unexposed workers.

The follow controls may be used to minimize potential exposures to exhaust gases/fumes:

- Use flexible tailpipe or stack exhaust hoses to vent equipment exhaust gases/fumes to the outside.
- Use of general ventilation (roof vents, open doors and windows, roof fans, rollup doors, floor fans, etc.) to move air through the work area to facilitate dilution of airborne exhaust gases/fumes. If exhaust gas/fume concentrations cannot be diluted with existing general ventilation methods, use local exhaust ventilation devices (portable axial blowers, coppus blowers) to vent exhaust gases/fumes to the outside.
- If feasible, use grade 1K diesel fuels which burns more clearly than Diesel 1 fuels.
- All equipment must have regular maintenance and frequent tune ups including checks of the exhaust system to determine if leaks exist. All equipment will be inspected using the Equipment Inspection Checklist provided in Attachment V.
- Prolonged idling of machinery should be avoided.
- Minimize the number of personnel in the area where internal combustion engines are operating. Observe workers for signs and symptoms of exposure.
- Monitor the work area for airborne concentrations of carbon monoxide which will be used to control exposures to carbon monoxide and other exhaust gases – follow established action levels.
- Use wetting methods to suppress airborne dusts generated during concrete coring or soil boring within the building.

5.5 HAND AND POWER TOOL SAFE WORK PRACTICES

The following safe work practices will be employed during hand and power tool usage:

- All hand and power tools will be maintained in a safe condition.
- Electrical power tools shall be grounded or double insulated with proper assured equipment grounding inspections or Ground Fault Interrupter (GFI) circuit protection provided.
- Pneumatic power tools shall be secured to the hose or whip by some positive means.
- Only properly trained Contractor employees shall operate power-actuated tools.
- All grinding machines shall conform to OSHA and ANSI requirements.

Hand and power tool use procedures are detailed in Section 3.16 of the LM handbook and will be followed.

5.6 HOUSEKEEPING / CLEANUP

Housekeeping procedures described in Section 5 of the LM Handbook (Attachment I) will be addressed and the following housekeeping practices will be employed during this field effort:

- Ensure discharge permits and/or Stormwater Pollution Prevention Plans (if applicable) are available at the project job site.

- Tetra Tech and/or subcontractor personnel will clean up its respective work area(s) and maintain work areas free from all slip, trip, and fall hazards at all times.

- Debris shall be kept cleared from work areas, passageways, stairs, and in and around buildings or other structures. The work area must be left free from accumulation of waste and rubbish at the end of each work shift.

- Combustible scrap and debris shall be removed at regular intervals during the course of work. Safe means shall be provided to facilitate such removal.

- At the end of each working day and/or the conclusion of work being performed, the work area will be restored to the same degree of neatness as when work commenced.

- Tetra Tech and/or subcontractor will furnish necessary equipment and/or receptacles to remove waste and rubbish from the job site unless otherwise specified by Lockheed Martin.

5.7 SAFE BOATING PRACTICES (i.e., WORKING FROM WATER VESSELS/BARGES)

Offshore Passive Soil Gas survey activities will require site personnel to work from pontoon boats in tidal bodies of water. The Diving Company HASP for this operation is attached to this HASP in Attachment XIV. To avoid potential hazards associated with working on water (drowning), the field team shall employ lifelines (tie-off procedure), safety harnesses, when on the barge. U.S. Coast Guard (USCG) approved personal flotation devices (PFD) will be on hand for all participants and will be used. Due to the obvious hazards associated with working on water during inclement weather, field activities may be temporarily suspended or terminated at the discretion and direction of the FOL or SSO. Tetra Tech personnel will also follow the Tetra Tech procedures for working over water outlined in Standard Operating Procedure SWP 5-6 .

Refer to the Diver's HASP in Attachment XIV of this HASP.

5.7.1 U.S.C.G. Flotation Device Types

Use the following information to determine the proper type of U.S.C.G. PFD.

Off Shore Life Jacket (Type I, 22lbs buoyancy)

Type I life jacket is the best choice for rough or open waters. This type will float you the best and is favorable if rescue may be long in coming. This type will turn an unconscious person upright in the water. Though is bulky it does have a highly visible color for easier detection.

Near Shore Buoyant Vest (Type II, 15.5lbs buoyancy)

Type II is a good choice for calmer waters. It will turn most unconscious persons face-up in the water. Though it is less bulky than Type I, it is not intended for long hours in calm or rough water.

Flotation Aid (Type III, 15.5lbs buoyancy)

Type III is probably the most comfortable device offering more freedom of movement, such as water skiing or fishing, but is not intended for rough water. Also, an unconscious person may end up face-down in the water.

Throwable Devices (Type IV)

Throwable devices are intended for calm waters with heavy boat traffic where help is always close. It is not intended for unconscious persons or non-swimmers or long hours in the water. They are good backups for the other devices.

Site personnel shall wear Type III personal flotation devices in the event someone falls overboard, boats sinks or capsizes. Type IIIs were selected as they offer the most flexibility for working while still meeting minimum requirements for buoyancy. In situations where personal flotation devices cannot be worn due to the task to be conducted, the flotation devices shall be immediately available/accessible. It is recommended that personal flotation devices be continually worn during colder months due to the potential for hypothermia to restrict muscle movement and therefore, self-rescue and maintaining buoyancy. In addition, a single Type IV Throwable Flotation Device shall be maintained on board the boat with at least 90 feet of 3/8 polypropylene line.

When work activities take personnel within four feet of navigable waters edge personnel will have immediately accessible a lifeline with a throwing bag or Type IV flotation device facilitate extraction from the water. Personnel working on water's edge will do so using the buddy system to assist in rescue efforts, if needed.

Device	Type	Description
Off Shore Life Jacket	Type I 22lbs buoyancy	Best in rough or open waters. Floats best especially in long time rescue. Will turn unconscious upright. Bulky but highly visible.
Near Shore Buoyant Vest	Type II, 15.5lbs buoyancy	Good in calmer waters. Will turn most unconscious face-up. Less bulky. Not for long time rescue.
Flotation Aid	Type III 15.5lbs buoyancy	Most comfortable device offering more freedom of movement. Not intended for rough water. Unconscious may end up face-down
Throwable Devices	Type IV	Throwable devices for calm waters with heavy boat traffic where help is always close. Not for unconscious, non-swimmers or long hours. Good backups for the other devices.

5.7.2 U.S.C.G Boat Regulations

No person born on or after March 1, 1986 shall operate a vessel that is fitted with propulsion machinery of more than ten (10) horsepower on waterways unless the person has successfully completed a boating safety education program as approved by the USCG. Certain bodies of water in some states may also have local restrictions as to type and size of watercraft or motor horsepower, restricted use areas, boat speed, and times for use. The FOL is responsible for checking with appropriate local authorities to identify and address any additional requirements/restrictions.

The U.S.C.G. requires boats to have the following equipment on board:

- One personal flotation device per person
- A sound producing device such as an air horn or whistle which can be heard one half mile.

Speed Limits

Any motorboat or vessel operated within a harbor or inlet or any pond of other confined body of water shall not exceed 45 mph from sunrise to sunset and 25 mph during periods of darkness or restricted visibility. Lower speed limits may be regulated in certain areas.

Reckless and Negligent Operation

Negligent or grossly negligent operation of a vessel which endangers lives and/or property is prohibited by law. A civil penalty may be imposed by the Coast Guard for this offense under federal laws. An operator may be subjected to a fine of up to $5,000 and or imprisonment for up to one year, or both. The Maryland penalty is a fine of up to $500 for the first offense.

Some examples of actions that may constitute negligent or grossly negligent operation include but are not limited to:

- Operating in a swimming area
- Operating under the influence of alcohol or drugs.
- Excessive speed in the vicinity of other boats or in dangerous waters.
- Hazardous water skiing practices
- Bow riding, also riding on seatback, gunwale or transom.

Termination of Use

A Maryland Natural Resources Police Officer who observes a boat being operated in an unsafe condition and who determines that an especially hazardous condition exists may direct the operator to take immediate steps to correct the condition, including returning to port. Termination for unsafe use may be imposed for, but is not limited to:

- Insufficient number of USCG approved Personal Flotation Devices.
- Insufficient fire extinguishers.
- Overloading beyond manufacturer's recommended safe loading capacity.
- Improper navigation light display.
- Ventilation requirements for tank and engine spaces not met.

- Fuel leakage.
- Fuel in bilges.
- Improper backfire flame control.

Boating Accident Reports

The operator of any boat involved in an accident must stop, render assistance, and offer identification. An accident report must be made to the Department within 48 hours if:

- A person dies within 24 hours;
- A person loses consciousness or receives medical treatment beyond first aid or is disabled more than 24 hours;
- A person disappears from the vessel under circumstances that indicate death or injury.

Accidents must be reported within 10 days if damage to all vessels and other property totals more than $500.00 or an earlier report is not required. Running aground or hitting a fixed or floating object is considered a boating accident. Boating accident report forms (DNR-149) are obtainable from the Natural Resources Police. They must be submitted to the Natural Resources Police by the operator of the vessel or vessels involved. Accident reports are required by federal law and furnish information for use in accident prevention. Information from individual reports will not be publicly disclosed nor may the information be used in court.

Rendering Assistance

Federal law requires the operator of a vessel to provide assistance that can be safely provided to any individual in danger on the water. Persons who fail to provide assistance may be subject to fine or imprisonment.

Vessels required to be Registered in Maryland

All vessels, whether commercial or recreational, must be registered in Maryland if it is equipped with any kind of primary or auxiliary mechanical propulsion; if it is not currently documented with the U. S. Coast Guard; and if it is being used principally in Maryland. An owner of a federally documented vessel, though exempt from state numbering requirements, shall apply to the Maryland Department of Natural Resources for documented use decals, and is subject to the state excise tax requirements.

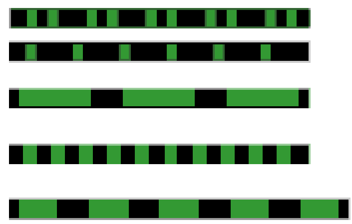
5.7.3 <u>Uniform State Waterway Marking System (USWMS)</u>

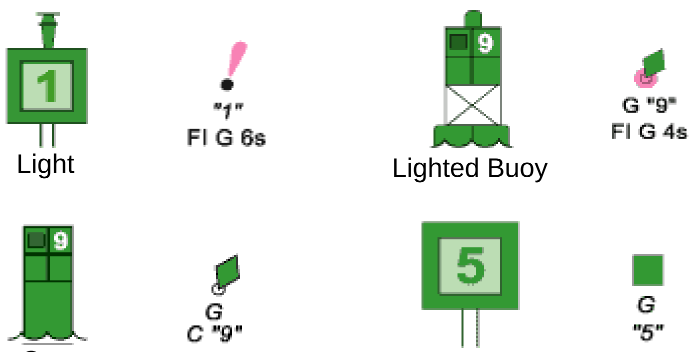
Lateral System (As Seen Entering From Seaward)

Port Side Odd Numbered Aids

Green Light Only

Flashing (2)
Flashing
Occulting
Quick Flashing
ISO



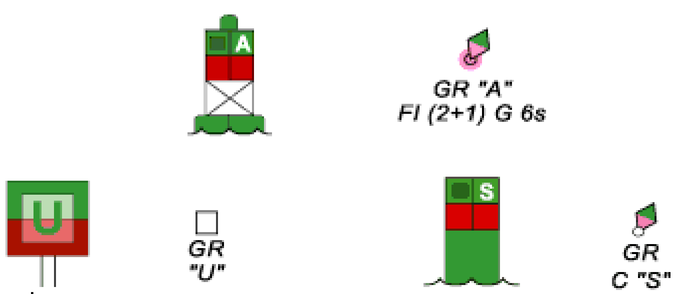


Light — Lighted Buoy — Can — Day beacon

Preferred Channel No Numbers-May Be Lettered
Preferred Channel To Starboard Topmost Band Green

Green Light Only

Composite Group Flashing (2+1)

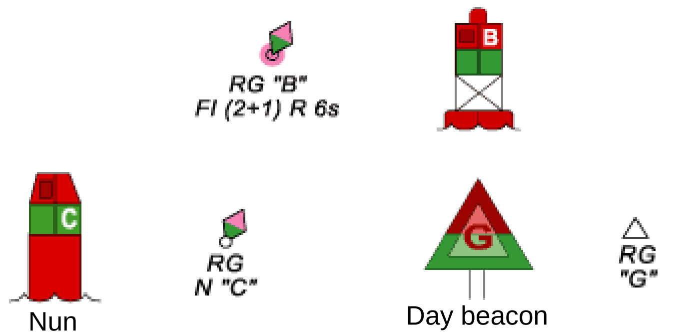


Day beacon — Can

Preferred Channel No Numbers-May Be Lettered
Preferred Channel To Port Topmost Band Red

Red Light Only

Composite Group Flashing (2+1)



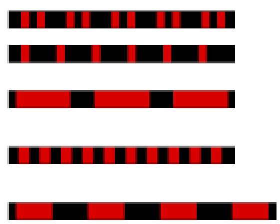
Starboard Side Even Numbered Aids

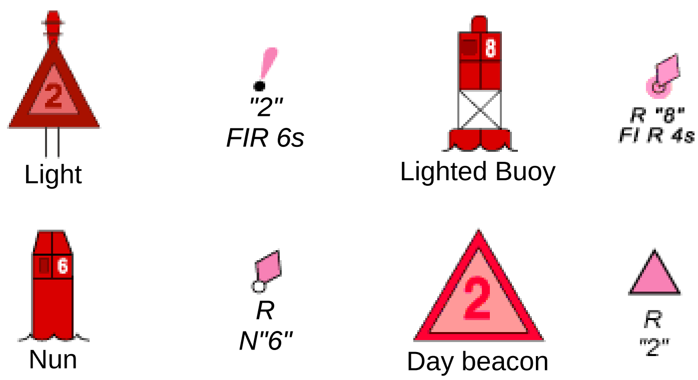
Red Light Only

Flashing (2)
Flashing
Occulting

Quick Flashing

ISO





Lateral Aids to Navigation generally indicates which side of an aid to navigation a vessel should pass when channels are entered from seaward. In the absence of a route leading from seaward, the conventional direction of buoyage generally follows a clockwise direction around landmasses. The most important characteristic of an aid is its color. The "3R" rule "Red Right Returning" is the essential rule of thumb for using the lateral system. This means that when entering one body of water from a larger body of water (i.e. returning to a harbor from a bay or sound); keep the red aids to starboard (right) side and green aids to port (left) side. In addition, each aid is numbered, and these numbers increase as entering from seaward.

Preferred Channel Marks are found at junctions of navigable channels and often mark wrecks or obstructions. A vessel may normally pass this aid on either side, but the top color band indicates the preferred channel. If the top band of the aid is red, it is treated as a red mark and kept to starboard as the vessel passes it while returning from sea. Caution: It may not always be possible to pass on either side of preferred channel aids to navigation. The appropriate nautical chart should always be consulted.

Lateral System

May show green reflector or light

Port Side

Solid Black Buoy
(Being replaced by Green Can Buoy)

Usually found in pairs
pass between these buoys

_ Looking upstream _

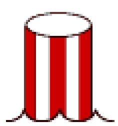
May show red reflector or light

Starboard Side

Solid Red Buoy
(Being replaced by Red Nun Buoy)

Cardinal System

May show white reflector or light

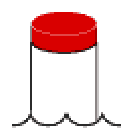


Red striped
white buoy

Do not pass between buoy
and nearest shore

Black topped
white buoy

Pass to north or east of
buoy



Red topped
white buoy

Pass to south or west of buoy

Safe Boating Practices:

The following are recommended safe boating practices to be employed prior to the commencement of sediment sampling. Ensure that:

- Fuel tanks are full
- The fuel line and gas tanks are not leaking
- Battery is charged
- If it is an enclosed engine compartment make sure it is free of fumes
- Motor in good operating condition
- Lights and horn are in working order
- Boat is checked for leaks
- Weather and water conditions suitable for the planned activity
- All gear and supplies properly stowed and secure

- Propeller in good condition, lower unit free of weeds and debris
- Passengers are briefed on emergency procedures--their PFDs should be checked for fit
- Operator alert, sober and ready
- Someone else knows how to operate the boat
- Be observant for other boats and/or subsurface obstacles.
- Do not moor to a navigation aid or regulatory marker.
- You understand the rules that describe who has the "right of way" for specific situations. When in doubt, "give way."

5.7.3.1 Boating Safety Precautions

The Captain has the authority to suspend field operations if it is determined conditions in the field are unsafe. Furthermore, the Captain is responsible for:

- Ensuring the Boat is in safe operating condition meeting the minimum safe USCG Vessel Certification.
- Providing the necessary safety equipment on the boat including:
  - A sufficient number of Personal Floatation Devices.
  - Emergency rescue devices to extract persons from the water.
  - Emergency alerting/alarm devices to signal when in distress.
  - Fire Extinguishers/First Aid Kit/Back up Bilge pumps as appropriate for the vessel type.

The Captain will operate the boat in a safe manner within the guidelines for operations in and around Cow Pen Creek.

5.7.3.2 Man Overboard (MOB) Procedures

When working on the boat or support vessels or when working on shore near water’s edge, the possibility exists that a person could fall into the water. This can be a serious and even potentially-fatal event, especially if it were to occur when the ambient conditions and water temperatures are cold, which are expected conditions during the course of the dredging activities and possibly other tasks as well

Since no work on water is to be conducted by one person alone, there will always be at least one other person present if such an event should occur who initiate a rescue response effort (i.e., the “buddy system” will be observed, at a minimum for all site operations). Also, members of the field crew will be assigned with the responsibility as “MOB Spotter” or “MOB Lookout” with the duty to monitor for any persons who may fall into the water. If a person does go overboard from a vessel or otherwise falls into the water, then the following MOB procedures will be observed.

Basically, in an MOB event, there are three basic primary actions that should occur:

1. SHOUT - "Man Overboard on the ______ side" (Port, Starboard, Stern/Aft, Bow)
2. THROW – a tethered, lifesaving flotation device (i.e., a life saver ring) or a portable PFD if a lifesaver is not readily available
3. POINT – the individual who first observed the person overboard and shouted the initial alarm should remain in place and point at the person in the water to assure that others who come to assist can quickly locate him/her

Specific MOB actions and procedures can vary depending if the incident involves a large or small watercraft, or is near land. Therefore, these different scenarios are addressed individually in the following paragraphs.

Small Watercraft (on boats, skiffs, etc.)

If a person goes overboard, the first person to discover this is to alert all others within the area by loudly yelling "Man Overboard". This person should also shout out what side the person fell off (Port, Starboard, Aft or Bow). See the illustrations in Figure 5-1 for a quick reference to Port and Starboard. "Bow" means the front of the vessel, and "Aft" means the stern, or rear of the vessel.

FIGURE 5-1
GENERAL SHIPBOARD DIRECTIONS

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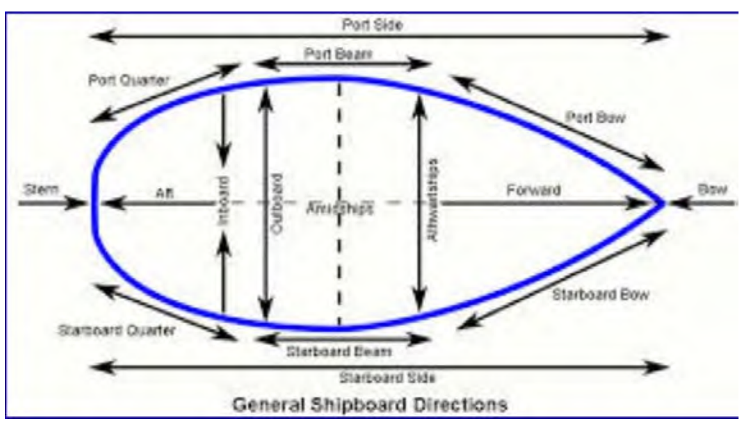

After hearing the "Man Overboard" alert, the following actions will immediately be taken:

- If the person is directly beside or near the boat, stop the motor
- If the boat has traveled too far from the person, maneuver the boat closer before throwing the ring. Motor must be in neutral when person in the water is alongside the boat.
- Throw the life ring (Type IV PFD) to the person.
- Extend the MOB pike pole to the individual, if necessary
- Give four blasts of the onboard emergency air horn to alert the rest of the project team.

- Instruct the person to tightly hold onto the ring, and then slowly bring the person to the side of the boat.

Depending on the boat size and configuration, the person may be able to climb back into the boat with assistance. For smaller boats like johnboats, attempting to bring someone on board can be difficult and could risk capsizing the boat. In this case, the rescuers should tell the person to hang onto boat and carefully maneuver boat to nearest shore. Rescuers can assist the person by holding on to his arms, but must exercise great care that they do not themselves fall or be pulled into the water.

Notify other site vessels and emergency responders and await assistance.

5.7.4 Strain/Muscle Pulls from Heavy Lifting

- During execution of planned activities there is some potential for strains, sprains, and/or muscle pulls due to the physical demands and nature of this site work. To avoid injury during lifting tasks personnel are to lift with the force of the load carried by their legs and not their backs. When lifting or handling heavy material or equipment use an appropriate number of personnel. Keep the work area (e.g., inside of boat) free from clutter to avoid unnecessary twisting or sudden movements while handling loads.

5.8 WETLAND SAFE WORK PROCEDURES

This investigation entails a wetland survey to conduct work safely field crews will know the wetland where the survey is being conducted:

- Depth of water in area where survey is being conducted

- Species (both plant and animal) that could be encountered relevant to the body of water where the survey is being conducted.

- Protective equipment required for a survey including:
  - Ranging pole to check water depths and bottom surface configuration in murky waters
  - Life jacket as specified in Section 5.7
  - Chest waders
  - Binoculars
  - Workers will work in groups of no less than two people for safety
  - Notify the guard station or site contact when working in or near water. In the event of an emergency site personnel are required to have a contact and or control point.

This wetland survey may possibly be performed from a water craft. In order to avoid potential hazards associated with working on water (drowning), the field team will follow the safety procedures outlined in Section 5.7 of this HASP.

5.9 RADIOLOGICAL HEALTH AND SAFETY PROCEDURES FOR SOIL INVESTIGATIONS

Purpose: This section provides guidance for the methods that will be used for radiological screening of surfaces and soils during field investigations at the Martin State Airport in Middle River, Maryland. The primary isotopes of concern include uranium 235 (U-235), thorium 232 (Th-232) and americium 241 (Am-241). These screening activities are being performed to insure personnel safety. No regulatory determinations will be made from the screening data.

Scope: Surface and subsurface soil and groundwater investigations will be conducted in accordance with the Greater Strawberry Point Supplemental Soil and Groundwater Characterization Work Plan. These investigations will include (1) gamma walk-over surveys, (2) soil sampling, (3) monitoring well measurements and groundwater sampling, (4) direct push technology (DPT) groundwater investigation, and (5) active soil gas sampling.

Screening Methods

- A reference background area adjacent to the investigation area(s) will be identified. Static measurements will be obtained at each location to determine ambient background radiation levels. Surveys will be performed in accordance with (IAW) Attachment VI, *Radiation and Contamination Surveys*. The surveys will be performed in areas adjacent to the areas of concern that are not expected to be impacted and are of similar geological characteristics. Ten (10) static measurements will be performed using a Ludlum Model 2241 coupled with a Ludlum Model 44-10 sodium iodide (NaI) gamma scintillation detector (or equivalent). The mean and standard deviation will be calculated and used for comparison in the areas of concern.

- The expected field conditions indicate that Level D PPE is appropriate. However, if field conditions change, SOP 022, *Radiological Protective Clothing Selection, Monitoring, and Decontamination* (Attachment VII) provides instruction for selection of PPE.

- A gamma walk-over survey of the investigation area will performed IAW SOP 006 (Attachment VI), *Radiation and Contamination Surveys.* The survey will be performed by traversing the survey area using a 1-meter grid spacing, holding the detector approximately 6-inches above the surface and moving it in a serpentine manner. Survey results will be documented IAW SOP 006 (Attachment VI).

- Soil sampling activities will be screened in the following manner:
  - All sample locations will be surface scanned prior to commencing sampling operations.

- DPT cores will be scanned with the NaI detector to determine potential areas of elevated activity.
- Equipment used for intrusive activities will be periodically monitored for removable and fixed contamination IAW SOP 006 (Attachment VI).
- Work surfaces will be periodically monitored for removable and fixed contamination IAW SOP 006 (Attachment VI).

- It is not expected that particulate airborne activity will be present during the planned field activities such that airborne concentrations would exceed 10 percent of the derived air concentration (DAC) for Ra-226 (3.0×10^{-10} microcurie per milliliter), as established by the Nuclear Regulatory Commission (NRC). Therefore, occupational exposure monitoring is not required in accordance with Title 10 Code of Federal Regulations (CFR) 20.1502. If elevated dose rates or contamination levels are encountered, the need for air sampling will be re-evaluated and MD DEP will be notified.

- Soil samples will be taken IAW the applicable Work Plans.

TABLE 5-1
RELEASE LIMITS FOR MATERIALS AND EQUIPMENT

Radiation Type	Release Limits[1/] (Fixed) (dpm per 100 cm^2)	Release Limits[1/] (Removable) (dpm per 100 cm^2)
Alpha (α)	100	20
Beta-Gamma (β-γ)	1000	200

Notes:
[1/] These limits are based on AEC Regulatory Guide 1.86 (AEC 1974)
AEC – Atomic Energy Commission
cm^2 – square centimeters
dpm – disintegrations per minute

5.10 PASSIVE DETECTION SURVEYS

5.10.1 Acoustic Surveys

Acoustic location methods are generally most applicable to waterlines or gas lines. A highly sensitive Acoustic Receiver listens for background sounds of water flowing (at joints, leaks, etc.) or to sounds introduced into the water main using a transducer. Acoustics may also be applicable to determine the location of plastic gas lines.

5.10.2 Thermal Imaging

Thermal (i.e., infrared) imaging is a passive method for detecting the heat emitted by an object. Electronics in the infrared camera convert subtle heat differentials into a visual image on the viewfinder or a monitor.

The operator does not look for an exact temperature; rather they look for heat anomalies (either elevated or suppressed temperatures) characteristic of a potential utility line.

The thermal fingerprint of underground utilities results from differences in temperature between the atmosphere and the fluid present in a pipe or the heat generated by electrical resistance. In addition, infrared scanners may be capable of detecting differences in the compaction, temperature and moisture content of underground utility trenches. High-performance thermal imagery can detect temperature differences to hundredths of a degree.

5.11 PORTABLE GENERATOR SAFE WORK PRACTICES

5.11.1 Major Causes of Accidents

- Shocks and electrocution from improper use of power or accidentally energizing other electrical systems.
- Carbon monoxide from a generator's exhaust.
- Fires from improperly refueling the generator or inappropriately storing fuel.

5.11.2 Generator Operation

- Inspect portable generators for damage or loose fuel lines that may have occurred during transportation and/or handling.
- Keep the generator dry.
- Maintain and operate portable generators in accordance with the manufacturer's use and safety instructions.
- Before refueling the generator, turn it off and let it cool down.
- Gasoline spilled on hot engine could ignite.
- Never store fuel indoors.

5.11.3 Electrical Considerations

- Never attach a generator directly to the electrical system of a structure (home, office or trailer) unless the generator has a properly installed transfer switch because this creates a risk of electrocution for utility workers.
- Always plug electrical appliances directly into the generator using the manufacturer's supplied cords.
  - Flexible cords (extension cords) will contain the number of conductors required for service, plus a ground wire. Cords will be rated for hard usage (S, SE, SEO, SO, SOO, ST, STO, STOO). Flexible cords are not allowed to pass through doors or windows, or to be placed on the ground where

they are subject to being run over by vehicles. If flexible cords must pass through walls, the cords will be protected by bushings or fittings.

- Flexible cords must be inspected on each day of use. No splices or fraying are allowed.
- Flexible cords will not be secured with staples, hung from nails, or suspended by bare wire. (Plastic tie straps, commonly used today, are acceptable.).
- Portable lamps must have bulbs protected by a substantial guard and attached to the lamp holder handle.
- The circuit breaker panels and electrical transformers and supply equipment must be labeled as to the voltage contained therein.
- The circuit breaker panels must be labeled as to what each breaker controls.
- The breaker panels and electrical panels must have a cover protecting any live exposed wires.
- At least a 30-inch clearance must be maintained on three sides of the circuit breaker boxes, transformers, and electrical supply equipment so as to provide ready access to the equipment in the event of an emergency. A 36-inch clearance is required for higher voltages.
- Circuit breaker boxes that are locked, or kept in locked rooms, must have a key readily available in the event of an emergency.

- Use undamaged heavy-duty extension cords that are grounded (3-pronged).
- Use ground-fault circuit interrupters (GFCIs) as per the manufacturer's instructions.
- Inspect extension cords for physical defects.
- Extension cords will be rated for outdoor use and will be of significant wire gage to carry intended amperage.
  - The longer the distance the heavier gauge of wire will be required.
  - When in doubt use a heavier gauge.
- Extension cords will be kept from standing water.
- Employees will not plug or unplug cords with wet gloves.
- Portable generators will be grounded, if required by manufacturer.

5.11.4 Carbon Monoxide Poisoning

- Never use a generator indoors.
- Never place a generator outdoors near doors, windows, or vents.
- If you or others show symptoms of CO poisoning — dizziness, headaches, nausea, tiredness—get to fresh air immediately and seek medical attention.

6.0 HAZARD ASSESSMENT AND CONTROLS

This section provides information regarding the chemical, physical, and natural hazards associated with the sites to be investigated and the activities that are to be conducted as part of the scope of work. Section 6 provides information on potential chemical contaminants, symptoms of exposure, physical properties, and air monitoring and sampling data.

6.1 CHEMICAL HAZARDS

Previous investigations indicate that the contaminants of concern (COCs) at both GSP and the Overall site are volatile organic compunds (VOCs), semi-volatile organic compounds (SVOCs), PCB's, and metals in both soil and water. Table 6-1 shows the primary COCs, their maximum concentrations, the worst case air concentrations of each primary COC that could be encountered, and their current occupational exposure limits (OELs).

6.1.1 Volatile Organic Compounds (VOCs)

The majority of VOCs are often related to chlorinated solvents and associated degradation products, paint thinners, dry cleaning solvents, constituents of petroleum fuels (e.g. gasoline and natural gas), and crude oil tanking. Symptoms of exposure to VOCs can include abdominal pain, irritation of the skin, eyes, nose, and throat, dizziness, tremors, vomiting, GI bleeding, enlarged liver, pallor of the extremities, and frostbite like-symptoms.

Short-term exposure to VOCs, such as TCE and VC, can cause irritation of the nose and throat and central nervous system (CNS) depression, with symptoms such as drowsiness, dizziness, giddiness, headache, loss of coordination. High concentrations have caused numbness and facial pain, reduced eyesight, unconsciousness, irregular heartbeat and death. Very high concentrations have produced death due to CNS effects, and, in rare cases, irregular heart beat. Permanent nervous system damage and/or liver injury have resulted from severe overexposure.

TABLE 6-1

COMPARISON OF COPCs, AVAILABLE WORST-CASE AIR CONCENTRATIONS, AND CURRENT OCCUPATIONAL EXPOSURE LIMITS

Contaminant of Concern	Maximum Concentration	Units	Worst-Case Air Concentration That Could Be Encountered	Current OSHA PEL or ACGIH TLV
Overall Site Surface Water				
HEXAVALENT CHROMIUM	5.21	UG/L	NA	0.005 mg/m3 0.0025 mg/m3 action level OSHA PEL 8-hour TWA
VINYL CHLORIDE	140	UG/L	62.27 ppm	OSHA: 1 ppm, TWA8 5 ppm Ceiling
TOTAL PCBS	0.42	UG/L	NA	OSHA PEL for PAHs workplace - 0.2 mg/m3
PERCHLORATE	0.79	UG/L	NA	NA
Overall Site Groundwater				
BENZENE	860	UG/L	59.6 ppm	ACGIH: 0.5 ppm TWA8 1 ppm STEL
CHLOROFORM	7200	UG/L	221.34 ppm	ACGIH TWA8 10ppm OSHA Ceiling 50ppm
1,2-DICHLOROETHANE	600	UG/L	7.15 ppm	ACGIH TWA8 10ppm OSHA TWA8 50; Ceiling 100ppm
1,1-DICHLOROETHENE	2200	UG/L	592.33 ppm	ACGIH: 5 ppm, TWA8
ETHYL BENZENE	3700	UG/L	274.62 ppm	
TOLUENE	51000	UG/L	3675.28 ppm	OSHA: 200 ppm ACGIH: 20 ppm TWA8
1,1,1-TRICHLOROETHANE	6000	UG/L	773.56 ppm	OSHA: 10 ppm ACGIH: 10 ppm TWA8
TRICHLOROETHENE	490000	UG/L	36734.15 ppm	OSHA: 100 ppm ACGIH: 10 ppm, TWA8
VINYL CHLORIDE	870000	UG/L	386976 ppm	OSHA: 1 ppm, TWA8 5 ppm Ceiling
XYLENES	28500	UG/L	17	ACGIH: 350 ppm, TWA8 OSHA: 350 ppm TWA_8
HEXANE	19	UG/L	397 ppm	ACGIH: 50 ppm, TWA8 OSHA: 500 ppm TWA_8
METHANE	1100	UG/L	4510 ppm	NA
1,2,4- TRIMETHYLBENZENE	590	UG/L	30.2 ppm	ACGIH: 25 ppm, TWA8
GSP Soil				
1,1-DICHLOROETHENE	0.006	MG/KG	1.46 ppm	ACGIH: 5 ppm, TWA8
TRICHLOROETHENE	3.9	MG/KG	135.56 ppm	OSHA: 100 ppm ACGIH: 10 ppm, TWA8
VINYL CHLORIDE	0.004	MG/KG	5.2 ppm	OSHA: 1 ppm, TWA8 5 ppm Ceiling
GSP Groundwater				
1,1-DICHLOROETHENE	330	UG/L	88.85 ppm	ACGIH: 5 ppm, TWA8
TRICHLOROETHENE	2600	UG/L	194.92 ppm	OSHA: 100 ppm ACGIH: 10 ppm, TWA8
VINYL CHLORIDE	4.7	UG/L	2.09 ppm	OSHA: 1 ppm, TWA8 5 ppm Ceiling

6.1.2 Semi-Volatile Organic Compounds (SVOCs)

SVOCs are substances composed primarily of carbon and hydrogen atoms that have boiling points greater than 200 degrees C. Sites where halogenated SVOCs may be found include burn pits, chemical manufacturing plants and disposal areas, contaminated marine sediments, disposal wells and leach fields, electroplating/metal finishing shops, firefighting training areas, hangars/aircraft maintenance areas, landfills and burial pits, leaking collection and system sanitary lines, leaking storage tanks, radiologic/mixed waste disposal areas, oxidation ponds/lagoons, pesticide/herbicide mixing areas, solvent degreasing areas, surface impoundments, and vehicle maintenance areas and wood preserving sites. Potential health effects related to SVOC expose include organ system toxicity (non-reproductive), cancer, birth or developmental effects, brain and nervous system damage, and reproduction and fertility damage.

6.1.3 Metals

Specific toxicities and symptoms from metals vary between individual metal compounds and associated isomers. However, general toxicities exist that can be applied to the general category of metals. For example metals are considered kidney toxins. Other generalized effects have demonstrated impacts on the peripheral and central nervous systems, blood forming mechanisms, gastrointestinal disturbances, cardio and vascular toxicities and some are cancer causing agents. In a particulate form, metals will cause respiratory, dermal, and eye irritation. Acute symptoms associated with ingestion include stomach pain, cramps, headaches, possibly diarrhea and vomiting. These conditions are typically symptomatic of chronic exposure or acute exposure to high concentrations which are not anticipated at this site.

Overexposure to these substances as indicated above typically occurs through ingestion or inhalation of particulates and/or fumes found within some industrial settings. The majority of the available toxicological information has been derived from such settings. In this investigation, potential exposure to these compounds are greatly reduced if not eliminated based on the media in which the contaminants exist. The mobility of these substances are greatly reduced as they are commingled and bound with soil particulates, sediments, as well as underwater. This aspect greatly reduces the mobility of the metals and thereby has a direct impact on the exposure through inhalation. Ingestion possibilities still exist. Exposure via this route is generally facilitated through contaminated hand or glove to mouth contact or to some media which eventually contacts the mouth. This exposure route can also be controlled and thereby minimize exposure potential. Actions include the use of gloves, good work hygiene practices, and through the employment of a suitable decontamination procedure.

These compounds will not have a distinct look, odor, or other physical characteristic.

6.1.4 PCBs

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor. PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

6.1.5 Inhalation

From a worst-case scenario, it is possible that workers participating in the activities being conducted in this HASP could encounter airborne concentrations of COCs that would represent an occupational exposure concern. . However, in regarding the results of this data evaluation, it is important to recognize that the planned work area is outdoors, with ample natural ventilation that will reduce any airborne COCs through dilution and dispersion.To monitor this route, real-time direct reading monitoring instruments will be used (as described in Section 7.0). This will be performed during intrusive tasks, as these tasks are the most likely to involve encountering/releasing any COCs into the air phase.

In addition, workers will monitor for visible dust, and in the event that visible dust is seen, area wetting techniques will be employed for dust suppression during active/intrusive activities.

6.1.6 Ingestion and Skin Contact

Potential exposure concerns to the COCs may also occur through ingestion, or coming into direct skin contact with contaminated groundwater. The likelihood of worker exposure concerns through these two routes are also considered very unlikely, provided that workers follow good personal hygiene and standard good sample collection/sample handling practices, and wear appropriate PPE as specified in this HASP.

Examples onsite practices that are to be observed that will protect workers from exposure via ingestion or skin contact include the following:

- No hand-to-mouth activities on site (eating, drinking, smoking, etc.)
- Washing hands upon leaving the work area and prior to performing any hand to mouth activities
- Wearing surgeon's-style gloves whenever handling potentially-contaminated media, including groundwater and any potential free product, sampling equipment, and sample containers.

6.2 PHYSICAL HAZARDS

The following is a list of physical hazards that may be encountered at the site or may be present during the performance of site activities.

- Slips, trips, and falls
- Cuts (or other injuries associated with hand tool use)
- Lifting (strain/muscle pulls)
- Ambient temperature extremes (heat stress)
- Pinches and compressions
- Vehicular and foot traffic
- Noise in excess of 85 dBA
- Flying projectiles
- Contact with underground or overhead utilities/electrical safety
- Heavy equipment hazards (rotating equipment, hydraulic lines, etc.)
- Compressed gas cylinders

Specific hazards are discussed further below, and are presented relative to each task in the task-specificAHA.

6.2.1 Slips, Trips, and Falls

During various site activities there is a potential for slip, trip, and fall hazards associated with wet, steep, or unstable work surfaces. To minimize hazards of this nature, personnel required to work in and along areas prone to these types of hazards will be required to exercise caution, and use appropriate precautions (restrict access, guardrails, life lines and/or safety harnesses) and other means suitable for the task at hand. Site activities will be performed using the buddy system.

6.2.2 Strain/Muscle Pulls from Heavy Lifting

During execution of planned activities there is some potential for strains, sprains, and/or muscle pulls due to the physical demands and nature of this site work. To avoid injury during lifting tasks personnel are to lift with the force of the load carried by their legs and not their backs. When lifting or handling heavy material or equipment use an appropriate number of personnel. Keep the work area free from ground clutter to avoid unnecessary twisting or sudden movements while handling loads.

6.2.3 Heat/Cold Stress

Heat Stress

Because of the geographical location of the planned work, the likely seasonal weather conditions that will exist during the planned schedule, and the physical exertion that can be anticipated with some of the planned tasks, it will be necessary for the field team to be aware of the signs and symptoms and the measures appropriate to prevent heat stress. At this time of year heat stress is unlikely but the possibility exists of warm weather in December. For this reason heat stress information is provided here. The SSO is responsible for reviewing and implementing controls as appropriate on this project.

In general, early signs of heat-related disorders include heat rash, cramps, heavy sweating which may be followed by the complete shutdown of a person's ability to sweat, pale/clammy skin, headaches, dizziness, incoordination, and other maladies. To prevent heat stress disorders, the following preventive measures are to be implemented by the SSO:

- When possible, schedule the most physically-demanding tasks so that they are performed during cooler periods of the day such as early morning or late afternoon
- Educate the field staff in heat stress signs and symptoms so that they can monitor themselves and their co-workers
- Schedule frequent breaks during the hottest parts of the day (such as a few minutes each hour). Breaks should be in shaded areas, and in a location where workers can remove PPE, wash their hands, and drink fluids
- Drinking fluids should be cool and non-caffeinated. Sports-drinks with electrolytes are acceptable provided that they do not contain alcohol. Water is also acceptable.

For more information on heat stress recognition and prevention, consult Tt Safe Work Practice SWP 05-15 available at https://intranet.tetratech.com/healthsafety/Manual/SWP%2005-15%20Heat%20Illness%20Prevention%20and%20Monitoring.pdf .

6.2.4 Cold Stress Related Disorders

Cold Stress is more likely to present problems on this site and present a problem for on-site personnel during all activities. Our focus is on recognizing conditions contributing to cold related disorders and selecting the most appropriate control measure.

Work performed when ambient air temperatures are below 50°F may result in varying levels of cold stress (frost nip, frost bite, and/or hypothermia) depending on environmental factors such as temperature, wind speed, and humidity; physiological factors such as metabolic rate and moisture content of the skin; and other factors such as work load and the protective clothing being worn.

Hypothermia

Fatal exposures to cold among workers have almost always resulted from accidental exposures involving failure to escape from low environmental air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body. Workers should be protected from exposure to cold so that the deep core temperature does not fall below 36°C (96.8°F); lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

The most significant potential for a member of the field team to suffer hypothermia would be in the event of a Man Overboard incident where the worker falls into the water, and becomes immersed under ambient and water temperature conditions that are low. In such an event, it is of great importance that the individual be rescued from the water as quickly as possible, taken to a sheltered/heated area out of the elements, and that saturated clothing be removed and warm dry clothing and/or blankets be applied immediately. The person should them be taken to (or be ambulated to) an emergency health care facility for treatment and evaluation.

Signs and Symptoms

- Pain in the extremities may be the first early warning of danger to cold stress.
- During exposure to cold, maximum severe shivering occurs when the body temperature has fallen to 35°C (95°F). This must be taken as a sign of danger and exposure to cold should be immediately terminated when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Control Measures

Since prolonged exposure to cold air, or to immersion in cold water, at temperatures well above freezing can lead to dangerous hypothermia. Whole body protection must be provided.

Adequate insulating dry clothing to maintain core temperatures above 36°C (96.8°F) must be provided to workers if work is performed in air temperatures below 4°C (40°F). Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. People with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions which should be considered. The precautionary actions to be taken will depend upon the physical condition of the worker and should be determined with the advice of a physician with knowledge of the cold stress factors and the medical condition of the worker.

- Acclimatization – With exposure the body does undergo changes that will permit it to adjust to the cold weather better.

- Dehydration – Water and salt loss magnifies conditions associated with hypothermia. Warm, sweet nonalcoholic fluids should be employed for fluid replacement. Soup, non-caffeinated drinks including decaffeinated teas, coffees, etc. are suitable for this purpose.

- Diet – A balanced diet can provide the body with the necessary nutrients to aid in combating cold stress. Restrictive diets avoiding salts, carbohydrates, etc. may rob you of certain elements that you need. Also, site personnel should avoid consuming caffeinated and alcoholic drinks as they can increase the effects of a cold environment on the body.

- Engineering Controls such as wind shields/barriers may be used to control the potential effects of cold stress.

- Administrative controls such as worker rotation; work/warm regimens; required fluid intake; scheduling the work for warmer weather; assigning more workers to the task to complete it quicker.

- Overall physical condition should always be considered when combating cold stress. Older persons, those on certain medications (blood pressure control) are vulnerable to cold environment and cold stress disorders.

- Environmental monitoring results will tell you if the conditions are such that cold related disorders can occur. Biological monitoring will provide real time information as to the progression of the cold related disorders within your field crew.

Monitoring

- Core temperature – Ensure that it does not drop below 96.8ºF
- Weight Loss – Monitoring weight loss may be indicative of water and salt loss through dehydration. >2% changes in body weight are indicative of water loss.
- Visual observation of signs and symptoms of overexposure.

The best way to avoid hypothermia and frostbite is to stay warm and dry indoors. Office trailers will be located on this site and will provide areas for warming of employees. When you must go outside, dress appropriately. Wear several layers of loose-fitting, lightweight, warm clothing. Trapped air between the layers will insulate you. Remove layers to avoid sweating and subsequent chill. Outer garments should be tightly woven, water repellent, and hooded. Wear a hat, because half of your body heat can be lost from your head. Cover your mouth to protect your lungs from extreme cold. Mittens, snug at the wrist, are better than gloves. Try to stay dry and out of the wind.

6.2.5 Pinch/Compression Points

Handling of tools, machinery, and other equipment on site may expose personnel to pinch/compression point hazards during normal work activities. Where applicable, equipment will have intact and functional guarding to prevent personnel contact with hazards. Personnel will exercise caution when working around pinch/compression points, using additional tools or devices (e.g., pinch bars) to assist in completing activities.

6.2.6 Natural Hazards

Natural hazards such as poisonous plants, bites from poisonous or disease carrying animals or insects (e.g., snakes, ticks, mosquitoes) are often prevalent at sites that are being investigated as part of hazardous waste site operations. To minimize the potential for site personnel to encounter these hazards, nesting areas in and about work areas will be avoided to the greatest extent possible. Work areas will be inspected to look for any evidence that dangerous animals may be present. Based on the planned location for the work covered by this HASP, encountering wild animals is not a likely probability.

During warm months (spring through early fall), tick-borne Lyme Disease may pose a potential health hazard. The longer a disease carrying tick remains attached to the body, the greater the potential for contracting the disease. Wearing long sleeved shirts and long pants (tucked into boots and taped) will prevent initial tick attachment, while performing frequent body checks will help prevent long term attachment. Site first aid kits should be equipped with medical forceps and rubbing alcohol to assist in tick removal. For information regarding tick removal procedures and symptoms of exposure, consult Section 4.0 of the Health and Safety Guidance Manual.

Contact with poisonous plants and bites or stings from poisonous insects are other potential natural hazards. Long sleeved shirts and long pants (tucked into boots), and avoiding potential nesting areas, will minimize the potential for exposure. Additionally, insect repellents may be used by site personnel. Personnel who are allergic to stinging insects (such as bees, wasps and hornets) must be particularly careful since severe illness and death may result from allergic reactions. As with any medical condition or allergy, information regarding the condition must be listed on the Medical Data Sheet (see Attachment III of this HASP), and the FOL or SSO notified.

6.2.7 Vehicular and Equipment Traffic

If working in or near streets or roadways, hazards associated with vehicular and equipment traffic are likely to exist during various site activities and whenever site personnel performed work on or near roadways. Site personnel will be instructed to maintain awareness of traffic and moving equipment when performing site activities. When working near roadways, site personnel will wear high visibility vests.

6.2.8 Inclement Weather

Project tasks under this Scope of Work will be performed outdoors. As a result, inclement weather may be encountered. In the event that adverse weather (electrical storms, tornadoes, etc.) conditions arise, the FOL and/or the SSO will be responsible for temporarily suspending or terminating activities until hazardous conditions no longer exist.

6.2.9 Contact with Underground or Overhead Utilities/Electrical Safety

Contact with energized sources can result in severe injury and even death. There are two areas of concern with this potential hazard: contact with energized processing equipment and contact with energized utilities including underground utilities (i.e., electrical transmission lines, gas lines, water lines, etc.) and overhead utilities (i.e., power lines, etc.).

- Use and application of the Tetra Tech Standard Operating Procedure (SOP) for Utility Locating and Excavation Clearance found in the Tetra Tech Health and Safety Guidance Manual will be employed. This procedure provides step-by-step instructions for clearance of underground utilities, as well as avoidance techniques, and required documentation.

- Establishment of a suitable clearance distance (20-feet) from overhead utilities will be the primary method to control hazards conveyed through contact with these power sources.

- Identify underground utilities and buried structures before commencing any DPT operations. Follow the Tetra Tech Utility Locating and Excavation Clearance Standard Operating Procedure.

In addition, the electrical safety procedures stipulated in Section 3.9 of the LM Handbook and the overhead power line safety procedures in Section 3.14 of the LM Handbook will also be followed.

No hazardous energy work is being conducted as part of this field effort. However, should activities associated with lockout/tagout be required, the requirements stipulated in Section 3.5 of the LM Handbook (Attachment I) will also be adhered to.

6.2.10 **Heavy Equipment/Excavation Hazards**

Ensure that workers are thoroughly trained and competent to perform their assigned task with the equipment used in investigation. Ensure that back-up alarms are functional on equipment. Heavy equipment will be subjected to an equipment inspection, upon arrival on-site and prior to leaving. This inspection will be recorded on the Equipment Inspection Checklist provided in Attachment V of this HASP. The equipment operators and on-site Supervisors responsible for the equipment are to ensure that the Equipment Inspection Checklist has been reviewed and completed, and that all moving parts are guarded if such parts are exposed. Check/test all emergency stop controls. Use escort vehicles with flashing lights to ward and control local traffic when moving large equipment to support area. Only trained and authorized workers may operate heavy equipment, industrial vehicles and/or cranes. All manufacturer's specifications and limitations will be adhered to. Utility clearances should be in place prior to the beginning of excavation (in accordance with the Tetra Tech Utility Locating SOP.

An Excavation Competent Person must be specifically identified to handle this responsibility prior to work beginning in the specified space provided (Section 1.3) in this HASP. Detailed Tetra Tech Excavation Safety Procedures, the Excavation Competent Person Checklist, the Tetra Tech Confined Space Entry Program and Procedures, and the Heavy Equipment Inspection Checklist are included in Attachments VIII, IX, X, and XI, and must be completed prior to beginning work. The OSHA Health and Safety Construction-Related regulations P-650 to 699 – Subpart P – Excavations are included in Attachment XII and must be followed during all excavation work.

In addition, the heavy equipment, industrial vehicle, and crane operation safety procedures and excavation procedures stipulated in Section 3.13 and 3.8 of the LM Handbook and will be followed.

6.2.11 Compressed Gas Cylinders

Work utilizing compressed gas cylinders is not anticipated as part of this field effort. However, if work utilizing compressed gas cylinders is required, this HASP will be updated/amended as necessary and the procedures in Section 3.17 of the LM Handbook (Attachment I) will be followed.

6.3 SANITATION AND BREAK AREAS

This section will address the following items:

- Toilets
- Potable water
- Showers and change rooms
- Break Areas

6.3.1 Toilets

One portable toilet will be provided for every 20 people. All toilets will be unisex and will have locking doors. The toilet provided will either be a chemical toilet and service provider or the flush toilet readily accessible at a predetermined approved location at the site where work is being conducted. If necessary the FOL will arrange to have toilets moved or delivered and picked up when work is occurring at other sites.

6.3.2 Potable Water

Potable water as well as electrolyte balance sports drinks such as Gatorade will be provided to the field crews for fluid replacement, as it is necessary under conditions of ambient temperature extremes. Storage and dispensing will proceed as follows:

- All containers will be clean and replenished daily.
- All containers will clearly marked as to their contents (Potable Water – Drinking Water Only; Gatorade, etc.).
- Dispensing locations will be placed in identified break areas within the support zone. The most likely location will be at a support vehicle staged near the work area. This will serve as an area for cooling or warming as well as an identified food and drink consumption area.
- If larger containers are used, dispensing cups will be provided.
- The coolers used for storage of potable drinks and single-use/disposable cups will be stored in plastic bags away from potentially contaminating materials when not in use.

6.3.3 Showers and Change Rooms

Based on this scope and duration of this project shower facilities and locker rooms will not be required.

6.3.4 Break Areas

Given the location and the time of the year structured suitable locations for work breaks and warming regimens will reflect the ambient conditions anticipated for that time of the year. Portable shelters such as an office trailer will provide shelter for protection from the weather as well as to provide a suitable area to permit warming if in a cold environment.

6.3.5 Flying Projectiles

- Restrict other personnel from decon pad during pressure washing operations.
- Pressure washer operator must exercise care when directing the wand so that it is not pointing at himself/herself or at any other worker.
- Pressure washer operator must wear full face shield over safety glasses with side shields and brow protection.
- At SSO discretion, additional PPE consisting of hardhat, rainsuit, apron, and or boot covers may be required during decon operations - depending on observations indicating that significant contact with decon overspray and/or windy conditions during washing activities.

6.3.6 Noise in Excess of 85 dBA

Worker exposure to noise that can approach hazardous levels is a common potential hazard on most project work sites. Workers who must work in areas or who must perform operations where noise levels can approach an 8-hour time weighted average of 85 decibels on the A-weighted scale (dBA) must have received hearing conservation training within the past 12 month period (this is normally provided as part of the 8-hour refresher training). If personnel have not had this training within the last 12 months they will be provided such training by the SSO at the project site prior to participating in high noise level activities. On this project, high noise levels may be encountered when working near the drill rig, and during decontamination operations when using a pressure washer,

As a general rule-of-thumb to prevent worker exposure to high noise levels, workers will be informed to observe the following:

- If ambient noise levels are loud enough that they have to raise their voice in order to communicate with another person who is less than two feet away, hearing protection will be required. Also, if any existing site operations are posted as high noise areas or that hearing protection is required in that area, then hearing protection will be used

7.0 AIR MONITORING

As a precaution, direct reading instrument will be used for onsite activities to screen source areas (i.e., monitoring wells) and worker breathing zones for the presence of volatile site contaminants. At least twice each day (e.g., at the beginning and end of each work day), the SSO will establish background levels by operating the instrument at locations that are at the perimeter of the site property, and that are upwind of planned or ongoing site activities, unlikely to be affected by any intrusive site activities performed as part of this investigation. These daily-established background levels will be the baseline for comparing all other direct reading instrument readings noted during the performance of intrusive activities. Any readings noted above 1 PPM for five minutes four times a day will be regarded as "elevated" and interpreted as possible indications of airborne releases from site activities, warranting specific action specified in this section.

If instrument readings indicate airborne levels (lasting five minutes or longer) in BZ areas that are higher than the daily established background levels, this will require site activities to be suspended and workers to retreat upwind to the pre-determined emergency congregation point. Work may not resume until and unless readings return to background levels. The use of personal protective equipment and the observance of the other control requirements presented in this HASP have been selected to minimize potential for personnel exposures to hazardous concentrations of the site contaminants of concern presented in Section 6.0.

7.1 INSTRUMENTS AND USE

Instruments will be used primarily as described above to monitor source points and worker breathing zone areas, observing instrument action levels. Action levels are discussed in Section 7.1.1 as they may apply to a specific task or location.

7.1.1 Photoionization Detector

Based on the properties of the identified contaminants of concern, a Photoionization Detector (PID) equipped with a lamp strength of at least 11.7eV lamp will be appropriate to screen source areas (sampling locations, monitoring wells, bore holes, etc.) during intrusive site activities at the two planned site work areas. This instrument will also be used to periodically (e.g., at least 3-4 times each day) to monitor the breathing zones of employees during site activities for elevated readings above the daily-established background level. The PID suitably equipped with the appropriate lamp strength has been selected because it is capable of detecting all of the identified contaminants of concern at the site.

As previously mentioned, daily background level readings will be taken away from any areas of potential contamination. These readings must be documented in the field operations logbook or other site documentation (e.g., sample log sheet).

Instrument Action Levels: The use of a PID will be acceptable, provided that the following action levels are observed:

- PID Action Level: any reading >1 ppm for more than 5 minutes above background in the breathing zone for 4 exposures of 5 minutes in one workday.
- Generation of dusts should be minimized. If airborne dusts are observed, area wetting methods will be used. If area wetting methods are not feasible, termination of activities may be used to minimize exposure to observed airborne dusts.

7.1.2 Hazard Monitoring Frequency

The frequency that hazard monitoring will be performed as well as the action levels will be determined by the PHSO who will also initiate the use of elevated levels of protection. The SSO may decide to increases these frequencies based on instrument responses and site observations. The frequency at which monitoring is performed will not be reduced without the prior consent of the PHSO or HSM.

7.2 INSTRUMENT MAINTENANCE AND CALIBRATION

Hazard monitoring instruments will be maintained and pre-field calibrated by the equipment provider (i.e., rental agency used). Operational checks and field calibration will be performed on site instruments each day prior to their use. Field calibration will be performed on instruments according to manufacturer’s recommendations. These operational checks and calibration efforts will be performed in a manner that complies with the employees health and safety training, the manufacturer's recommendations, and with the applicable manufacturer standard operating procedure (which the SSO must assure are included with the instrument upon its receipt onsite). Field calibration efforts must be documented. Figure 7-1 is provided for documenting these calibration efforts. This information may instead be recorded in a field operations logbook, provided that the information specified in Figure 7-1 is recorded. This required information includes the following:

- Date calibration was performed
- Individual calibrating the instrument
- Instrument name, model, and serial number
- Any relevant instrument settings and resultant readings (before and after) calibration
- Identification of the calibration standard (lot no., source concentration, supplier)
- Any relevant comments or remarks

7.3 DOCUMENTING INSTRUMENT READINGS

The SSO is responsible for ensuring that air monitoring instruments are used in accordance with the specifications of this HASP and with manufacturer's specifications/recommendations. In addition, the SSO is also responsible for ensuring that all instrument use is documented. This requirement can be satisfied either by recording instrument readings on pre-printed sampling log sheets or in a field log book. **This includes the requirement for documenting instrument readings that indicate no elevated readings above noted daily background levels (i.e., no-exposure readings)**. At a minimum, the SSO must document the following information for each use of an air monitoring device:

- Date, time, and duration of the reading
- Site location where the reading was obtained
- Instrument used (e.g., PID, etc.)
- Personnel present at the area where the reading was noted
- Other conditions that are considered relevant to the SHSO (such as weather conditions, possible instrument interferences, etc.)

7.4 RADIOLOGICAL AIR AND SURFACE MONITORING

The instruments described in this section are suitable for the physical and environmental conditions at Greater Strawberry Point. The instruments and measurement methods will be able to detect the ROC or radiation types of interest, and are, in relation to the survey or analytical technique, capable of measuring levels sufficient to support the data quality objectives.

7.4.1 Field Survey Instruments

The surveys conducted will be composed of one or more of the following general techniques:

- Scanning with hand-held instruments
- Direct measurements with hand-held instruments for spot readings and marginally accessible surface areas
- Field counting of swipes with Radiation Scaler/Sample Counter

Hand-held instrumentation may be used to scan small areas or surfaces that are not readily accessible otherwise. The hand-held instrumentation will be based on best available technology applicable to the release limits. Instrumentation may include sodium-iodide (NaI), Geiger-Mueller (GM), or zinc sulfide detectors. Swipes taken to determine the presence of removable radioactivity will be analyzed on site using an alpha/beta scaler/sample counter. Portable survey instruments will be used to perform measurements in the field.

7.4.1.1 Daily Performance

Prior to use of the portable survey instruments, calibration verification, physical inspection, battery check if direct current (DC) powered, and source-response check will be performed. The portable survey instruments will have a current calibration label that will be verified daily prior to use of the instrument. Physical inspection of the portable survey instrument will include:

- General physical condition of the instrument and detector prior to each use
- Knobs, buttons, cables, connectors
- Meter movements/displays
- Instrument cases
- Probe/probe windows
- Other physical properties that may affect the proper operation of the instrument or detector
- Any portable survey instrument or detector having a questionable physical condition will not be used until the problems have been corrected.

For instruments that are battery powered, a battery check will be performed to ensure that sufficient voltage is being supplied to the detector and instrument circuitry for proper operation. This check will be performed in accordance with the instrument's operations manual. The instrument will be exposed to the appropriate (alpha and beta) check source to verify the instrument response is within acceptable range.

7.4.1.2 Instruments for Surface Scan Surveys for Alpha and Beta Activity

Scan surveys for alpha, beta and gamma radiation will be performed using hand-held systems with scintillation detectors. The hand held equipment will be either a Ludlum 2241 or Ludlum Model 2360 data logger (or equivalent) equipped with a Ludlum Model 43-93 alpha-beta scintillation probes (or equivalent) or a Ludlum Model 44-10 NaI scintillation detector (or equivalent).

7.4.1.3 Instruments for Direct Measurement Static Surveys for Alpha and Beta Activity

Static surveys for alpha and beta radiation will be performed using hand-held systems with scintillation detectors. The hand held equipment will be either a Ludlum 2241 or Ludlum Model 2360 data logger (or equivalent) equipped with a Ludlum Model 43-93 alpha-beta scintillation probes (or equivalent) or a Ludlum Model 44-10 NaI scintillation detector (or equivalent).

Model 2360
Alpha/Beta Data Logger

Radiation Detection for a Safer World

Ludlum Measurements, Inc.

Features

- Scaler/Ratemeter/Data Logger
- Simultaneous Alpha & Beta Measurements with Audio Discrimination
- Logs 550 Data Points
- Analog & Digital Display
- Six Separate Alarms
- Overload Protection
- RS-232 Port

Part Number 48-2872

Specifications

SUGGESTED DETECTOR: dual phosphor scintillation and gas proportional detectors
LINEARITY: reading within 10% of true value
HIGH VOLTAGE: adjustable from 200–2000 volts (can be read on meter)
OVERLOAD: senses detector saturation, indicated by red lamp on meter and meter deflecting to full scale (internally adjustable)
RESPONSE: will vary according to number of counts, typically 2–11 seconds from 10%-90% of final reading
SCALER: 6-digit LCD display with 0.64 cm (0.25 in.) digits, overflow arrow, colons to indicate when a count is in process, and backlight
COUNT TIME RANGE: 0.1–60 minutes with capability to preset user-programmed value
DATA LOGGER: capable of storing up to 550 individual data points with the following identifiers for each point: (all data is stored in non-volatile memory allowing batteries to be removed without loss of data)

alpha and beta sample counts
sample number
date/time stamp
scaler count time
10-character location identifier (can be set by ASCII terminal or PC)

HEADER INFORMATION: 6 lines of user defined memory at the beginning of the stack for storing user name, survey name, serial numbers, etc. (information is dumped with logged data)
RS-232 PORT: located on the can, this allows the instrument to be connected to a PC for dumping of data, and setup of parameters
LOGGING FUNCTION CONTROL: internal selection that enables the pushbutton to log a ratemeter reading, initiate a scaler count and log the resulting reading, log both the scaler and ratemeter reading, or disable the logging function
ALARM: has alarm capabilities on both the scaler and ratemeter, both circuits allow for independent alarm settings of the alpha channel, beta channel, and the alpha/beta channel, the scaler alarm setpoints can be set at any point from 0–999999 counts, the ratemeter alarms can be set at any point from 0–999999 cpm, alarm points can be set via the keypad, or PC
CONTROLS:

RESET/READ HV: a two-position, momentary action switch to allow for the meter to be reset or a reading of the HV setting
COUNT TYPE: toggle switch to select alpha+beta or "alpha", only, or "beta" only
AUDIO VOLUME: rotary knob volume control, greater than 60 dB at 61 cm (2 ft), full volume, selectable dual or individual click-per- event for alpha and beta counts and divisions of 1, 10, 100, or 1000 events per click (beta counts only)
INSTRUMENT: 6-position rotary knob for instrument off, battery check, range multipliers: x1, x10, x100, x1000
COUNT TIME: switch selectable times of 0.1, 0.5, 1, 2, 5, 10, 60 minutes, or PC to allow for a specific count time to be set from a PC
LOGGING PUSHBUTTON: located in handle; used to activate scaler and/or log a count

CALIBRATION DUE DATE: an internal date that disables the instrument if the required calibration interval has been missed
METER DIAL: 0–500 cpm, 0–2 kV, BAT OK, OL (overload); others available
BATTERY LIFE: typically 250 hours with alkaline batteries (battery condition can be checked on meter)
TEMPERATURE RANGE: -20 to 50 °C (-4 to 122 °F), may be certified for operation from -40 to 65 °C (-40 to 150 °F)
SIZE: 16.5 x 8.9 x 21.6 cm (6.5 x 3.5 x 8.5 in.) (H x W x L)
WEIGHT: 1.6 kg (3.5 lb), including batteries

P.O. Box 810, Sweetwater, Texas 79556 / http://www.ludlums.com
800-622-0828 / 325-235-5494 / Fax: 325-235-4672 / E-mail: ludlum@ludlums.com

1/24/2011

Model 43-93
Alpha/Beta Detector

Radiation Detection for a Safer World

Ludlum Measurements, Inc.

Part Number: 47-2556

Detector Face

Specifications

INDICATED USE: alpha beta survey
SUGGESTED INSTRUMENTS: Ludlum Model 2224-1, Model 2360, Model 2929, Model 3030E
DETECTOR TYPE: ZnS(Ag) adhered to 0.254 cm (0.010 in.) thick plastic scintillation material
EFFICIENCY (4π): 20% of ^{239}Pu; 15% of ^{99}Tc; 20% of ^{90}Sr/^{90}Y
WINDOW: 1.2 mg/cm² metalized polyester
REMOVABLE PROTECTIVE SCREEN: 0.79 mm (0.03 in.) thick, 6.5 mm (0.26 in.) square openings, 88% open
SCREEN OUTER DIMENSIONS: 167.6 x 92.2 mm (6.6 x 3.6 in.) (L x W)
WINDOW AREA:
  Open: 88 cm² (13.6 in²) open
  Active: 100 cm² (15.5 in²) active
NON-UNIFORMITY: less than 10%
BACKGROUND: alpha: 3 cpm or less; beta: 300 cpm or less
CROSS TALK:
  alpha to beta: < 10%
  beta to alpha: < 1%
PHOTOMULTIPLIER TUBE: 2.9 cm (1.12 in.) diameter
OPERATING VOLTAGE: typically 500–1200 volts
CONSTRUCTION: aluminum with beige powder coating
TEMPERATURE RANGE: -20 to 50 °C (-4 to 122 °F)
CONNECTOR: series “C”, unless specified otherwise
OVERALL SIZE: 6.4 x 9.5 x 31 cm (2.5 x 3.8 x 12.3 in. (H x W x L), plus feet
WEIGHT: 0.5 kg (1.0 lb)

Optional Protective Screens

Model L-7393-209: 0.79 mm (0.031 in.) thick, 4 mm (0.16 in.) square openings, 81% open
Model L-7393-208: 0.79 mm (0.031 in.) thick, 4.8 mm (0.19 in.) hex openings, 83.5% open
Model L-7393-138: 0.51 mm (0.020 in.) thick, 6.5 mm (0.26 in.) square openings, 88% open

P.O. Box 810, Sweetwater, Texas 79556 / http://www.ludlums.com
800-622-0828 / 325-235-5494 / Fax: 325-235-4672 / Email: ludlum@ludlums.com

Model 2929
Alpha/Beta Scaler

Radiation Detection for a Safer World

Ludlum Measurements, Inc.

Features

- Dual-Channel Scaler with Independent Readouts
- 0.1 to 990 Minutes Scaler Range
- Independent Audio Volume Adjustments
- Independent RS-232 Outputs

Part Number: 48-1426

Introduction

The Model 2929 is a dual-channel scaler designed for use with a "phoswitch" and/or proportional type detectors that support discrimination between alphas and betas. A pulse height analyzer provides the separation and displays the counts for each on dedicated six-digit LED readouts. Each readout is accompanied by an audio volume rotary control. The high voltage is set via a fine 10-turn dial with the readout given on an analog meter.

The scaler count time is set by a combination of thumbwheel and multiplier controls that allow setting the time from 0.1 to 990 minutes. The front panel additionally provides a start-count button, halt-count button, and an on/off power switch. A red count lamp is illuminated anytime the instrument is performing a timed count. Independent RS-232 serial outputs are supplied for the alpha and beta channels on the back panel for supplying data to either a printer or PC.

Specifications

INDICATED USE: scaler for alpha beta sample counting
DETECTOR COMPATIBILITY: phoswich or proportional type detectors
HIGH VOLTAGE: adjustable from 200 to 2500 volts
THRESHOLDS: beta: 4 mV; alpha: 175 mV
BETA WINDOW: 50 mV
SCALERS: 2 ea. 6-digit LED displays with a range of 0–999999 counts
SCALER LINEARITY: reading within 2% of true value
TIMER: thumbwheel adjustment from 0-99 minutes with selectable multipliers of x0.1, x1, x10, or EXT for manual timing
DATA-OUTPUT: two 15-pin connectors allowing for recorder and printers (one for alpha, one for beta)
AUDIO: built-in unimorph type speakers with volume controls to provide dual tone (1 per channel) click-per-event audio
AMP OUT: "BNC" connector provides amplified detector pulse
METER DIAL: 0–2.5 kV
METER: 6.4 cm (2.5 in.) arc, 1 mA movement analog type
POWER: 95 to 250 Vac, 50 to 60 Hz single phase
SIZE: 24.4 x 37.1 x 25.1 cm (9.6 x 14.6 x 9.9 in.) (H x W x D)
WEIGHT: 5.5 kg (12.1 lb), including detector

Available Options:

Model 43-10-1 Alpha/Beta Sample Counter Head: detector with counter head and sample tray (Part Number 47-1305)
Model 264 Printer: can provide date/time stamp on each line, uses standard calculator paper (Part Number 48-1642)
Model CS12 Check Source: ^{230}Th (Part Number 01-5860)
Model CS13 Check Source: ^{99}Tc (Part Number 01-5852)

P.O. Box 810, Sweetwater, Texas 79556 / http://www.ludlums.com
800-622-0828 / 325-235-5494 / Fax: 325-235-4672 / E-mail: ludlum@ludlums.com

5/10/2011

Model 43-10-1
Alpha/Beta Sample Counter Head

Radiation Detection for a Safer World

Part Number: 47-1305

Ludlum Measurements, Inc.

Specifications

INDICATED USE: alpha/beta sample counting
SUGGESTED INSTRUMENTS: Model 2929, Model 2223, Model 2224, Model 3030E
DETECTOR TYPE: scintillator, ZnS (Ag)
DETECTOR OPERATING VOLTAGE: 500–1200 volts
CONNECTOR: series "C" (others available)
SAMPLE SIZE (maximum): 5.1 x 0.9 cm (2 x 0.4 in.) (Dia x L)
SAMPLE HOLDER: anodized aluminum tray with sample ring to allow for 2.5 cm (1 in.) or 5.1 cm (2 in.) diameter x 0.32 cm (0.13 in.) deep samples
PHOTOMULTIPLIER TUBE: 5.1 cm (2 in.)
WINDOW: 0.4 mg/cm^2
EFFICIENCY (4π): 37% for ^{239}Pu, 5% for ^{14}C, 27% for ^{99}Tc, 32% for ^{230}Th, 39% for ^{238}U, 29% for ^{137}Cs, 26% for $^{99}Sr/^{90}Y$
BACKGROUND: 3 cpm or less alpha, 80 cpm or less for beta-gamma
CONSTRUCTION: aluminum housing with beige powder coating
TEMPERATURE RANGE: -20 to 50 °C (-4 to 122 °F), may be certified for operation from -40 to 65 °C (-40 to 150 °F)
SIZE: 23.6 x 11.4 x 23.6 cm (9.3 x 4.5 x 9.3 in.) (H x W x L)
WEIGHT: 1.9 kg (4.1 lb)

Optional Accessories

Sample Planchets
SIZE: 5.1 x 0.32 cm (2 x 0.125 in.) (Dia x Thickness)
Aluminum: Part Number 7525-371
Stainless Steel: Part Number 7525-371-01
(minimum order quantity 500)

P.O. Box 810, Sweetwater, Texas 79556 / http://www.ludlums.com
800-622-0828 / 325-235-5494 / Fax: 325-235-4672 / E-mail: ludlum@ludlums.com

6/13/2011

Model 2241
General Purpose Ratemeter / Scaler

Radiation Detection for a Safer World

Ludlum Measurements, Inc.

Features

- Digital Ratemeter with Built-In Scaler
- Auto Ranging
- Accommodates 6 Detector Setups
- Adjustable Audible and Visual Alarms
- Wide Range HV
- Overrange & Overload Protection
- GM, Proportional & Scintillation Detectors

Part Number: 48-2444

Introduction

The Model 2241 is a portable, rugged, microprocessor-based instrument designed for use with scintillation, Geiger-Mueller (GM), and proportional type detectors. It is constructed of cast-and-drawn aluminum with beige powder coating, which aids in the decontamination of surfaces and is suitable for indoor or outdoor use. Parameters may be programmed either manually, or by computer through the RS-232 port. Free PC Data Logging Software and a Data Logging Data Sheet are available online.

Specifications

DETECTORS: Geiger-Mueller (GM), proportional, and scintillation
ALERT/ALARM:
- indicated by annunciation on display
- built-in speaker for audible tone
- set at any range
- speaker volume control available as an option

DISPLAY: 4-digit LCD display with 1.3 cm (0.5 in.) high digits, 2 additional 0.5 cm (0.2 in.) digits for overflow counter, separate annunciators for display units, ALERT, ALARM, Low Battery, detector OVERLOAD, counting OVERFLOW, and scaler COUNTING
BACKLIGHT: pushbutton activates LCD backlight for a pre-programmed time
RATEMETER: can display in R/hr, Sv/h, cpm, or cps when selector switch is in RATE position
DISPLAY RANGE: auto ranging from 0.0 μR/hr – 9999 R/hr, 0.000 μSv/h – 9999 Sv/h; 0 cpm – 999 kcpm; or 0 cps –100 kcps
SCALER: adjustable from 1 – 9999 seconds (in 1-second intervals)
SCALER ALARM: adjustable from 1 – 999999 counts
DETECTOR DEAD TIME COMPENSATION (DTC): adjustable from 0 to 9999 microseconds
LINEARITY: within 10%
ADJUSTABLE PARAMETERS (via Removable Switchboard): Backlight "ON" time, set minimum Display, RS-232 dump mode, Detector Setup mode, Baud rate, detector dead time compensation (DTC), Calibration Constant, display Units, display Range, Time Base (seconds or minutes), Auto Divide, Response Time (variable or fixed), Ratemeter Alert/Alarm, Scaler Alarm, Scaler Count Time
AUDIO: built-in unimorph speaker with AUD ON/OFF switch and volume control potentiometer
HIGH VOLTAGE: 400 to 2400 volts (regulated within 0.2 % at 1000 Vdc; maximum load of 50 μA)
DISCRIMINATOR: adjustable from 2–100 mV
POWER: 2 "D" cell batteries housed in externally accessible sealed compartment
BATTERY LIFE: typically 200 hours with alkaline batteries (Low Battery warning icon on LCD)
SIZE: 16.5 x 8.9 x 21.6 cm (6.5 x 3.5 x 8.5 in.) (H x W x L)
WEIGHT: 1.6 kg (3.5 lb), including batteries

P.O. Box 810, Sweetwater, Texas 79556 USA / http://www.ludlums.com
800-622-0828 / 325-235-5494 / Fax: 325-235-4672 / E-mail: ludlum@ludlums.com

3/29/2011

Model 44-10 Gamma Detector

Radiation Detection for a Safer World

Ludlum Measurements, Inc.

Part Number: 47-1540

Specifications

INDICATED USE: low-level, wide-energy gamma detection
ENERGY RESPONSE: energy dependent
SUGGESTED INSTRUMENTS: general purpose survey meters, ratemeters, and scalers
OPERATING VOLTAGE: 500–1200 volts
SCINTILLATOR: 5.1 x 5.1 cm (2 x 2 in.) (Dia x L) NaI
SENSITIVITY: typically 900 cpm/µR/hr (^{137}Cs gamma)
BACKGROUND: 9750 cpm
RECOMMENDED ENERGY RANGE: 50 KeV–3.0 MeV
PHOTOMULTIPLIER TUBE: 5.1 cm (2 in.) diameter, magnetically shielded
CONNECTOR: series "C" (others available)
TEMPERATURE RANGE: -20 to 50 °C (-4 to 122 °F), may be certified to operate from -40 to 65 °C (-40 to 150 °F)
CONSTRUCTION: aluminum housing with beige polyurethane paint
SIZE: 6.6 x 27.9 cm (2.6 x 11 in.) (Dia x L)
WEIGHT: 1.0 kg (2.3 lb)

Options: Model 180-7 and **Model 180-9 Sample Holders** provide repeatable geometry for counting wipes, filter paper, or slides at user-selectable spacings of 0.32, 0.64, 1.3, 2.5, and 5.1 cm (0.125, 0.25, 0.5, 1, and 2 in.) from the detector.
Model 180-7 anodized aluminum frame, sample tray, and colllimator (P/N 47-1675)
Model 180-9: has 3.81 cm (1.5 in.) thick lead housing with beige powder coat (P/N 47-1591)
Collimator: 7.9 x 6.6 cm (3.125 x 2.6 in.) (Dia x L), 0.56 cm (0.22 in.) thickness (P/N 4260-076)
Collimator: 7.9 x 15.2 cm (3.125 x 6 in.) (Dia x L), 0.56 cm (0.22 in.) thickness (P/N 4260-079)
Planchets: 5.1 cm x 3.2 mm (2.0 x 0.125 in.) (Dia x thickness) in stainless steel or aluminum Stainless Steel (P/N 7525-371-01); Aluminum (P/N 7525-371) Minimum order quantity of 500

P.O. Box 810, Sweetwater, Texas 79556 / http://www.ludlums.com
800-622-0828 / 325-235-5494 / Fax: 325-235-4672 / E-mail: ludlum@ludlums.com

12/21/2011

7.4.2 Instrument Data Fact Sheets

The Ludlum Data Fact Sheets are included in this section to provide the technical information for the types of portable survey equipment and swipe analyzers expected to be used.

7.4.3 Instrument Action Level

The administrative control level for radiation workers for this project is 500 mrem/yr.

7.4.4 Instrument Maintenance and Calibration

The portable survey instrument calibration will be completed on an annual frequency; the instruments will be source checked daily when in use. Instrument calibration will also be conducted after repairs or modifications have been performed on the instrument. The instrument will be calibrated in accordance with the manufacturer's recommended method.

Figure 7-1 is provided for documenting Pre-operational and daily source checks. This information may instead be recorded in a field operations logbook or electronically, provided that the information specified in Figure 7-1 is recorded. This required information includes the following:

- Date calibration was performed and due date for next calibration
- Instrument name, model, and serial number
- Ambient background readings
- Source ReadingIdentification of the calibration standard (lot no., source concentration, supplier)
- Any relevant comments or remarks

Radiological survey instruments will be prepared for use in accordance with SOP 007, *Preparation of Portable Radiation and Contamination Survey Meters and Instruments for Field Use*.

7.4.5 Documenting Instrument Readings

The Project Health Physicist (PHP) is responsible for ensuring that radiation monitoring instruments are used in accordance with the specifications of this HASP and with manufacturer's specifications/recommendations. In addition, the PHP is also responsible for ensuring that the instrument use is documented. This requirement can be satisfied either by recording instrument readings on pre-printed sampling log sheets, on survey sheets or in a field log book. This includes the requirement for documenting instrument readings that indicate no elevated readings above noted daily background levels (i.e., no-exposure readings). At a minimum the following information should be included:

- Date, time, and duration of the reading
- Site location where the reading was obtained
- Instrument used (e.g., 2241, 2360, etc.)
- Personnel present at the area where the reading was noted
- Radiological notifications will be performed by Lawson Bailey Project Health Physicist (PHP) thru Lockheed Martin contacts.
- Other conditions that are considered relevant to the SSO (such as weather conditions, possible instrument interferences, etc.)
- Radiological surveys will be documented in accordance with SOP 006, *Radiation and Contamination Surveys.*

Portable Instrument Pre-Operational Response Check Sheet

Instrument Model:______________________ Serial Number:____

Probe Type:___________________________ Serial Number:____

Instrument Calibration Date:_____________________ Calibration Expiration Date:______________________

Check Source ID: _________________________Background At Time Of Initial Response Check_________________

Reference Reading/Unit:__________-20%______________ +20%________________

Date/Time	Bkgd.	Reading	Pass/Fail	Print/Sign	Comments

Reviewed By:____ Date:________________________

FIGURE 7-1

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: ______________________________ **PROJECT NO.:**____________

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		

8.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

8.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING

This section is included to specify health and safety training and medical surveillance requirements for Tetra Tech personnel participating in on site activities. Tetra Tech personnel must complete 40 hours of introductory hazardous waste site training prior to performing work at the LMC MSA. Tetra Tech personnel who have had introductory training more than 12 months prior to site work must have completed 8 hours of refresher training within the past 12 months before being cleared for site work. In addition, 8-hour supervisory training in accordance with 29 CFR 1910.120(e)(4) will be required for site supervisory personnel. Tetra Tech and subcontractor personnel working on site who are potentially exposed to hazardous substances shall receive initial and annual refresher training in accordance with 29 CFR 1910.120(e) – Hazardous Waste Operations and Emergency Response or the applicable state OSHA standard. Lockheed Martin shall be provided with electronic copies of the training certificates. Site personnel must complete yearly LMC-MSA required H&S orientation as part of site specific training.

Documentation of Tetra Tech introductory, supervisory, and refresher training as well as site-specific training will be maintained at the site. Copies of certificates or other official documentation will be used to fulfill this requirement.

The requirements described in Section 3.20.3 of the LM Handbook (Attachment I) addressing training will be followed.

8.2 SITE-SPECIFIC TRAINING

Tetra Tech SSO will provide site-specific training to Tetra Tech employees who will perform work on this project. Figure 8-1 will be used to document the provision and content of the project-specific and associated training. Site personnel will be required to sign this form prior to commencement of site activities. This training documentation will be employed to identify personnel who through record review and attendance of the site-specific training are cleared for participation in site activities. This document shall be maintained at the site to identify and maintain an active list of trained and cleared site personnel.

The Tetra Tech SSO will also conduct a pre-activities training session prior to initiating site work. This will consist of a brief meeting at the beginning of each day to discuss operations planned for that day, and a review of the appropriate Activity Hazard Analysis (AHA) for the planned task participants. A short meeting may also be held at the end of the day to discuss the operations completed and any problems encountered.

In addition, site-specific health and safety training will be conducted by the onsite maintenance contractor (EMCOR). Each person on a yearly basis will be required to have this training prior to obtaining an unescorted security badge for the site.

8.3 MEDICAL SURVEILLANCE

Tetra Tech personnel participating in project field activities will have had a physical examination meeting the requirements of Tetra Tech's medical surveillance program. Documentation for medical clearances will be maintained in the Tetra Tech Pittsburgh office and made available, as necessary, and will be documented using Figure 8-1 for every employee participating in onsite work activities at this site. Tetra Tech shall provide evidence of employee enrollment in a medical surveillance program. Lockheed Martin does not provide medical surveillance examinations to contractor employees.

The medical surveillance requirements described in Section 3.20.4 of the LM Handbook (Attachment I) will be followed.

Each field team member, including visitors, entering the exclusion zone(s) shall be required to complete and submit a copy of the Medical Data Sheet (see Attachment III of this HASP). This shall be provided to the SSO, prior to participating in site activities. The purpose of this document is to provide site personnel and emergency responders with additional information that may be necessary in order to administer medical attention.

FIGURE 8-1

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing field activities at LCM MSA and that I have received site-specific training which included the elements presented below:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of personal protective equipment
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- Emergency response procedures (evacuation and assembly points)
- Incipient response procedures
- Review of the contents of relevant Material Safety Data Sheets/Safwty Data Sheets/SDS
- Review of the use of Activity Hazard Analysis
- Stop Work Procedures

I have been given the opportunity to ask questions and all of my questions have been answered to my satisfaction. The dates of my training and medical surveillance requirements indicated below are accurate.

Name (Printed and Signature)	**Site-Specific Training Date**	**40-Hour Training (Date)**	**8-Hour Refresher Training (Date)**	**8-Hour Supervisory Training (Date)**	**Medical Exam**

9.0 SITE CONTROL

This section outlines the means by which Tetra Tech will delineate work zones and use these work zones in conjunction with decontamination procedures to prevent the spread of contaminants into previously unaffected areas of the site. It is anticipated that a three-zone approach will be used during work at this site. This approach will be comprised of an exclusion zone, a contamination reduction zone, and a support zone. It is also anticipated that this approach will control access to site work areas, restricting access by the general public, minimizing the potential for the spread of contaminants, and protecting individuals who are not cleared to enter work areas.

9.1 EXCLUSION ZONE

The exclusion zone will be considered the areas of the site of known or suspected contamination. It is anticipated that the areas around active/intrusive activates will have the potential for contaminants brought to the surface. These areas will be marked and personnel will maintain safe distances. Once active/intrusive activities have been completed and any surface contamination has been removed, the potential for exposure is again diminished and the area can then be reclassified as part of the contamination reduction zone. The exclusion zones for this project are those areas of the site where active work (DPT work areas, drilling, installation, and sample collection, etc.) is being performed plus a designated area of at least 25 feet surrounding the work area. Exclusion zones will be delineated as deemed appropriate by the FOL, through means such as erecting visibility fencing, barrier tape, cones, and/or postings to inform and direct personnel.

9.1.1 Exclusion Zone Clearance

An Exclusion Zone (EZ) will be established at each well installation/sampling location. The purpose of establishing and maintaining these localized exclusion zones is to define areas where more rigorous safety and health protection measures will be required and to designate areas restricted to non-essential and unauthorized personnel. The size and dimensions of these EZs will vary based on the nature of the planned activities, and may be subject to change at the SSO's discretion based on factors such as visual observations, nearby concurrent operations, and other factors. However, the following dimensions represent basic considerations for establishing EZs:

- DPT and associated concurrent sampling activities. The EZ for this activity will be set at the height of the mast, plus five feet surrounding the point of operation, with a minimum of 25-feet. This distance will also apply when surface and subsurface soil sampling from behind these type rigs.

- Monitoring well development, purging, piezometer construction and use, and collecting groundwater samples and water level readings. The EZ for these activities will be set to encompass an area of at least 10-feet surrounding the well head.

- Decontamination operations. The EZ for this activity will be set at 25 feet surrounding the gross contamination wash and rinse as well as 25-feet surrounding the heavy equipment decontamination area. Sample equipment decontamination boundaries will be set at 10-feet surrounding hand wash and rinse areas.

- Investigative Derived Waste (IDW) area will be constructed and barricaded. Only authorized personnel will be allowed access.

EZs will be marked using barrier tape, traffic cones and/or drive pole, or other readily-visible devices. Signs may also be posted at the SSO's discretion to inform and direct site personnel and site visitors. EZs shall remain marked until the SSO has evaluated the restoration effort and has authorized changing the zone status.

A pre-startup site visit will be conducted by members of the identified field team in an effort to identify proposed subsurface investigation locations, conduct utility clearances, and provide upfront notices concerning scheduled activities within the facility.

Subsurface activities will proceed only when utility clearance has been obtained. In the event that a utility is struck during a subsurface investigative activity, the emergency numbers provided in Section 2.0, Table 2-1, will be notified.

9.2 CONTAMINATION REDUCTION ZONE

Contamination Reduction Zones (CRZs) will be established to minimize the potential for the spread of contaminated media from being spread into previously-unaffected areas. The primary function of a CRZ is to provide an adequate area for decontamination activities. For personal and small item (e.g., sampling equipment) decontamination activities, a CRZ will be established at the perimeter of each EZ. For decontamination activities that will require specialized equipment, larger areas, and more significant containment, a heavy equipment decontamination pad CRZ will be established in one or more areas to support the two work areas.

In order to move from on EZ to another, the following activities will be performed in the localized CRZs:

- As samplers move from location to location, dedicated sampling devices and PPE will be washed to remove visible gross contamination, and then these items will be bagged and removed. Personnel will use hygienic wipes (such as "baby wipes") as necessary for interim personnel decontamination until they can access a facility equipped with hands washing and rinsing capabilities. At the first available opportunity personnel will wash their face and hands. This is critical prior to breaks and lunch when contamination may be transferred to the mouth through hand to mouth contact.

- Disposable PPE, sampling equipment, and other items are to be sequentially removed/deposited and double-bagged. Such waste is to be disposed of in accordance with the direction of the client. Reusable items that are grossly contaminated (such as muddy over-boots, hardhats, etc.) will be required to be removed, bagged, and taken to the established decontamination pad for washing and rinsing prior to being used at another EZ.

- Potentially contaminated tooling will be wrapped, as necessary, for transport to the decontamination area for cleaning.

9.3 SUPPORT ZONE

The support zone for this project will include a staging area where site vehicles will be parked, equipment will be unloaded, and where food and drink containers will be maintained. The support zones will be established at areas of the site where away from potential exposure to site contaminants during normal working conditions or foreseeable emergencies.

9.4 ACTIVITY HAZARD ANALYSIS

Exclusion Zone work conducted in support of this project will be performed using Activity Hazard Analysis (AHA’s) to guide and direct field crews on a task by task basis. Partially completed AHA’s for the work to be performed are attached (Attachment IV) to this HASP. These permits were completed to the extent possible as part of the development of this HASP. It is the SSO's responsibility to finalize and complete all blank portions of the AHA’s based on current, existing conditions the day the task is to be performed, and then review that completed permit with all task participants as part of a pre-task tail gate briefing session. This will ensure that site-specific considerations and changing conditions are appropriately incorporated into the AHA, provide the SSO with a structured format for conducting the tail gate sessions, as well will also give personnel an opportunity to ask questions and make suggestions. All AHA’s require the signature of the FOL or SSO.

9.5 SITE SECURITY

As this activity will take place at an active facility, the first line of security will be provided by the facility entrance/gate restricting the general public. The second line of security will take place at the work site referring interested parties to the FOL and LMC Contact.

Security at the work areas will be accomplished using field personnel. This is a multiple person operation, involving multiple operational zones. Tetra Tech personnel will retain complete control over active operational zones.

The site contact will serve as the focal point for facility personnel and interested parties and will serve as the primary enforcement contact.

9.6 SITE VISITORS

Site visitors for the purpose of this document are identified as representing the following groups of individuals:

- Personnel invited to observe or participate in operations by Tetra Tech
- Regulatory personnel (i.e. EPA, MDEP, OSHA)
- Property Owners
- Authorized Personnel
- Other authorized visitors

Non Tetra Tech personnel working on this project are required to gain initial access to the facility by coordinating with the Tetra Tech FOL or designee and following established facility access procedures.

Once access to the facility is obtained, personnel who require site access into areas of ongoing operations will be required to obtain permission from the PM. In addition, site visitors wishing to observe operations in progress will be escorted by a Tetra Tech representative and shall be required to meet the minimum requirements discussed below:

- Site visitors will be directed to the FOL/SSO, who will sign them into the field logbook or daily sign-in sheet. Information to be recorded in the logbook or sign-in sheet will include the individual's name (proper identification required), the entity which they represent, and the purpose of the visit.

- Site visitors must be escorted and restricted from approaching any work areas where they could be exposed to hazards from Tetra Tech operations. If a visitor has authorization from the client and from the Tetra Tech Project Manager to approach our work areas, the FOL must assure that the visitor first provides documentation indicating that he/she/they have successfully completed the necessary OSHA introductory training, receive site-specific training from the SSO, and that they have been physically cleared to work on hazardous waste sites. Site visitors wishing to enter the exclusion zone will be required to produce the necessary information supporting clearance to the site. This shall include information attesting to applicable training and medical surveillance as stipulated in Section 8.0 of this document. In addition, to enter the site operational zones during planned activities, visitors will be required to first go through site-specific training covering the topics stipulated in Section 8.2 of this HASP. All jobsite visitors must have a safety orientation prior to commencing work or touring the site. A visitor log will be kept to document the orientation.

- Once the site visitors have completed the above items, they will be permitted to enter the operational zone. Visitors are required to observe the protective equipment and site restrictions in effect at the site at the time of their visit. Visitors entering the exclusion zones during ongoing operations will be accompanied by a Tetra Tech representative. Visitors not meeting the requirements, as stipulated in this plan, for site clearance will not be permitted to enter the site operational zones during planned activities. Any incidence of unauthorized site visitation will cause the termination of on site activities until the unauthorized visitor is removed from the premises. Removal of unauthorized visitors will be accomplished with support from local law enforcement personnel.

9.7 SITE MAP

Once the areas of contamination, access routes, topography, and dispersion routes are determined, a site map will be generated and adjusted as site conditions change. These maps will be posted to illustrate up-to-date collection of contaminants and adjustment of zones and access points.

9.8 BUDDY SYSTEM

Personnel engaged in on site activities will practice the "buddy system" to ensure the safety of personnel involved in this operation.

9.9 COMMUNICATION

As personnel will be working in proximity to one another during field activities, a supported means of communication between field crew members will not be necessary.

External communication will be accomplished by using the cell phones/telephones at predetermined and approved locations. External communication will primarily be used for the purpose of resource and emergency resource communications. Prior to the commencement of activities at the LCM MSA, the FOL will determine and arrange for telephone communications.

9.10 SELF-AUDITS

The procedures outlined in Section 7 of the LM Handbook (Attachment I) addressing self-audits will be adhered to.

Tetra Tech and/or subcontractor personnel will perform periodic work area/project field inspections to monitor compliance with project environmental, safety and health requirements. The name of Tetra Tech's jobsite health and safety (H&S) representative will be provided to Lockheed Martin prior to starting work at the jobsite.

For jobs that are ongoing, an annual H&S audit shall be conducted and for jobs with a duration of less than one year at least one audit shall occur. A competent H&S representative designated by the Tetra Tech shall perform the audit. Unsafe acts and/or non-compliance conditions noted during inspections shall be corrected immediately.

The documentation related to the audits and inspections shall be submitted electronically to the Lockheed Martin Project Lead.

10.0 SPILL CONTAINMENT PROGRAM AND WASTE MANAGEMENT PLAN

10.1 SCOPE AND APPLICATION

It is not anticipated that bulk hazardous materials (over 55-gallons) will be generated or handled at any given time as part of this scope of work. It is also not anticipated that such spillage would constitute a danger to human health or the environment.

This Spill Prevention and Containment Program applies to the potential release from one or more containers on the work site involving a single or aggregate accumulation of bulk storage materials (over 55-gallons). As the classification of certain materials such as IDW is unknown, these materials will be treated as hazardous, pending laboratory certification to the contrary.

However, as the job progresses, some potential may exist for accumulating Investigative Derived Wastes (IDW) such as decontamination fluids, soil cuttings, disposable sampling equipment and PPE.

The spill containment and control will be engaged any time there is a release of the above-identified materials from a containment system or vessel. This spill containment program will be engaged in order to minimize associated hazards.

10.2 POTENTIAL SPILL AREAS

Potential spill areas will be periodically monitored in an ongoing attempt to prevent and control further potential contamination of the environment. Currently, limited areas are vulnerable to this hazard including:

- Resource deployment
- Waste transfer
- Central staging

It is anticipated that the IDW generated as a result of this scope of work will be containerized, labeled, and staged to await further analyses. The results of these analyses will determine the method of disposal.

10.3 LEAK AND SPILL DETECTION

To establish an early detection of potential spills or leaks, a periodic walk-around by the personnel staging or disposing of drums area will be conducted during working hours to visually determine that storage vessels are not leaking. If a leak is detected, the contents will be transferred, using a hand pump, into a new vessel. The leak will be collected and contained using absorbents such as Oil-Dry, vermiculite, or sand, which are stored at the vulnerable areas in a conspicuously marked drum. This used material, too, will be containerized for disposal pending analysis. Inspections will be documented in the project logbook.

In case of a spill or release of hazardous chemicals, Tetra Tech shall immediately notify the Lockheed Martin Project Lead, and/or if the severity of the spill warrants, the local fire department by calling 9-1-1. Tetra Tech shall take all necessary steps to control the spread of the release and to provide site control to prevent unauthorized personnel from entering the affected area.

Section 8.2 of the LM Handbook (Attachment I) pertaining to spill reporting will be addresses.

10.4 PERSONNEL TRAINING AND SPILL PREVENTION

Personnel will be instructed in the procedures for incipient spill prevention, containment, and collection of hazardous materials in the site-specific training. The FOL and the SSO will serve as the Spill Response Coordinators for this operation, should the need arise.

10.5 SPILL PREVENTION AND CONTAINMENT EQUIPMENT

The following represents the types of equipment that should be maintained at the staging areas for the purpose of supporting this Spill Prevention/Containment Program.

- Sand, clean fill, vermiculite, or other non combustible absorbent (Oil-dry)
- Drums (55-gallon U.S. DOT 1A1 or 1A2)
- Shovels, rakes, and brooms
- Container labels

Hazardous materials shall be stored in designated areas and all containers effectively closed. Spill equipment/supplied shall be readily available to contain and/or mitigate accidental spills of hazardous materials.

10.6 SPILL CONTROL PLAN

This section describes the procedures the Tetra Tech field crew members will employ upon the detection of a spill or leak.

- Notify the SSO or FOL immediately upon detection of a leak or spill. Activate emergency alerting procedures for that area to remove non-essential personnel.

- Employ the personal protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel. Spread the absorbent material in the area of the spill, covering it completely.

- Transfer the material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment and disposal options.

- Re-containerize spills, including 2-inch of top cover impacted by the spill. Await test results for treatment or disposal options.

It is not anticipated that a spill will occur that the field crew cannot handle. Should this occur, notification of the appropriate Emergency Response agencies will be carried out by the FOL or SSO in accordance with the procedures discussed in Section 2.0 of this HASP.

As mentioned above, in the event of a spill or release of hazardous chemicals, Tetra Tech will immediately notify the LMC personnel in the order presented in Table 2-1, and/or if the severity of the spill warrants, the local fire department by calling 9-1-1.

10.7 WASTE MANAGEMENT PLAN

Tetra Tech personnel will adhere to the decontamination and waste management procedures laid out the TtSOPs and the Tetra Tech Decontamination of Field Equipment and Waste Handling Standard Operating Procedure (Attachment XIII).

In addition, all requirements described in Sections 4.1 and 4.2 of the LM Handbook (Attachment I) will be addressed.

11.0 CONFINED-SPACE ENTRY

It is not anticipated, under the proposed scope of work, that confined space and permit-required confined space activities will be conducted. **Therefore, personnel under the provisions of this HASP are not allowed, under any circumstances, to enter confined spaces**. A confined space is defined as an area which has one or more of the following characteristics:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, manholes, sewers, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry).
- Is not designed for continuous employee occupancy.

Additionally, a Permit-Required Confined Space must also have one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly caving walls or by a floor that slopes downward and tapers to a smaller cross-section.
- Contains any other recognized, serious, safety or health hazard.

For further information on confined space, consult the Health and Safety Guidance Manual or call the PHSO. If confined space operations are to be performed as part of the scope of work, detailed procedures and training requirements will have to be addressed and this HASP will be updated/amended as necessary to address the confined space entry requirements detailed in Section 3.3 of the LM Handbook (Attachment I). If subcontractors are performing confined space entry, the subcontractor will work under their own HASP approved by a Tetra Tech health and safety official along with complying with any site specific permit requirements.

12.0 HOT WORK

No hot work activities are being conducted as part of this field effort. Should hot work be required, this HASP will be amended/updated as necessary to include the requirements stipulated in Section 3.4 of the LM Handbook (Attachment I).

13.0 USE OF LOCKHEED MARTIN MATERIALS AND EQUIPMENT

No Lockheed Martin materials, tools, equipment, PPE shall be used until authorized by Lockheed Martin.

No Tetra Tech personnel will start, stop, relocate, or adjust any Lockheed Martin process or production equipment without approval of the Lockheed Martin Project Lead. Details of these requirements are described in Section 3.6 of the LM Handbook.

14.0 ELEVATED LOCATIONS / LADDERS / SCAFFOLDS

No elevated location work, ladder work, or scaffolding activities are being conducted as part of this field effort. Should any of these activities be required, this HASP will be amended/updated as necessary to include the requirements stipulated in Sections 3.10, 3.11, and 3.12 of the LM Handbook (Attachment I).

15.0 DANGEROUS OPERATIONS

Tetra Tech and subcontractor personnel will isolate their work areas from Lockheed Martin operations, employees, and the public. Barricades, signs, and signals will be employed as necessary and will be visible at all times where hazards exist.

Tetra Tech and subcontractors will effectively barricade excavations, floor openings, etc. as required by OSHA regulations.

Prior to beginning work, Tetra Tech and subcontractors must inform the Lockheed Martin Project Lead of any potentially dangerous operations.

All requirements addressing dangerous operations are detailed in Section 3.7 of the LM Handbook and will be adhered to.

16.0 EXCAVATIONS, TRENCHES, AND EARTHWORK

This field effort includes the excavation of test pits, therefore the following excavation procedures will apply to the excavation work.

16.1 EXCAVATION SAFE WORK PRACTICES

- Utility clearances should be in place prior to the beginning of excavation (in accordance with the Tetra Tech Utility Locating SOP in the Health and Safety Guidance Manual Section 7.0).

- Excavation boundaries should be demarcated with appropriate warning signs (e.g., construction activities in progress).

- Traffic patterns for equipment and the loading of trucks should be established. This pattern should form a loop to minimize backing, an activity which causes many accidents.

- Traffic patterns for foot and small vehicular traffic should keep workers away from heavy equipment.

- Traffic patterns for heavy equipment should be constructed to maintain traffic flow a minimum of 10 feet from unsupported walls or excavation boundaries.

- Excavation along thoroughfares will require the use of warning signs, barricades and flag-persons for alteration of traffic patterns, as necessary.

- Ground personnel should be provided with reflective vests to increase visibility and air horns to signal loud trucks and heavy equipment.

- Ground activities with heavy equipment should be supported with a ground spotter. The operators should be instructed that they are to follow the instructions provided by the ground spotter unless another party is otherwise authorized.

- Surface encumbrances within the intended work area of the excavation will be removed or supported, as necessary, in accordance with OSHA 1926.651(a).

- Prior to being put into service at the site, the excavator will be inspected by the SSO, and this inspection will be documented using the applicable forms in Attachment V.

- Heavy equipment will be positioned and operated so that it never approaches closer than 4 feet from the edge of an open excavation (other than the boom and bucket portion of the excavator).

- A decontamination station should be established at the loading and off-loading areas to flush mud and dirt from the wheels and tires as well as any areas of the vehicle impacted during the loading operation.

Note: Tetra Tech personnel WILL NOT enter a trench past 4 feet deep

16.2 EMPLOYER DESIGNATED "COMPETENT PERSON"

The Employer Designated "Competent Person" is responsible for all aspects of excavation safety. This includes:

16.2.1 Pre-Excavation Activities

- Utility Clearance identification and marking
- Establishment of site control measures (temporary utilities, temporary traffic patterns, barricades, signs, etc.)
- Removal and/or control of Surface and Subsurface Encumbrances
- Traffic (Foot/Vehicular) Impact and routing
- Surface drainage patterns and impact

16.2.2 During Excavation Activities

- Utility sweeps
- Review and evaluation of entry/egress systems
- Installing support systems for surface and subsurface encumbrances as necessary (i.e. supporting building foundations, sidewalks, utility runs, etc.)
- Soil classification – Visual and Manual Analysis
- Hazardous atmosphere evaluation (initial and periodic monitoring)
- Recommendation/Installation/Evaluation of protective system (in and out of the excavation)

16.2.3 Post Excavation Activities

- Evaluation of the protective systems installed (sloping, benching, shielding, etc.)
- Soil conditions (Moisture content, fissures developing, horizontal cracks, etc.)
- Loading the excavation walls (Spoils piles, resource/fill materials stock piling, traffic, etc.)
- Atmospheric monitoring
- Backfill

16.2.4 Competent Persons Qualifications

- The employer designates Competent Person(s) based on knowledge and training.
- Capable of identifying existing or predictable hazards associated with excavated cuts or cavities in the earth.
- Has the authority to take prompt action to abate these hazards.
- Working knowledge of Soil Analysis/Soil Classification.
- Knowledgeable in the area of Protective Systems.
- Working knowledge of the requirements of 29 CFR 1926 Subpart P.

This position will typically be filled by Site Safety Officer (SSO), Field Operations Leader (FOL), or a Registered Professional Engineer (PE). The Excavation Competent Person must be specifically identified to handle this responsibility prior to work beginning in the specified space provided (Section 1.3) in this HASP.

Detailed Tetra Tech Excavation Safety Procedures, the Excavation Competent Person Checklist, the Tetra Tech Confined Space Entry Program and Procedures, and the Heavy Equipment Inspection Checklist are included in Attachments VIII, IX, X and XI, and must be completed prior to beginning work. The OSHA Health and Safety Construction-Related regulations P-650 to 699 – Subpart P – Excavations are included in Attachment XII and must be followed during all excavation work.

16.3 LM EXCAVATION REQUIREMENTS

In addition, the requirements stipulated in Section 3.8 of the LM Handbook (Attachment I) will be reviewed and adhered to during the excavation work and a trained, competent person will be designated to oversee the activities. These requirements include:

- Review the Lockheed Martin intrusive fieldwork requirements in Appendix A of the LM Handbook.

- If workers are to enter excavations, a competent person must be designated and trained in soil classification and the recognition of trenching and excavation hazards.

- Excavations and trenches shall be inspected by a competent person daily and after every rainstorm, earthquake, or other hazard-increasing occurrence.

- Inspect the face, banks, and top daily when workers are exposed to falling or rolling materials.

- Shore, bench, slope, or use equivalent methods to protect workers in excavations four feet deep or more.

- Locate soil at least two feet from the edge of the excavation, or one foot from the edge when the excavation is less than five feet deep.

- Ladders or steps shall be provided and secured in all trenches four feet or more in depth. Ladders shall be located to require no more than twenty-five feet of lateral travel before having access or egress and shall extend three feet above the top of the trench bank.

- Install crossings with standard guardrails and toeboards when the excavation is more than 7½ feet deep.

- All open trenches and other excavations shall be provided with suitable barriers, signs, and lights to the extent that adequate protection is provided to the public.

- Do not excavate beneath the level of adjacent foundations, retaining walls, or other structures until a qualified person has determined that the work will not be hazardous. Support undermined sidewalks.

17.0 ASBESTOS

No asbestos abatement work is being conducted as part of this field effort. Should it be required, this HASP will be amended/updated as necessary to include the requirements stipulated in Section 3.19 of the LM Handbook (Attachment I).

It is not anticipated during this field effort, but should asbestos containing material (ACM) or presumed asbestos containing material (PACM) be disrupted, Tetra Tech and/or subcontractor personnel shall immediately report to the Lockheed Martin Project Lead and to other employers of employees working at the job site any discovery, disturbance, and/or spill of ACM and/or PACM. All operations will cease in the immediate area of the suspect ACM and/or PACM and demarcate the area. The approval of the Lockheed Martin Project Lead is required before resuming operations.

Tetra Tech and/or subcontractor personnel shall not disturb any pipe insulation, boiler insulation, or any other material reasonably suspected of containing asbestos until the Lockheed Martin is notified and approval is obtained.

Abatement of asbestos can be performed only by persons properly trained and licensed to perform such activities.

All requirements addressed in Section 3.18 of the LM Handbook pertaining to incidental asbestos exposure will be followed.

18.0 NANOTECHNOLOGY

No nanotechnology work is being conducted as part of this field effort. Should it be required, this HASP will be amended/updated as necessary to include the requirements stipulated in Section 3.21 of the LM Handbook (Attachment I).

19.0 WORK INVOLVING AIR EMISSIONS

No work involving air emissions is being conducted as part of this field effort. Should it be required, this HASP will be amended/updated as necessary to include the requirements stipulated in Section 4.3 of the LM Handbook (Attachment I).

20.0 WORK INVOLVING WATER DISCHARGES

Work involving water discharges has been conducted at the site during sediment removal actions and groundwater remediation. Treated water is stored in a holding tank, purged through carbon filtration or a similar specified appropriate media and the water is transported by tanker truck to an approved local sanitary discharge manhole onsite.

21.0 MATERIALS AND DOCUMENTATION

The Tetra Tech Field Operations Leader (FOL) shall ensure the following materials/documents are taken to the project site and used when required.

- A complete copy of this HASP
- TtSOPs
- Incident Reports
- Medical Data Sheets
- Material Safety Data Sheets/Safety Data Sheets for chemicals brought on site, including decontamination solutions, fuels, sample preservatives, calibration gases, etc.
- A full-size OSHA Job Safety and Health Poster (posted in the site trailer)
- Training/Medical Surveillance Documentation Form (Blank)
- First-Aid Supply Usage Form
- Emergency Reference Form (Section 2.0, extra copy for posting)
- Directions to the Hospital

21.1 MATERIALS TO BE POSTED AT THE SITE

The following documentation is to be posted or maintained at the site for quick reference purposes. In situations where posting these documents is not feasible (such as no office trailer), these documents should be separated and immediately accessible.

- **Chemical Inventory Listing (posted)** - This list represents all chemicals brought on-site, including decontamination solutions, sample preservations, fuel, etc. This list should be posted in a central area.

- **SDS (maintained)** - The SDS should also be in a central area accessible to all site personnel. These documents should match all the listings on the chemical inventory list for all substances employed on-site. It is acceptable to have these documents within a central folder and the chemical inventory as the table of contents.

- **The OSHA Job Safety & Health Protection Poster (posted – Attachment XV)** - This poster should be conspicuously posted in places where notices to employees are normally posted, as directed by 29 CFR 1903.2 (a)(1). Each FOL shall ensure that this poster is not defaced, altered, or covered by other material. The law also states that reproductions or facsimiles of the poster shall be at least 8 1/2 by 14 inches with 10 point type.

- **Site Clearance (maintained)** - This list is found within the training section of the HASP (Figure 8-1). This list identifies all site personnel, dates of training (including site-specific training), and medical surveillance. The list indicates not only clearance, but also status. If personnel do not meet these requirements, they do not enter the site while site personnel are engaged in activities.

- **Emergency Phone Numbers and Directions to the Hospital(s) (posted)** - This list of numbers and directions will be maintained at all phone communications points and in each site vehicle.

- **Medical Data Sheets/Cards (maintained)** - Medical Data Sheets will be filled out by on-site personnel and filed in a central location. The Medical Data Sheet will accompany any injury or illness requiring medical attention to the medical facility. A copy of this sheet or a wallet card will be given to all personnel to be carried on their person.

- **Personnel Monitoring (maintained)** - All results generated through personnel sampling (levels of airborne toxins, noise levels, etc.) will be posted to inform individuals of the results of that effort.

- **Placards and Labels (maintained)** - Where chemical inventories have been separated because of quantities and incompatibilities, these areas will be conspicuously marked using DOT placards and acceptable [Hazard Communication 29 CFR 1910.1200(f)] labels.

The purpose of maintaining or posting this information, as stated above, is to allow site personnel quick access. Variations concerning location and methods of presentation are acceptable providing the objective is accomplished.

21.2 HAZARD COMMUNICATION – USE OF HAZARDOUS MATERIALS

All hazardous substance (as defined by OSHA) brought onto Lockheed Martin remediation sites must be accompanied by a MSDS/SDS and the containers labeled in accordance with the Red OSHA Hazard Communication Standard, 29 CFR 1910.1200 or applicable state OSHA standard. Tetra Tech and subcontractor personnel will provide MSDS/SDSs for chemicals brought on site. The contents of these documents will be reviewed by the SSO with the user(s) of the chemical substances prior to any actual use or application of the substances on site. A chemical inventory of the chemicals used on site will be developed using the TtSOP. The MSDS/SDSs will then be maintained in a central location (i.e., temporary office) and will be available for anyone to review upon request.

The Lockheed Martin Project Lead shall be notified prior to bringing any quantity of hazardous materials onto Lockheed Martin remediation sites. Hazardous materials shall be stored in designated areas and all containers effectively closed. Spill equipment/supplied shall be readily available to contain and/or mitigate accidental spills of hazardous materials.

All other hazard communication requirements are detailed in Section 3.2 and Section 4.1 of the LM Handbook (Attachment I) and will be adhered to.

22.0 ACRONYMS / ABBREVIATIONS

CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CPT	Cone Penetrometer
CSP	Certified Safety Professional
DPT	Direct Push Technology
DRA	Dump Road Area
DRI	Direct Reading Instrument
FID	Flame Ionization Detector
FOL	Field Operations Leader
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSM	Health and Safety Manager
IDW	Investigation Derived Waste
MDEP	Maryland Department of Environmental Protection
MIP	Membrane Interface Probe
MAA	Maryland Aviation Administration
MSA	Martin State Airport
N/A	Not Available
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PHSO	Project Health and Safety Officer
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
RCT	Radiaition Control Technician
RI	Remedial Investigation
RSO	Radiation Site Officer
SSO	Site Safety Officer
TBD	To be determined
TCE	Trichloroethene
Tetra Tech	Tetra Tech, Inc.
µg/L	microgram per liter
USEPA	United States Environmental Protection Agency
VC	Vinyl Chloride
VOCs	Volatile Organic Compounds

ATTACHMENT I

LOCKHEED MARTIN'S
REMEDIATION CONTRACTOR'S ESH
HANDBOOK

REMEDIATION CONTRACTOR'S ESH HANDBOOK

June 10, 2009

Revision 1

Lockheed Martin Corporation
Energy, Environment, Safety & Health

A COPY OF THE JOB SPECIFIC HASP SHALL BE AVAILABE AT THE JOB SITE FOR THE DURATION OF THE PROJECT

REVISION STATUS

REVISION	DATE	COMMENTS
1	06/10/2009	

Table of Contents

CONTRACTOR'S ESH HANDBOOK

GENERAL

Lockheed Martin Corporation management at all levels is committed to conducting operations and activities in a manner that provides and maintains safe and healthful working conditions, protects the environment, and conserves natural resources.

This *Contractor's ESH Handbook* has been prepared to assist each project jobsite employer/contractor in satisfying its' contractual and legal accident prevention responsibilities, in such a manner that a safe, efficient operation is assured. All applicable requirements outlined in this handbook shall be incorporated into the contractor's site specific Safety and Health Plan The site specific Safety and Health plan shall be submitted to the Lockheed Martin Project Lead at least two weeks prior to starting work on any Lockheed Martin remediation projects.

This material must not be considered to be all inclusive as to the hazards that might be encountered, safe practices that should be performed, or safe conditions that should be maintained during the course of any project. Moreover, this handbook does not replace the contractor's legal obligation to its employees under all relevant environmental, safety and health requirements and laws. All legal standards not specifically referenced in this handbook shall apply when applicable.

1 <u>CONTRACT RESPONSIBILITIES</u>

The Contractor agrees to comply with all rules and procedures contained in this document, known as the *Remediation Contractor's ESH Handbook*, unless Lockheed Martin specifically agrees, in writing, to a modification or exemption. In addition, the Contractor and subcontractors, at any tier, shall:

1.1 Lockheed Martin is a drug free-work workplace. This requirement extends to contractors working on Lockheed Martin remediation projects. Additionally, the use of tobacco is not permitted on Lockheed Martin owned property.

1.2 Take all prudent and proper environmental, safety and health (ESH) precautions to protect Lockheed Martin employees, all other workers, and the public from ESH hazards associated with contractor activities.

1.3 Comply with all applicable Federal, State, municipal, local, and any other applicable occupational safety and health statutes, rules, ordinances, regulations, and requirements issued or imposed by any governmental authority (including, but not limited to *Title 29, Code of Federal Regulations Parts 1903, 1904, 1910* and *1926*).

1.4 Comply with all applicable Federal, State, municipal, local, and any other applicable air pollution statutes, rules, ordinances, regulations, and requirements issued or imposed by any governmental authority.

1.5 Comply with all Federal, State, municipal, local and Lockheed Martin hazardous materials, hazardous waste, and non-hazardous waste statutes, rules, ordinances, regulations, and requirements (including, but not limited to *Title 40, Code of Federal Regulations*).

1.6 Obtain the applicable ESH permits to conduct the work in compliance with local, state, federal ESH regulations and site requirements (including, but not limiting to *Title 29, Code of Federal Regulations, 1910 and 1926*).

1.7 Ensure that all employees and subcontractors have received the appropriate level of ESH training in accordance with applicable ESH regulations necessary for the performance of the work requested by Lockheed Martin.

1.8 To instruct, prior to commencement of operations, all employees on the jobsite about relevant governmental laws and regulations, specific hazards expected to be encountered and proper safety precautions to be observed. In addition, jobsite employees shall read and certify that they have read and understand the job specific health and safety plan (HASP). The certification forms provided by the contractor within the HASP shall be electronically sent to the Lockheed Martin Project Lead.

1.9 Provide all jobsite visitors with a safety orientation prior to commencing work or touring the site. A visitor log shall be kept to document the orientation.

1.10 To ensure Contractor's job specific health and safety plan (HASP) encompasses Federal, State, municipal, local and the Lockheed Martin requirements found within this document the HASP should contain a section on crisis management / emergency response. A copy of the job specific HASP shall be maintained at the job site where jobsite employees have access to a copy. All Contractor Project Managers shall be provided a copy of the *Contractor's ESH Handbook* found within the Lockheed Martin Request for Proposal or as an appendix of the Key National Contractor Agreement. Contractors shall flow these requirements down to their subcontractors.

1.11 Contractor understands that Lockheed Martin may immediately stop Contractor's work if Contractor violates any applicable Federal, State, municipal, local, or any other rules, regulations, and requirements, *Remediation Contractor’s ESH Handbook* provisions, or other contract terms and conditions regarding environmental, safety and health compliance. Lockheed Martin shall not incur work stoppage charges unless the contractor demonstrates that the work stoppage was unwarranted for any of the reasons stated above. Any dispute regarding work stoppage charges must be resolved through binding arbitration.

1.12 Contractor is advised that the Project may be inspected from time to time by Lockheed Martin or a representative of Lockheed Martin. Periodic Lockheed Martin inspections in no way relieve the Contractor of their obligation to maintain its own inspection program to identify unsafe conditions or acts. ESH violations will be considered in evaluation of Contractor’s performance.

1.13 Lockheed Martin is not responsible for training or supervising Contractor employees or abating workplace hazards created by the Contractor or to which the Contractor's employees are exposed.

1.14 Contractor agrees to maintain copies of all pertinent ESH records at the job site. Pertinent records include, but is not limited to, personnel training documentation, evidence of enrollment in a medical surveillance program, accident/injury reporting, work area inspections, periodic safety meetings, MSDS's, air monitoring data, waste container inspections, etc. These records shall also be provided electronically to the Lockheed Martin Project Lead.

1.15 Contractor shall contact the Lockheed Martin Project Lead immediately in the event of a fatal or serious injury, an unpermitted environmental release, or any ESH incident that is likely to generate significant publicity or an adverse situation for Lockheed Martin (e.g., alleged releases of contaminants beyond property boundaries, purported fish or wildlife impacts, allegations of adverse community health or property impacts, etc.)

2 DEFINITION

2.1 Contractor: any agent/agency engaged by Lockheed Martin through written contract (or other written agreement) to perform work on Lockheed Martin Remediation Sites. For the purposes of this *Remediation Contractor's ESH Handbook*, "Contractor" shall also include Contractor's subcontractors at any tier.

2.2 EPA: the Environmental Protection Agency.

2.3 Fed/OSHA: the Federal Occupational Safety and Health Administration

2.4 Hazard Communication Program: a written program meeting the requirements of Title 29, Code of Federal Regulations, Section 1910.1200 - Hazard Communication.

2.5 Lockheed Martin: Lockheed Martin Corporation, Corporate Energy, Environment, Safety & Health

2.6 Lockheed Martin Project Lead: the Lockheed Martin Corporate Environment, Safety & Health individual that has been designated to manage a specific project.

2.7 Lockheed Martin Contract Representative: the Lockheed Martin Corporate Environment, Safety & Health contract representative (Contract Administrator/Buyer) for the project.

2.8 RCRA: the Federal Resource Conservation and Recovery Act and all amendments or revisions.

3 SAFETY & HEALTH

Contractor shall comply with applicable provisions of Federal, State, municipal, local, and any other applicable occupational safety and health statutes, rules, ordinances, regulations and requirements. Contractor shall take all precautions for the protection of the safety and health of Contractor employees, subcontractor employees, and Lockheed Martin employees to prevent accidents or injury to them or to other persons on, about, or adjacent to site of work performance. Notwithstanding this handbook, Contractor will hold harmless Lockheed Martin for any incident, violation, regulatory agency inspection resulting in a finding, or any other ESH issue that occurs to a Contractor employee.

Within Section 3.0, Lockheed Martin is identifying specific requirements within the Federal regulations that need extra attention. These are not all encompassing and adherence to the all rules and regulations must be followed.

3.1 PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

1926 Subpart E or 1910 Subpart I
1910.139 / 1926.103
ANSI Z87.1
ANSI Z41 Standard
ANSI Z89.1 Standard

3.1.1 Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

- Eye Protection. Safety eyewear meeting ANSI Z87.1 shall be worn in areas designated as "Eye Protection Required" and on all jobs where a potential injury to the eyes is possible whether or not the area is posted.
- Foot Protection. Affected employee(s) shall wear protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and where such employee's feet are exposed to electrical hazards. Safety shoes and boots which meet the ANSI Z41 Standard shall be provided when impact and/or compression hazards exist. Soft-shoes, including but not limited to, tennis shoes, athletic shoes, moccasins, sandals, and open-toed or open-heeled shoes shall not be worn.
- Respiratory Protection Devices. Appropriate, MSHA/NIOSH-approved respiratory protective devices must be worn when applicable state and/or federal action levels or OSHA permissible exposure levels (PELs) are exceeded. Contractor must have fully implemented a respiratory protection program meeting the requirements of *Title 29, Code of Federal Regulations, Section 1910.139 / 1926.103* or applicable state OSHA regulations prior to issuing and using respiratory equipment. Contractor shall supply and maintain

appropriate air monitoring and respiratory protection equipment if inhalation hazards are anticipated.

- Protective Clothing such as suits, aprons, boots, or gloves shall be worn where there is a hazard to the body through dermal contact with chemicals, dusts, heat or other harmful agents or conditions.
- Hearing Protection (muffs and/or plugs) must be worn in all areas posted to indicate high noise level or where Contractor employees are exposed to noise levels in excess of the OSHA action level (85 dBA over a 8-hour time-weighted average or a dose of fifty percent).
- Hard Hats will be worn in all areas where there is a danger of impact to the head or hazard from falling or moving objects. Hard hats must meet the ANSI Z89.1 Standard.

3.1.2 Contractor will issue or cause to be issued prior to commencing the job all necessary personal protective equipment and air monitoring equipment to all its agents and employees, together with full instructions and training on the use of said equipment.

3.1.3 Contractor will meet all applicable Federal, Sate, municipal, local, and Lockheed Martin requirements for protective clothing and equipment. Contractor will properly supervise all its agents and employees to ensure protective clothing and equipment are used in conformance with applicable rules and regulations.

3.2 HAZARD COMMUNICATION - USE OF HAZARDOUS MATERIALS

Title 29, Code of Federal Regulations, Section 1926.59 Hazard Communication
Title 29, Code of Federal Regulations, Section 1910.1200 Hazard Communication

3.2.1 Contractor personnel shall not bring any hazardous substances (as defined by OSHA) onto Lockheed Martin remediation sites unless accompanied by a Material Safety Data Sheet (MSDS) and the containers are appropriately labeled. MSDS's must be maintained at the job site.

3.2.2 Contractor shall notify the Lockheed Martin Project Lead prior to bringing onto Lockheed Martin remediation sites any quantity of hazardous materials.

3.2.3 Contractor shall ensure all containers of hazardous materials are labeled in accordance with the Fed OSHA Hazard Communication Standard, 29 CFR 1910.1200 or applicable state OSHA standard.

3.2.4 Do not handle or use any hazardous material that does not have adequate safety warning labels.

3.2.5 Do not dump, drain or discharge any hazardous materials or wastes into any sink, drain or sewer.

3.2.6 The Lockheed Martin Project Lead shall inform the Contractor(s) of the identity of hazardous chemicals to which Contractor's employees may be exposed from

Lockheed Martin operations, if applicable. The Lockheed Martin Project Lead shall provide the following information:

- Where to obtain information concerning any hazardous substances used in Lockheed Martin operations that the Contractor's employees may come in contact with while performing their work;
- If Lockheed Martin owns or uses chemicals on a remediation site for any process where contractors could be exposed, Lockheed Martin shall make available to the Contractor Material Safety Data Sheets (MSDS) and sufficient information to permit the Contractor to train its employees on the hazards of the chemical Appropriate protective measure Contractor employees may take to protect themselves from exposure to known hazards from Lockheed Martin operations; and
- Appropriate work practice procedures (safety rules) for the location where work is to be performed.

3.2.7 Contractor shall ensure its employees are trained in the safe handling and use of hazardous materials in accordance with *29 CFR 1910.1200 - Hazard Communication* or the applicable state-OSHA hazard communication standard.

3.2.8 Contractor shall ensure that all applicable employees are medically qualified (as defined by OSHA) to perform the work assigned.

3.2.9 Hazardous materials shall be stored in designated areas and all containers effectively closed. Spill equipment/supplies shall be readily available to contain and/or mitigate accidental spills of hazardous materials.

3.3 CONFINED SPACE ENTRY

Title 29, Code of Federal Regulations, Section 1910.146 Permit-Required Confined Spaces

3.3.1 If Contractor or any other employee must enter a confined space (tank, vat, pit, sewer, etc.), the entry must be performed in accordance with the applicable state OSHA or federal OSHA regulations.

3.3.2 Before Contractor's employees are permitted entry into any confined space, the internal atmosphere shall be tested with a calibrated direct-reading instrument for the following conditions in the order given: 1) Oxygen content, 2) Flammable gases & vapors, and 3) Potential toxic air contaminants. Contractor shall furnish the air testing equipment and a person competent in the use of the testing equipment.

3.3.3 When possible, the Contractor shall notify the Lockheed Martin Project Lead prior to entering a permit required confined space. A permit shall be issued by the contractor prior to entry and electronically submit a copy to the Lockheed Martin Project Lead.

3.3.4 To ensure the safety of Contractor personnel during entry into confined spaces, the Contractor shall have a written confined space entry program.

3.4 HOT WORK REQUIREMENTS (i.e., welding, torch cutting, brazing, etc.)

Title 29, Code of Federal Regulations, Section 1910 Subpart Q
Title 29, Code of Federal Regulations, Section 1926 Subpart J

3.4.1 All hot work activities shall be conducted in accordance with the hot work permit requirements outlined in the site specific HASP (i.e., fire suppression equipment availability, removal of combustibles, fire watch, etc.).

3.4.2 Contractor personnel must secure all oxygen and acetylene cylinders in a manner that will prevent them from falling or tipping over. Oxygen and acetylene cylinders must be stored separately. Oxygen cylinders in storage must be separated from fuel gas cylinders a distance of 20 feet or by a noncombustible barrier 5 feet high. Acetylene cylinders shall not be stored horizontally, lying on their side.

3.4.3 When welding, Contractor personnel shall use welding curtains and/or suitable protective devices to protect persons from indirect exposure to welding flashes.

3.5 LOCKOUT / TAGOUT - Control of Hazardous Energy

Title 29, Code of Federal Regulations, Section 1910.147

3.5.1 Contractors are required to establish a written program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energization, start-up or release of stored energy in order to prevent injury to employee.

3.5.2 Contractor shall not service and/or maintain machines and equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury to employees. Servicing and/or maintaining such equipment shall not be conducted until appropriate energy control methods have been initiated.

The Contractor shall provide training to ensure that the purpose and function of the energy control program are understood by their employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by the employees.

3.5.3 If Contractor needs to service or maintain Lockheed Martin equipment, Contractor(s) shall notify the Lockheed Martin Project Lead and/or on-site facility operator (if applicable) of the intended equipment service for any unscheduled maintenance.

3.5.4 Upon completion of the job, Contractor is to notify the Lockheed Martin Project

Lead and/or on-site facility operator (if applicable) so power can be resumed to the equipment after the lock-outs and tags have been removed.

3.6 USE OF LOCKHEED MARTIN MATERIALS AND EQUIPMENT

3.6.1 Contractor's employees shall not use Lockheed Martin tools, equipment, materials, or personal protective equipment unless otherwise authorized by Lockheed Martin.

3.6.2 Contractor shall not start or stop any production equipment without the approval of the Lockheed Martin Project Lead.

3.6.3 Contractor shall not adjust or relocate any Lockheed Martin process equipment without the approval of the Lockheed Martin Project Lead.

3.7 DANGEROUS OPERATIONS - WARNINGS AND BARRICADES

Title 29, Code of Federal Regulations, Section 1926, Subpart G-Signs, signals and barricades

3.7.1 Contractor shall isolate their work areas from Lockheed Martin operations, employees, and the public by using barricades or other effective means of isolation. Signs, signals and barricades shall be visible at all times where a hazard exists.

3.7.2 Contractor personnel shall erect and properly maintain, at all times, all necessary safeguards for the protection of Contractor personnel, Lockheed Martin employees and the public. This includes:

- If doing any overhead work, Contractor must utilize warning signs and barricades, or station someone on the ground to prevent passers-by from entering the area below the overhead work;
- Contractor must effectively barricade excavations, floor openings, etc., as required by OSHA regulations;
- Contractor must construct and maintain all scaffolds and working platforms in accordance with OSHA regulations; and
- If Contractor's equipment, barricades or other safeguards restrict fire lanes or fire equipment access, the Contractor shall notify the Lockheed Martin Project Lead about its notification to the local fire department.

3.7.3 Prior to commencing work, Contractor must inform Lockheed Martin Project Lead of any work posing a potential danger to personnel.

3.8 EXCAVATIONS, TRENCHES, EARTHWORK

Title 29, Code of Federal Regulations, Section 1926 Subpart P

3.8.1 Review the Lockheed Martin intrusive fieldwork requirements in Appendix A.

3.8.2 If workers are to enter excavations, a competent person must be designated and trained in soil classification and the recognition of trenching and excavation hazards.

3.8.3 Excavations and trenches shall be inspected by a competent person daily and after every rainstorm, earthquake, or other hazard-increasing occurrence.

3.8.4 Inspect the face, banks, and top daily when workers are exposed to falling or rolling materials.

3.8.5 Shore, bench, slope, or use equivalent methods to protect workers in excavations four feet deep or more.

3.8.6 Locate soil at least two feet from the edge of the excavation, or one foot from the edge when the excavation is less than five feet deep.

3.8.7 Ladders or steps shall be provided and secured in all trenches four feet or more in depth. Ladders shall be located to require no more than twenty-five feet of lateral travel before having access or egress and shall extend three feet above the top of the trench bank.

3.8.8 Install crossings with standard guardrails and toeboards when the excavation is more than 7½ feet deep.

3.8.9 All open trenches and other excavations shall be provided with suitable barriers, signs, and lights to the extent that adequate protection is provided to the public.

3.8.10 Do not excavate beneath the level of adjacent foundations, retaining walls, or other structures until a qualified person has determined that the work will not be hazardous. Support undermined sidewalks.

3.9 ELECTRICAL SAFETY

Title 29, Code of Federal Regulations, Section 1926 Subpart K-Electrical
Title 29, Code of Federal Regulations, Section 1910.269 Electrical Power Generation, Transmission and Distribution

3.9.1 Only qualified persons are permitted to work on electrical systems, as defined by *Title 29, Code of Federal Regulations Section 1910.269(a)(2)*. Qualified persons shall be trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment;
- The skills and techniques necessary to determine the nominal voltage of exposed live parts;
- The minimum approach distances specified by OSHA corresponding to the voltages to which the qualified employee will be exposed; and

- The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment.

3.9.2 Contractor personnel shall properly ground all electrical tools, mechanical digging or concrete breaking equipment and all other electrical equipment while in use.

3.9.3 All electrical work, installation and wire capacities shall be in accordance with the pertinent provisions of the National Electrical Code, ANSI and OSHA.

3.9.4 Covers or barriers must be installed on boxes, fittings, and enclosures to prevent accidental contact with live parts.

3.9.5 Temporary wiring installations must be grounded.

3.9.6 Electrical systems shall be de-energized utilizing appropriate lockout/tagout procedures prior to conducting work.

3.10 <u>ELEVATED LOCATIONS / FALL PROTECT</u>

Cal/OSHA General Industry Safety Orders, 8 CCR 3210
Title 29, Code of Federal Regulations, Section 1926 Subpart M – Fall Protection

3.10.1 <u>California employers</u>: Guardrails shall be provided on all open sides of unenclosed room openings, open and glazed sides of landings, balconies or porches, platforms, runways, ramps, or working levels more than 30 inches above the floor, ground, or other working areas. The railing must be provided with a toeboard where the platform, runway, or ramp is 6 feet or more above places where employees normally work or pass and the lack of a toeboard could create a hazard from falling tools, material, or equipment.

3.10.2 Contractor must provide fall protection systems whenever a worker is exposed to a fall of four feet or more (in construction the threshold is six feet). Guardrails are the most common forms of fall protection systems. If guardrail systems are not feasible, safety nets, personal fall arrest systems, positioning device systems, warning line systems, or some other demonstrated, effective means of fall protection shall be used. Fall protection systems and devices shall be inspected prior to each use Title 29, Code of Federal Regulations, Section 1926 Subpart M.

3.11 <u>LADDERS</u>

Title 29, Code of Federal Regulations, Section 1910 Subpart D – Walking and Working Surfaces
Title 29, Code of Federal Regulations, Section 1926 Subpart X - Ladders

3.11.1 The use of ladders with broken or missing rungs or steps, broken or split rails or other defective construction is prohibited.

3.11.2 Ladders shall extend no less than 36 inches above landing and be secured to prevent displacement.

3.11.3 Portable ladders must be equipped with safety shoes.

3.11.4 Wooden ladders shall not be painted.

3.11.5 Do not use metal ladders for electrical work or near live electrical parts.

3.12 SCAFFOLDS

Title 29, Code of Federal Regulations, Section 1910.28 – Safety Requirements for Scaffolding
Title 29, Code of Federal Regulations, Section 1926 Subpart L - Scaffolds

3.12.1 Scaffolds must be provided for all work that cannot be done safely by employees standing on solid construction at least 20 inches wide, except where such work can be safely done from ladders.

3.12.2 Erection and dismantling of scaffolds shall be performed in accordance with good engineering practice.

3.12.3 Footings or anchorage for any scaffold shall be sound, rigid and capable of carrying the maximum intended load without settling or displacement.

3.12.4 No unstable objects such as concrete blocks shall be used to support scaffolds or planks.

3.12.5 Any part of a scaffold weakened or damaged shall be repaired or replaced immediately.

3.12.6 All scaffold planking shall be free of knots and cracks (Class A number) and shall completely cover the work platform.

3.12.7 Scaffold planks shall be laid tight, cleated at both ends or overlapped a minimum of 12 inches and nailed or bolted to prevent movement. Overlaps to occur directly above scaffold supports.

3.12.8 A safe and unobstructed means of access, such as a walkway, stair, or ladder shall be provided to all scaffold platforms.

3.13 HEAVY EQUIPMENT, INDUSTRIAL VEHICLES, AND CRANES

Title 29, Code of Federal Regulations, Section 1926 Subparts N, O and W

3.13.1 Only trained and authorized workers may operate heavy equipment, industrial vehicles, and/or cranes.

3.13.2 The Contractor shall designate a competent person who shall inspect all machinery and equipment prior to each use to make sure it is in safe operating condition.

3.13.3 The Contractor shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all heavy equipment, industrial vehicles, and cranes.

3.13.4 Seatbelts are required to be worn if the vehicle has Roll-Over Protection Structures (ROPS).

3.13.5 The swing radius of cranes shall be barricaded.

3.13.6 Equipment shall not be lubricated while in use.

3.13.7 Rated load capabilities, recommended operating speeds, special hazard warning, specific hand signal diagrams and special instructions shall be visible to the operator while he is at the control station.

3.13.8 Contractor's employees shall not be allowed to work under the load of cranes. Tag lines shall be used on all loads.

3.14 OVERHEAD POWER LINES

Title 29, Code of Federal Regulations, Section 1926.550 (a) (15)

3.14.1 If work is to be performed near overhead power lines, the lines must be de-energized and grounded by the owner or operator of the lines, or other protective measures must be provided before work is started. Protective measures (such as guarding or insulating the lines) must be designed to prevent employees from contacting the lines.

3.14.2 Unqualified employees and mechanical equipment must stay at least 10 feet away from overhead power lines. If the voltage is over 50,000 volts, the clearance should be increased by four inches for each additional 10,000 volts.

3.14.3 When mechanical equipment is being operated near overhead lines, employees standing on the ground may not contact the equipment unless it is located so that the required clearance cannot be violated even at the maximum reach of the equipment.

3.14.4 A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means.

3.14.5 Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicates that it is not energized.

3.15 FIRE PREVENTION / FLAMMABLE LIQUIDS

Title 29, Code of Federal Regulations, Section 1926 Subpart F or 1910 Subpart E

3.15.1 Contractor shall be responsible for fire protection in its work and operational areas, including offices, tool rooms, and storage areas 24 hours per day, seven days per week through the duration of this Contract. Approved fire-fighting equipment, in adequate quantities, must be provided.

3.15.2 Contractor shall familiarize Contractor's employees with the locations of fire extinguishers in their respective work areas and ensure they are prepared to use them safely if necessary. In certain remote field locations or within abandoned (discontinued) facilities where fire extinguishers may not exist in the immediate work area, contractor shall provide and locate fire extinguisher(s) in close proximity to the active work area(s).

3.15.3 In case of fire, Contractor shall call 9-1-1. Contractor shall also inform all Contractor and Lockheed Martin employees in the area to evacuate to a safe place and direct arriving fire response personnel to the fire. Notify the Lockheed Martin Project Lead as soon as reasonably possible.

3.15.4 Contractor employees shall only attempt to put out a fire when such action can be performed safely.

3.15.5 If a Contractor employee uses a Lockheed Martin fire extinguisher, Contractor shall report its use to the Lockheed Martin Project Lead.

3.15.6 Contractor shall report all fires extinguished by the Contractor to the Lockheed Martin Project Lead.

3.15.7 Contractors are to store, dispense, and use flammable and combustible liquids in accordance with OSHA regulations and the Uniform Fire Code. Bonding and grounding of containers containing flammable liquids will be required.

3.15.8 Open flames and smoking shall not be permitted in flammable or combustible liquid storage areas.

3.15.9 Contractor shall provide sufficient fire extinguishers necessary for their work activities.

3.16 HAND AND POWER TOOLS

Title 29, Code of Federal Regulations, Section 1910 Subpart P – Hand and Portable Powered Tools and Other Hand-Held Equipment
Title 29, Code of Federal Regulations, section 1926 Subpart I – Tools Hand and Power

3.16.1 All hand and power tools, whether furnished by Contractor, or by Contractor's employee, shall be maintained in a safe condition.

3.16.2 Electrical power tools shall be grounded or double insulated with proper assured equipment grounding inspections or Ground Fault Interrupter (GFI) circuit protection provided.

3.16.3 Pneumatic power tools shall be secured to the hose or whip by some positive means.

3.16.4 Only properly trained Contractor employees shall operate power-actuated tools.

3.16.5 All grinding machines shall conform to OSHA and ANSI requirements.

3.17 COMPRESSED GAS CYLINDERS

Title 29, Code of Federal Regulations, Section 1910.101 – Compressed Gases
Title 29, Code of Federal Regulations, Section 1926.350 – Gas Welding and Cutting

3.17.1 Compressed gas cylinders shall be secured in an upright position at all times.

3.17.2 When transporting, moving and storing cylinders, valve protection caps shall be in place and secured.

3.17.3 Compressed gas cylinders shall be kept away from excessive heat, shall not be stored where they might be damaged or knocked over by passing or falling objects, and shall be stored at least 20 feet away from highly combustible materials.

3.17.4 Cylinders shall be labeled as to the nature of their contents.

3.17.5 Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials a minimum of 20 feet or by a noncombustible barrier at least five feet high having a fire-resistant rating of at least one-half hour.

3.17.6 Acetylene cylinders shall be stored and used in a vertical, valve-end-up position only.

3.17.7 Anti-flashback arrestors shall be installed on all oxygen and acetylene cylinders.

3.18 INCIDENTAL CONTACT WITH ASBESTOS

3.18.1 This section applies to all contractors who incidentally disrupt the matrix of asbestos containing material (ACM) or presumed asbestos containing material (PACM); i.e., contractors who have not been specifically hired to perform ACM abatement.

3.18.2 Contractor shall immediately report to the Lockheed Martin Project Lead and to other employers of employees working at the job site any discovery, disturbance, and/or spill of ACM and/or PACM. Contractor(s) is to cease all operations in the immediate area of the suspect ACM and/or PACM and demarcate the area. The approval of the Lockheed Martin Project Lead is required before resuming operations.

3.18.3 Contractor shall not disturb any pipe insulation, boiler insulation, or any other material reasonably suspected of containing asbestos until the Contractor notifies the Lockheed Martin Project Lead. Lockheed Martin approval is required before operations may commence.

3.18.4 Abatement of asbestos can be performed only by persons properly trained and licensed to perform such activities

3.19 ASBESTOS ABATEMENT CONTRACTORS

3.19.1 This section applies to Contractors performing maintenance, construction, repair, renovation, demolition, salvage, or any other operation in which any material containing more than 1% asbestos is sanded, abrasive blasted, sawed, shoveled, removed, or otherwise handled in a manner that would generate airborne asbestos fibers. These requirements are in addition to any requirements contained in Contractor's scope of work.

3.19.2 All Contractors working with asbestos shall comply with applicable federal and state OSHA, EPA, local air district, and other applicable Federal, State, municipal, and local statutes, regulations, rules, and ordinances; and specific contract terms and conditions regarding the handling of, use of, and work involving asbestos.

3.19.3 The contractor shall ensure that a competent person, as defined by OSHA supervises all asbestos work performed within regulated areas.

3.19.4 Before commencing work, all asbestos abatement contractors shall supply to Lockheed Martin proof of:

- Asbestos abatement contractor certification by the state Contractor's License Board
- Liability insurance for Contractor employees engaged in asbestos work operations
- Copies of asbestos work notification letters to state OSHA
- Local air district Asbestos Demolition/Renovation Notification

3.19.5 Contractors shall minimize the creation and spread of airborne asbestos fibers by using appropriate work practices, engineering controls, and established procedures (i.e., wet methods, HEPA filter vacuums, negative pressure enclosure, local exhaust ventilation equipped with HEPA filter dust collection system, etc.).

3.19.6 All Class I, II and III asbestos work shall be conducted within regulated areas. The regulated area shall be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne asbestos. Where critical barriers or negative pressure enclosures are used, they may demarcate the regulated area. Signs shall be provided and displayed at each location where a regulated area is required to be established. Signs shall be posted at such a distance from such a location that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. Warning signs shall bear the following information:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY

3.19.7 On multiple employer worksites requiring the establishment of a regulated area, the asbestos Contractor shall inform other employers on the site of the nature of the work with asbestos and/or PACM, of the existence of and requirements pertaining to regulated areas, and the measures taken to ensure that employees of such other employers are not exposed to asbestos.

3.19.8 Contractors shall package and label asbestos waste in accordance with federal and or applicable state OSHA requirements and federal or applicable state hazardous waste regulations. Labels shall be affixed to all products containing asbestos and to all containers containing such products, including waste containers. Labels shall be printed in large, bold letters on a contrasting background and shall contain the following information:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

3.19.9 Contractors shall properly dispose of all asbestos waste. Proper disposal includes the use of hazardous waste manifests and Lockheed Martin approved and licensed waste haulers, and disposal facilities according to federal RCRA law and applicable state hazardous waste regulations. Contractor shall contact the Lockheed Martin Project Lead before transporting or disposing of any hazardous waste. Lockheed Martin must review all hazardous waste manifests prior to shipment.

3.19.10 Contractors shall ensure that employee exposure air monitoring is conducted as required by federal or applicable state OSHA regulations. All other air monitoring (i.e. clearance sampling) shall be conducted by a third-party contracted air monitoring firm not affiliated with the Contractor.

3.19.11 Contractor shall, at no cost to the employee, institute a training program for and ensure the participation of all employees engaged in asbestos-related work who may reasonably be expected to be exposed to asbestos fibers from asbestos containing construction materials.

3.19.12 Contractor shall institute a medical surveillance program for all employees who are or will be exposed to airborne concentrations of fibers of asbestos at or above the TWA and/or excursion limit.

3.20 HAZARDOUS WASTE OPERATIONS and EMERGENCY RESPONSE (HAZWOPER)

Title 29, Code of Federal Regulations, Section 1910.120 - Hazardous Waste Operations and Emergency Response

Title 29, Code of Federal Regulations, Section 1926.65 – Hazardous Waste Operations and Emergency Response

This section applies to Contractors performing hazardous waste-type activities. This includes operations that pose a potential or reasonable possibility for employee exposure to hazardous waste/chemical contaminants during site investigations, clean-up operations, abatement, or hazardous substance removal work (remedial actions). These requirements are in addition to any requirements contained in Contractor's scope of work.

3.20.1 Contractor shall provide a **site-specific safety and health plan** at least two (2) weeks prior to field mobilization to the Lockheed Martin Project Lead (global statement – move to the beginning).

Contractor shall provide a **safety and health plan** in accordance with *Title 29, Code of Federal Regulations, Section 1910.120 - Hazardous Waste Operations and Emergency Response* or the applicable state OSHA standard and, at a minimum, shall contain the following elements:

- Safety and health risk or hazard analysis for each anticipated site task
- Employee training requirements
- Personal protective equipment to be used by employees for each of the site tasks and operations
- Medical surveillance requirements
- Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used
- Site control measures
- Decontamination requirements and procedures
- Emergency response plan
- Confined space procedures (if applicable)
- Emergency response plan
- Confined space procedures (if applicable)
- Spill containment program
- Periodic documented safety meetings
- Periodic documented work area safety inspections and corrective actions

3.20.2 Contractors performing hazardous waste-type operations shall adhere to the requirements specified in *29 CFR 1910.120 - Hazardous Waste Operations and Emergency Response* or the applicable state OSHA standard.

3.20.3 Training: All Contractor and subcontractor employees working on site who are potentially exposed to hazardous substances shall receive initial and annual refresher training in accordance with *29 CFR 1910.120(e) – Hazardous Waste Operations and Emergency Response* or the applicable state OSHA standard. Lockheed Martin shall be provided with electronic copies of the training certificates.

3.20.4 Medical Surveillance: Contractor employees must be enrolled in a medical surveillance program prior to performing hazardous waste operations. Upon Lockheed Martin request, Contractor shall provide evidence of employee enrollment in a medical surveillance program. Lockheed Martin does not provide medical surveillance examinations to Contractor employees.

3.20.5 Periodic work area inspections: Contractor agrees to perform periodic work area inspections to determine the effectiveness of the site safety and health plan and to identify and correct unsafe conditions in contractor's responsible work area. These inspections shall be documented and available to Lockheed Martin upon request for review.

3.21 MANAGEMENT OF NANOTECHNOLOGY

3.21.1 The Lockheed Martin Project Lead shall work with the designated contractor responsible for nanotechnology to implement this procedure and ensure areas where nanomaterials (materials incorporating engineered nanoparticles or nanoscale features that exhibit unique physical and chemical properties as a result of the nanoparticles or nanoscale features) will be used meet engineering control requirements of this procedure.

3.21.2 The contractor shall ensure that the safety and environmental hazards of nanomaterials are managed as described in the requirements of this section.

3.21.3 A plan must be developed and executed that addresses the following requirements:

3.21.3.1 **Hazard Analysis:** Identify potential adverse health effects and environmental impacts that could result from the chemical and physical properties exhibited by the nanomaterials and/or nanoparticles in use, to be used, under development, or to be developed at the site.

3.21.3.2 **Exposure Assessment**: Evaluate all tasks involving nanomaterials and identify where exposures could occur. The evaluation must include at a minimum, an evaluation of materials; chemical intermediates; by-products; end-products; waste products; processes; process equipment; the amount of material used; material form; degree of containment; duration of use; and work space including laboratory and manufacturing space.

3.21.3.3 **Exposure Control**

- Implement appropriate controls to mitigate worker exposure and environmental emissions identified in sections 3.21.2.1 and 3.21.2.2 of this procedure.

- Implement Control Bands as indicated on the Control Band Matrix below.

Exposure Duration	Bound Materials	Potential Release	Free / Unbound
Hazard Group A (Known to be inert)			
Short	1	1	2
Medium	1	1	2
Long	1	2	2
Hazard Group B (Understand reactivity/function)			
Short	1	2	2
Medium	1	2	3
Long	1	3	3
Hazard Group C (Unknown Properties)			
Short	2	2	3
Medium	2	3	4
Long	2	4	4

Duration Key:
Short - Less than 4 hrs/day; 2 days/week
Medium - Between 4 to 6 hrs/day; 3 to 5 days/week
Long - 6 to > 8 hrs/day; 3 to 5 days/week

Release Key:
Bound Materials: Nanoparticles in a solid matix e.g. polycarbonate
Potential Release: Nanoparticles in friable or solgel matrix
Free / Unbound: Nanoparticles unbound, not aggregated

Control Band:
1. General Ventilation and PPE
2. Engineering Controls and/or Respirators and additional PPE
3. Containment e.g. glove box
4. Specialist Advise

- Establish designated areas for Control Banding. The designated area shall, at a minimum, include warning signs informing employees that they are entering a nanomaterial work area as well as signs specifying administrative controls and personal protective equipment (PPE) required for entry.
- Identify appropriate administrative controls (e.g. good housekeeping methods, HEPA vacuums, wet wipe methods, employee training, safe work practices), engineering controls (e.g. containment, exhaust ventilation) and Personal Protective Equipment (e.g. respiratory protection, protective coveralls, gloves, goggles) based on Control Band and best industry practices.
- Develop and execute procedures for housekeeping, including clean-as-you-go practices that do not re-suspend particles.
- Develop and execute procedures for management of nanomaterial-associated waste.

4 ENVIRONMENTAL

Contractors shall comply with all applicable provisions of Federal, State, municipal, local, and other environmental statutes, rules, and regulations. Contractor shall take all necessary precautions to protect the environment. Contractor shall also store, transport, dispose, or otherwise handle hazardous wastes and non-hazardous wastes to prevent discharges of materials into the environment except in accordance with applicable governmental regulations.

4.1 HAZARD COMMUNICATION - USE OF HAZARDOUS MATERIALS

4.1.1 Contractor shall develop a Waste Management Plan in accordance with the requirements outlined in the LMC Remediation Waste Management Procedure in

Appendix B. Lockheed Martin shall approve the Waste Management Plan prior to work commencement.

4.1.2 Contractor must segregate hazardous from non-hazardous waste; all hazardous waste generated by its operations must be labeled in accordance with all governmental regulations.

4.1.3 Contractor shall dispose of all hazardous waste within the time frame stipulated by local, state, or federal regulations. Contractor shall not leave behind on Lockheed Martin remediation sites any containers of hazardous materials or waste (including drums, roll-offs, maintenance chemicals, etc.), empty or not, after the termination of operations.

4.1.4 In case of a spill or release of hazardous materials or waste, Contractor shall immediately notify the Lockheed Martin Project Lead and if the severity of the spill warrants, notify the local fire department (Call 9-1-1). The Contractor shall be liable for the costs of any spill resulting from Contractor's actions, including, but not limited to, costs of containment, cleanup, and disposal.

4.2 NON-HAZARDOUS WASTE DISPOSAL

4.2.1 Contractor shall develop a Waste Management Plan in accordance with the requirements outlined in the LMC Remediation Waste Management Procedure in Appendix B. This plan must be approved by the Lockheed Martin Project Lead.

4.3 WORK INVOLVING AIR EMISSIONS

4.3.1 Contractor shall work with the Lockheed Martin Project Lead to identify applicable Federal, state, and/or local permit application requirements for air emission sources (i.e., stationary point source, fugitive emissions, etc.) associated with the anticipated project.

4.3.2 Contractor shall submit permit applications and/or notifications to the Lockheed Martin Project Lead for review prior to submittal to the applicable regulatory agency.

4.3.3 Contractor shall abide by the requirements of the permit(s) and gather emissions data (as applicable) to document compliance. This data shall be electronically submitted to the Lockheed Martin Project Lead.

4.3.4 Contractor shall immediately contact the Lockheed Martin Project Lead in the event permit conditions are not met.

4.3.5 Ensure permits are posted on permitted equipment (or in close proximity) as required by the respective permit.

4.4 WORK INVOLVING WATER DISCHARGES

4.4.1 At no time is an unauthorized, unpermitted release allowed. Contractor shall notify the Lockheed Martin Project Lead in the event of a release and obtain the approval of Lockheed Martin before discharging any material into storm drains or sewers.

4.4.2 Contractor shall work with the Lockheed Martin Project Lead to identify applicable National Pollutant Discharge Elimination System (NPDES), Stormwater Pollution Prevention Plans (SWPPP), and POTW requirements associated with the anticipated project.

4.4.3 Contractor shall submit permit applications and/or Notice of Intent forms to the Lockheed Martin Project Lead for review prior to submittal to the applicable regulatory agency.

4.4.4 Contractor shall abide by the requirements of the discharge permit(s) and maintain discharge monitoring information and inspection data to document compliance. This documentation shall be electronically provided to the Lockheed Martin Project Lead.

4.4.5 Contractor shall immediately contact the Lockheed Martin Project Lead in the event permit conditions are not met.

5 HOUSEKEEPING / CLEANUP

5.1 Ensure discharge permits and/or SWPPP plans (as applicable) are available at the project job site.

5.2 Contractor shall continuously clean up its respective work area(s). Contractor shall maintain its work areas free from all slip, trip, and fall hazards at all times.

5.3 Debris shall be kept cleared from work areas, passageways, stairs, and in and around buildings or other structures. The work area must be left free from accumulation of waste and rubbish at the end of each work shift.

5.4 Combustible scrap and debris shall be removed at regular intervals during the course of work performed by Contractor. Safe means shall be provided to facilitate such removal.

5.5 At the end of each working day and/or the conclusion of work being performed, Contractor shall restore the work area to the same degree of neatness as when work commenced.

5.6 Contractor shall furnish necessary equipment and/or receptacles to remove waste and rubbish from the job site unless otherwise specified by the Lockheed Martin.

6 CHANGE MANAGEMENT

If deviations are encountered from the field work plan, the contractor shall A) notify to the Lockheed Martin Project Lead and B) suspend work to assess changes to the work plan(s) and the HASP. Changes to the work plan(s) and the HASP shall be reviewed by the PL.

7 REQUIREMENT TO PERFORM & DOCUMENT SELF-AUDITS

7.1 Contractor agrees to perform periodic work area/project field inspections to monitor compliance with project environmental, safety and health (ESH) requirements. The name of Contractor's jobsite ESH representative will be provided to Lockheed Martin prior to the Contractor starting work at the jobsite.

7.2 For jobs that are ongoing, an annual ESH audit shall be conducted and for jobs with a duration of less than one year at least one audit shall occur. A competent ESH representative designated by the Contractor shall perform the audit. Unsafe acts and/or non-compliance conditions noted during inspections shall be corrected immediately.

7.3 The documentation related to the audits and inspections shall be submitted electronically to the Lockheed Martin Project Lead.

8 ACCIDENT, INJURY, ILLNESS, INCIDENT and SPILL REPORTING

8.1 Contractor shall immediately contact the Lockheed Martin Project Lead and/or Lockheed Martin Safety & Health Manager in the event of a fatality, injury, environmental release (spill), near-miss incident, or any ESH incident that is likely to generate significant publicity. A written report of the incident/injury/spill and corrective action(s) taken shall be submitted to the Lockheed Martin Project Lead within one (1) day of the incident. Representatives from Lockheed Martin may conduct joint investigations with the contractor if deemed necessary.

8.2 In case of a spill or release of hazardous chemicals, Contractor shall immediately notify the Lockheed Martin Project Lead, and/or if the severity of the spill warrants, the local fire department by calling 9-1-1. Contractor shall take all necessary steps to control the spread of the release and to provide site control to prevent unauthorized personnel from entering the affected area. The Contractor shall be liable for the costs of any spill resulting from Contractor's actions, including, but not limited to, costs of containment, cleanup, and disposal.

9 FINES, PENALTIES AND COSTS

9.1 Contractor shall indemnify and hold Lockheed Martin harmless from any and all liability (including but not limited to fines and penalties), loss, cost, damage, or expense (including attorney's fees) suffered or incurred by Lockheed Martin by reason of Contractor's failure to comply with Federal, State, municipal, local or other laws, rules, regulations, ordinances and requirements, or failure to comply with generally accepted environmental safety and health practices.

10 LOCKHEED MARTIN ESH MANAGER

10.1 The Lockheed Martin ESH Manager is Jimmy Yeager. Contact Jimmy regarding any questions or concerns at (301) 873-1444 or via email at james.l.yeager@lmco.com.

Appendix A – LMC Requirements for Invasive Fieldwork

LMC Minimum Requirements for Inv

Appendix B – LMC Waste Management Procedure

LMC Waste Mgmt Procedure Rev 4

CONTRACTOR'S ESH HANDBOOK

COMPLIANCE AGREEMENT

The Key National Contractor Program Manager has read and understands the contents of the *Contractor's ESH Handbook*. Contractor agrees while performing work on Lockheed Martin-owned or Lockheed Martin-controlled premises, that the Contractor shall require its employees and subcontractors at any tier to comply with the contents of this *Contractor's ESH Handbook* and the job specific HASP. A copy of the HASP shall be maintained at the job site and made readily available to contractor and subcontractor employees for their information. All contractor employees and subcontractors shall read and certify that they have read and understand the job specific health and safety plan (HASP). The certification forms shall be electronically sent to the Lockheed Martin Project Lead.

I further understand that this handbook and the rules and regulations it contains do not in any way relieve the Contractor (employer) of its responsibility to comply with the applicable environmental safety and health (ESH) regulations and its obligation to implement and enforce its own written ESH programs while working on this project.

Company: ____

Name: ____

Signature: ____

Title: ____

Date: ____

COMPLETE, SIGN AND RETURN THIS CERTIFICATE TO THE LOCKHEED MARTIN ESH MANAGER.

ATTACHMENT II

INCIDENT REPORT FORM

Tetra Tech.
Incident Report

Report Date	Report Prepared By	Incident Report Number

INSTRUCTIONS:

All incidents (including those involving subcontractors under direct supervision of Tetra Tech personnel) must be documented on the IR Form.

Complete any additional parts to this form as indicated below for the type of incident selected.

TYPE OF INCIDENT (Check all that apply)		Additional Form(s) Required for this type of incident
Near Miss (No losses, but could have resulted in injury, illness, or damage)	☐	Complete IR Form Only
Injury or Illness	☐	Complete Form IR-A; Injury or Illness
Property or Equipment Damage, Fire, Spill or Release	☐	Complete Form IR-B; Damage, Fire, Spill or Release
Motor Vehicle	☐	Complete Form IR-C; Motor Vehicle

INFORMATION ABOUT THE INCIDENT

Description of Incident

____

____

____

Date of Incident	Time of Incident
	________ AM ☐ PM ☐ *OR* Cannot be determined ☐
Weather conditions at the time of the incident	**Was there adequate lighting?**
	________ Yes ☐ No ☐

Location of Incident

________ Was location of incident within the employer's work environment? Yes ☐ No ☐

Street Address	City, State, Zip Code and Country
Project Name / Project #	**Client:**
Tt Supervisor or Project Manager	**Was supervisor on the scene?**
	Yes ☐ No ☐

WITNESS INFORMATION (attach additional sheets if necessary)

Name	Company
Street Address	**City, State and Zip Code**
Telephone Number(s)	

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CORRECTIVE ACTIONS

Corrective action(s) immediately taken by unit reporting the incident:

____

____

____

Corrective action(s) still to be taken (by whom and when):

____

____

____

ROOT CAUSE ANALYSIS LEVEL REQUIRED

Root Cause Analysis Level Required: Level - 1 ☐ Level - 2 ☐ None ☐

Root Cause Analysis Level Definitions

Level - 1	**Definition:** A Level 1 RCA is conducted by an individual(s) with experience or training in root cause analysis techniques and will conduct or direct documentation reviews, site investigation, witness and affected employee interviews, and identify corrective actions. Activating a Level 1 RCA and identifying RCA team members will be at the discretion of the Corporate Administration office. The following events may trigger a Level 1 RCA: ▪ Work related fatality ▪ Hospitalization of one or more employee where injuries result in total or partial permanent disability ▪ Property damage in excess of $75,000 ▪ When requested by senior management
Level - 2	**Definition:** A Level 2 RCA is self performed within the operating unit by supervisory personnel with assistance of the operating unit HSR. Level 2 RCA will utilize the 5 Why RCA methodology and document the findings on the tools provided. The following events will require a Level 2 RCA: ▪ OSHA recordable lost time incident ▪ Near miss incident that could have triggered a Level 1 RCA ▪ When requested by senior management

Complete the Root Cause Analysis Worksheet and Corrective Action form. Identify a corrective action(s) for each root cause identified within each area of inquiry.

NOTIFICATIONS

Title	Printed Name	Signature	Telephone Number	Date
Project Manager or Supervisor				
Site Safety Coordinator or Office H&S Representative				
Operating Unit H&S Representative				
Other: ____________________				

The signatures provided above indicate that appropriate personnel have been notified of the incident.

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INCIDENT FORM IR-A

INSTRUCTIONS:

Complete all sections below for incidents involving injury or illness.
Do NOT leave any blanks.
Attach this form to the IR FORM completed for this incident.

Incident Report Number: (From the IR Form)

EMPLOYEE INFORMATION

Company Affiliation

Tetra Tech Employee? ☐ TetraTech subcontractor employee (directly supervised by Tt personnel)? ☐

Full Name	**Company (if not Tt employee)**

Street Address, City, State and Zip Code	**Address Type**
______________________	Home address (for Tt employees) ☐
______________________	Business address (for subcontractors) ☐

Telephone Numbers

Work: ______________	Home: ______________	Cell: ______________

Occupation (regular job title)	**Department**

Was the individual performing regular job duties?	**Time individual began work**
Yes ☐ No ☐	________ AM ☐ PM ☐ *OR* Cannot be determined ☐

Safety equipment

Provided? Yes ☐ No ☐

Used? Yes ☐ No ☐ If no, explain why

____

____

____

Type(s) provided:

☐ Hard hat ☐ Protective clothing
☐ Gloves ☐ High visibility vest
☐ Eye protection ☐ Fall protection
☐ Safety shoes ☐ Machine guarding
☐ Respirator ☐ Other (list)

____

NOTIFICATIONS

Name of Tt employee to whom the injury or illness was first reported	**Was H&S notified within one hour of injury or illness?**
	Yes ☐ No ☐
Date of report	**H&S Personnel Notified**
Time of report	**Time of Report**

If subcontractor injury, did subcontractor's firm perform their own incident investigation?

Yes ☐ No ☐ If yes, request a copy of their completed investigation form/report and attach it to this report.

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INCIDENT FORM IR-A

INJURY / ILLNESS DETAILS

What was the individual doing just before the incident occurred? Describe the activity as well as the tools, equipment, or material the individual was using. Be specific. Examples: "Climbing a ladder while carrying roofing materials"; "Spraying chlorine from a hand sprayer"; "Daily computer key-entry"

____

____

____

What Happened? Describe how the injury occurred. Examples: "When ladder slipped on wet floor and worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; Worker developed soreness in wrist over time"

____

____

____

____

Describe the object or substance that directly harmed the individual: Examples: "Concrete floor"; "Chlorine"; "Radial Arm Saw". If this question does not apply to the incident, write "Not Applicable".

____

____

MEDICAL CARE PROVIDED

Was first aid provided at the site: Yes ☐ No ☐ If yes, describe the type of first aid administered and by whom?

____

Was treatment provided away from the site: Yes ☐ No ☐ If yes, provide the information below.

Name of physician or health care professional	**Facility Name**
Street Address, City State and Zip Code	**Type of Care?**
______________________ ______________________	Was individual treated in emergency room? Yes ☐ No ☐ Was individual hospitalized overnight as an in-patient? Yes ☐ No ☐ Did the individual die? Yes ☐ No ☐ If yes, date: ________ Will a worker's compensation claim be filed? Yes ☐ No ☐
Telephone Number	

NOTE: Attach any police reports or related diagrams to this report.

SIGNATURES

I have reviewed this report and agree that all the supplied information is accurate

Affected individual (print)	**Affected individual (signature)**	**Telephone Number**	**Date**

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.

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INCIDENT FORM IR-B

INSTRUCTIONS:

Complete all sections below for incidents involving property/equipment damage, fire, spill or release.
Do NOT leave any blanks.
Attach this form to the IR FORM completed for this incident.

Incident Report Number: (From the IR Form)

TYPE OF INCIDENT (Check all that apply)

Property Damage ☐ Equipment Damage ☐ Fire or Explosion ☐ Spill or Release ☐

INCIDENT DETAILS

Results of Incident: Fully describe damages, losses, etc.

____
____
____

Response Actions Taken:

____
____
____

Responding Agency(s) (i.e. police, fire department, etc.)	Agency(s) Contact Name(s)

DAMAGED ITEMS (List all damaged items, extent of damage and estimated repair cost)

Item:	Extent of damage:	Estimated repair cost

SPILLS / RELEASES (Provide information for spilled/released materials)

Substance	Estimated quantity and duration	Specify Reportable Quantity (RQ)
		____________ Exceeded? Yes ☐ No ☐ NA ☐

FIRES / EXPLOSIONS (Provide information related to fires/explosions)

Fire fighting equipment used? Yes ☐ No ☐ If yes, type of equipment: ______________________________

NOTIFICATIONS

Required notifications	Name of person notified	By whom	Date / Time
Client: ________________ Yes ☐ No ☐			
Agency: ________________ Yes ☐ No ☐			
Other: ________________ Yes ☐ No ☐			

Who is responsible for reporting incident to outside agency(s)? Tt ☐ Client ☐ Other ☐ Name: ____________________

Was an additional written report on this incident generated? Yes ☐ No ☐ If yes, place in project file.

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INCIDENT FORM IR-C

INSTRUCTIONS:

Complete all sections below for incidents involving motor vehicle accidents. Do NOT leave any blanks. Attach this form to the IR FORM completed for this incident.

Incident Report Number: (From the IR Form)	

INCIDENT DETAILS

Name of road, street, highway or location where accident occurred		**Name of intersecting road, street or highway if applicable**
County	**City**	**State**

Did police respond to the accident?	**Did ambulance respond to the accident?**
Yes ☐ No ☐	Yes ☐ No ☐
Name and location of responding police department	**Ambulance company name and location**
Officer's name/badge #	

Did police complete an incident report? Yes ☐ No ☐ If yes, police report number: ______________________
Request a copy of completed investigation report and attach to this form.

VEHICLE INFORMATION

How many vehicles were involved in the accident? _______________ (Attach additional sheets as applicable for accidents involving more than 2 vehicles.)

Vehicle Number 1 – Tetra Tech Vehicle		**Vehicle Number 2 – Other Vehicle**	
Vehicle Owner / Contact Information		**Vehicle Owner / Contact Information**	
Color		**Color**	
Make		**Make**	
Model		**Model**	
Year		**Year**	
License Plate #		**License Plate #**	
Identification #		**Identification #**	
Describe damage to vehicle number 1		**Describe damage to vehicle number 2**	
Insurance Company Name and Address		**Insurance Company Name and Address**	
Agent Name **Agent Phone No.**		**Agent Name** **Agent Phone No.**	
Policy Number		**Policy Number**	

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INCIDENT FORM IR-C

DRIVER INFORMATION

Vehicle Number 1 – Tetra Tech Vehicle		**Vehicle Number 2 – Other Vehicle**	
Driver's Name		**Driver's Name**	
Driver's Address		**Driver's Address**	
Phone Number		**Phone Number**	
Date of Birth		**Date of Birth**	
Driver's License #		**Driver's License #**	
Licensing State		**Licensing State**	
Gender	Male ☐ Female ☐	**Gender**	Male ☐ Female ☐
Was traffic citation issued to Tetra Tech driver? Yes ☐ No ☐		Was traffic citation issued to driver of other vehicle? Yes ☐ No ☐	
Citation #		**Citation #**	
Citation Description		**Citation Description**	

PASSENGERS IN VEHICLES (NON-INJURED)

List all non-injured passengers (excluding driver) in each vehicle.
Driver information is captured in the preceding section.
Information related to persons injured in the accident (non-Tt employees) is captured in the section below on this form.
Injured Tt employee information is captured on FORM IR-A

Vehicle Number 1 – Tetra Tech Vehicle		**Vehicle Number 2 – Other Vehicle**	
How many passengers (excluding driver) in the vehicle? ____		How many passengers (excluding driver) in the vehicle? ____	
Non-Injured Passenger Name and Address		**Non-Injured Passenger Name and Address**	
Non-Injured Passenger Name and Address		**Non-Injured Passenger Name and Address**	
Non-Injured Passenger Name and Address		**Non-Injured Passenger Name and Address**	

INJURIES TO NON-TETRATECH EMPLOYEES

Name of injured person 1				**Address of injured person 1**		
Age	**Gender**	**Car No.**	**Location in Car**	**Seat Belt Used?**	**Ejected from car?**	**Injury or Fatality?**
	Male ☐ Female ☐			Yes ☐ No ☐	Yes ☐ No ☐	Injured ☐ Died ☐
Name of injured person 2				**Address of injured person 2**		
Age	**Gender**	**Car No.**	**Location in Car**	**Seat Belt Used?**	**Ejected from car?**	**Injury or Fatality?**
	Male ☐ Female ☐			Yes ☐ No ☐	Yes ☐ No ☐	Injured ☐ Died ☐

OTHER PROPERTY DAMAGE

Describe damage to property other than motor vehicles	
Property Owner's Name	**Property Owner's Address**

COMPLETE AND SUBMIT DIAGRAM DEPICTING WHAT HAPPENED

ATTACHMENT III

MEDICAL DATA SHEET

MEDICAL DATA SHEET

This Medical Data Sheet must be completed by on-site personnel and kept in the command post during the conduct of site operations. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project ____

Name ______________________________ Home Telephone ____________

Address ____

Age ____________ Height __________________ Weight ______________

Person to notify in the event of an emergency: Name: ______________________________

Phone: ______________________________

Drug or other Allergies: ____

Particular Sensitivities : ____

Do You Wear Contacts?____

What medications are you presently using? ______________________________

____

Name, Address, and Phone Number of personal physician: ______________________________

____

____

Note: Health Insurance Portability and Accountability Act (HIPAA) Requirements

HIPAA took effect April 14, 2003. Loosely interpreted, HIPAA regulates the disclosure of Protected Health Information (PHI) by the entity collecting that information. PHI is any information about health status (such as that you may report on this Medical Data Sheet), provision of health care, or other information. HIPAA also requires Tetra Tech to ensure the confidentiality of PHI. This Act can affect the ability of the Medical Data Sheet to contain and convey information you would want a Doctor to know if you were incapacitated. So before you complete the Medical Data Sheet understand that this form will not be maintained in a secure location. It will be maintained in a file box or binder accessible to other members of the field crew so that they can accompany an injured party to the hospital.

DO NOT include information that you do not wish others to know, only information that may be pertinent in an emergency situation or treatment.

____________________	____________________	____________
Name (Print clearly)	Signature	Date

ATTACHMENT IV

ACTIVITY HAZARD ANALYSIS

ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech, Inc.

Activity/Work Task: Site Mobilization/Demobilization and Site Preparation	Overall Risk Assessment Code (RAC) (Use highest code)					**L**
Project Location: LMC MSA	**Risk Assessment Code (RAC) Matrix**					
Date Prepared: January 2016		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: C. Snyder	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by: J. Carothers, PhD	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (See above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.				**RAC Chart**	
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				**E= Extremely High Risk** **H= High Risk**	
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				**M= Moderate Risk** **L= Low Risk**	

JOB STEPS	HAZARDS	CONTROLS	RAC
Mobilization\Demobilization • Assembling equipment and supplies • Performing initial/exit inspections of the intended work areas • Arranging for utilities, site access, notifying appropriate client contacts	1. Minor cuts, abrasions or contusions	1. Wear cut-resistant gloves when handling items with sharp or rough edges.	L
	2. Heavy lifting (muscle strains and pulls)	1. Practice safe lifting techniques. Use mechanical lifting devices such as a dolly whenever possible 2. Ensure clear path of travel. 3. Have a good grasp on object. Perform "test lift" to gauge ability to safely make the lift. 4. Lift with legs not back. Obtain help when needed to lift large, bulky, or heavy items).	L
	3. Vehicular traffic when moving large equipment to the support area	1. Designate and mark vehicle and equipment staging areas. Inform the site personnel of heavy equipment areas and of their responsibility to stay clear of moving vehicles. 2. In high traffic areas, wear a high-visibility vest, shirt or jacket. 3. Construct Traffic Control Plan if existing traffic patterns enter. Free space of Travel (within 15-feet of existing established traffic patterns.	L
	4. Slips, Trips, Falls	1. Watch for tree branches, roots, weeds, limbs and other ground hazards. 2. Wear appropriate foot protection to prevent slips and trips. 3. Use caution when working on uneven and wet ground surfaces. 4. Practice good housekeeping.	L
	5. Inclement weather	1. The FOL and/or the SSO will temporarily suspend outside activities in the event of electrical storms or high winds.	L

JOB STEPS	HAZARDS	CONTROLS	RAC
		2. It is preferred that supported systems such as lightning detection devices or emergency weather broadcasts are employed. 3. However, when this is not possible field personnel should use the 30/30 Rule: *"If there is less than 30 seconds between thunder and lightning go inside and stay inside for at least 30 minutes after the last thunder."*	
	6. Implement Site Specific Hazard Communication Program	1. Complete the chemical inventory for the project 2. Procure Material Safety Data Sheets/Safety Data Sheets (SDS) for chemicals used on this site. 3. Label containers used on site for hazardous materials 4. Identification of any additional hazard communication training requirements	L
PORTABLE POWER HAND TOOLS	Any portable power tools (e.g., electric demolition hammers, pneumatic tools, drills) used in the work area must have appropriate guarding, interlocks, or controls to ensure safe operation, in accordance with 29 CFR 1926.301 and 302. Machinery and equipment must be inspected for defects in the guarding, electrical safety, and operation before each use.	The following specific precautions will be used to help prevent injuries and accidents: • Never remove, make inoperative, or reduce the effectiveness of any equipment or machine guard. • Never override any safety interlock or attempt to operate any piece of equipment or machinery without guards or other required safety devices in place and fully functional. • Never operate any piece of equipment or machinery when it is functioning improperly or at any time when operation would constitute a hazard. Malfunctioning equipment must be repaired immediately or removed from the premises. • Do not use electrically powered tools near flammable materials. • At no time will electrical power equipment be operated without proper grounding. • All electrical power tools will be marked to indicate that they have double insulation by a nationally recognized laboratory. • Do not use electrical tools in wet or damp areas. • Use tools only for their intended purpose • Repair mushroomed punch, drift, and chisel heads or take the tool out of service and replace. • Do not use conductive (i.e., metal) tools around energized electrical sources. • Select the correct size and type of wrench for each job. Wrench handles will not be extended with a pipe or "cheater" bar. • Wear eye protection at all times when using hand tools • All hand tools and power tools will be inspected prior to use	L

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	SITE TRAINING REQUIREMENTS
Hand tools (dollies, hand carts, hand knives, etc.)	Visual inspection prior to use by user.	Review of AHA during pre-task tailgate safety briefing with the intended task participants.
Personal Protective Equipment Minimum: Sleeved Shirts, Long Pants,Safety toe boots, safety glasses. Optional items: Hardhat, hearing protection when needed. **HTRW:** None anticipated for this task.	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in any onsite activities, and will be confirmed by visual observations of worker activities.

I have read and understand my responsibility as specified in this AHA:

Name (Printed)	Signature	Date

ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task: Soil Excavation and backfilling, Transportation, and Placement and disposal activities	Overall Risk Assessment Code (RAC) (Use highest code)	L

	Risk Assessment Code (RAC) Matrix					
Project Location: LMC MSA	**Severity**	**Probability**				
Date Prepared: January 2016		**Frequent**	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Prepared by: C. Snyder	**Catastrophic**	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by: J Carothers, PhD	**Marginal**	H	M	M	L	L
	Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (see above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	**E= Extremely High Risk** **H= High Risk**
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	**M= Moderate Risk** **L = Low risk**

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
Excavation and Trenching	Struck by Heavy Equipment/Vehicles	1. Operators/Drivers will submit a copy of their valid driver's license on initial arrival for each vehicle brought on site. 2. Drivers will maintain workers on foot in sight, if you lose sight of someone, Stop! 3. Design the site traffic controls to minimize backing operations. 4. Personnel are not allowed to use a cellular phone while driving a vehicle on-site. 5. Use spotters for traffic control whenever there is "blind spots", backing in congested areas, or where there are road hazards or unsafe road conditions. 6. Be aware of heavy equipment operations. 7. Keep out of the swing radius of heavy equipment. 8. Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times. 9. Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		10. Ground personnel will not stand directly behind heavy equipment when it is in operation. 11. Do not approach heavy equipment unless eye contact with appropriate hand signals has been made with the operator to cease activity. Equipment operators will confirm that eye contact had been made by stopping operation and clearly showing their hands are off of the controls.	
	Rollovers	1. Equipment will have rollover protective structures and seat belts. 2. Operators will wear seat belts when operating equipment. 3. Equipment will not be operated on grades which exceed manufacturer's recommendations. 4. Run articulated equipment (i.e., rollers, trucks) up and down slopes – not at an angle.	L
	Unstable Soils	1. During hauling operations, keep soft areas/ruts filled and graded. Do not allow off-road trucks to continually run over ruts. 2. Off-road trucks should vary their path on the haul roads. 3. Prior to beginning any grading activities in potentially unstable areas, an operator experienced with working on unstable material will run a LGP dozer over the entire area to evaluate for signs of unstable areas.	L
	Underground Utilities	1. Check all available information for location of possible underground obstruction, (e.g., buried pipe, conduit, cable, and telephone lines), especially at sites where plants or structures already exist. 2. Contact local utility companies, landowners, and organizations such as 'dig safe' to assure identification of all buried utilities and obstacles. 3. In planning size of work area at toe of slope, allow for accessibility and maneuverability of equipment planned for construction activities. 4. Follow TtSOP for Utility Clearance	L
	Slopes	1. Earth slopes for trenches and other embankments must be in accordance with OSHA regulations. 2. Locate borrow and waste areas to maximize downhill hauls. 3. Consider use of "reinforced earth" retaining walls. 4. Ensure erosion control materials comply with the E&S Plan. 5. Consider use of geotextiles, erosion control blankets, hay bales or other means to maintain drainage areas and prevent wastage.	L
	Noise	1. Where provided close the cab to reduce noise levels associated with the machinery operation. 2. Wear hearing protection when operating noise levels exceed 85dBA.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		3. SSO will be responsible for implementing the Site Specific Hearing Conservation Program. 4. Provisions for initial monitoring; selection of types of hearing protection and performance requirements are provided there.	
	Eye Injuries	1. Wear safety eye ware	L
	Struck By/Against	1. Personnel will understand and review hand signals. 2. All machines will be equipped with backup alarms.	L
Excavation	Excavation Hazards	1. Prior to beginning work, the competent person shall complete a Checklist for any excavation 4 feet or greater. 2. Do not leave excavations open overnight whenever possible fill them. 3. Install open trench warning devices/barricades. 4. Excavated and loose materials should be kept at least 4 feet from the edge of excavations. The spoils shall be properly slope at a safe angle. 5. If the excavated site is large enough for employees to bodily enter and perform work, and has limited means for entry or exit, and is not designed for continuous employee occupancy, it falls under OSHA confined space regulations. 6. If deemed necessary, use the benching and sloping methods to prevent cave-ins (29 CFR 1926.652, Appendix B). 7. If personnel entry is necessary, stairways, ladders, or ramps shall be provided as means of egress in all trenches 4 feet or more in depth. 8. Travel distance shall be no more than 25 feet between means of exit. 9. Protective systems are required on all excavations over 5 feet in depth or in excavations less than 5 feet when examination of the ground by a competent person reveals conditions that may result in cave-ins (29 CFR 1926.652, Appendices C & D). 10. Excavations will be inspected by a competent person prior to personnel entering the excavation. Continuous air monitoring will be performed in accordance with Section 6.0 if personnel are required to enter the excavation. The competent person shall have completed an accredited excavation safety course.	L
	Exposure to potential site contaminants (VOC's, Metals, PCB's) • Inhalation • Skin contact • Absorption	1. Monitoring with portable photoionization detector (PID) Calibrate monitoring equipment twice/day. • In the morning prior to use to ensure the operational status • In the evening in order to compensate results for any instrument drift due to battery loss. 2. Establish background levels to be incorporated into the monitoring results. 3. Periodically screen the borehole and any samples collected with a PID equipped with an 11.7eV Ultra Violet (UV) lamp.	

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
	• Ingestion	4. If readings above daily-established background levels (BGLs) are noted in borehole, monitor worker breathing zone (BZ) areas. 5. If readings in worker BZ areas exceed: • PID Action Level: >1 ppm above BG sustained for 1 minute in BZ areas for 4 exposures of 5 minutes in one work day for VOC's. • Visible Dust - employ dust suppression area wetting 6. Monitoring will be conducted in the breathing zone to collect data for the worst case scenario in order to evaluate air emissions from this source point.	
	Heavy Equipment Operation	1. Reference General Site Hazards. 2. Only operators trained and experienced with the specific equipment will operate that equipment. 3. Equipment will have guards, canopies or grills to protect from flying objects. 4. Ground personnel will stay clear of all suspended loads. 5. Eye contact with operators will be made before approaching equipment. Equipment will not be approached on blind sides. 6. Avoid equipment swing radius. This area will be delineated with cones. 7. Know hand signals. 8. All equipment will be equipped with backup alarms. 9. The use of headphones for entertainment purposes is prohibited. 10. A 15 foot minimum safe separation distance (boom fully extended) will be maintained between equipment and overhead utility lines. 11. Equipment will be shut down before and during fueling operations.	L
	Exposure to Contaminants	1. Site personnel will wear PPE as required. 2. Site personnel will make an effort to stay clean and use good hygiene practices during work activities. 3. Minimize the amount of work that must be performed in excavations.	L
Trenching	Confined Space Entry	1. Personnel entry into the excavation or trench is not planned 2. A permit is required for any confined space entry that has one or more of the following characteristics: • Contains or has the potential to contain a hazardous atmosphere. • Contains a material that has the potential for engulfing the Entrant. • Has an internal configuration that can cause a person to be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller area. • Contains any other recognized serious safety or health hazard. 3. Complete the Non-Permit Confined Space Pre-Entry Checklist Form prior to entry to assure that all conditions for a Non-PRCS are met.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		4. All hazardous energy sources shall be isolated before entry is permitted. 5. Provide safe access into the work area (e.g., ladders, scaffolding, or guarded platforms). Where possible, multiple openings for entry/exit shall be provided for access to confined spaces. 6. Prior to entry, perform air monitoring in accordance with Section 6.0 and inspections to ensure no atmospheric hazards or other safety hazards exist. 7. Perform on-going visual inspections of the Non-PRCS during entry to ensure all health and safety hazards are identified and mitigated. 8. If performing hot work in a relative small/restricted confined space, an attendant will be stationed outside and be capable of executing pre-planned rescue operations. 9. If any condition or hazard is detected that would cause the Non-PRCS to meet the definition of a PRCS, all entrants will evacuate the space and PRCS procedures will be employed prior to re-entry or until that condition/hazard is eliminated. 10. All site personnel involved in confined space entry (i.e., Entry Supervisors, Entrants, Attendants, and Rescue Teams) will receive confined space entry training.	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Excavators and transport trucks	SSO to inspect each vehicle prior to permitting site access using Heavy Equipment Inspection Checklist provided in Attachment XI.	Heavy equipment operators must demonstrate experience in proper vehicle/equipment operations. Over the road heavy motorized vehicle operators must possess appropriate DOT licenses.
Personal Protective Equipment: **Minimum**: Hard hats, steel toe boots, sleeved shirt, long pants, safety glasses, high visibility vests **Optional items**: Hearing protection when required and surgeons gloves when sampling **HTRW**: VOC's, Metals/dust, PCB's	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations.

All persons working within the operation will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training

Tetra Tech, Inc.	ACTIVITY HAZARD ANALYSIS (AHA)					
Activity/Work Task: Decontamination	**Overall Risk Assessment Code (RAC) (Use highest code)**					L
Project Location: LMC MSA	**Risk Assessment Code (RAC) Matrix**					
Date Prepared: January 2016	**Severity**	**Probability**				
		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: C. Snyder	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by: J. Carothers, PhD.	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (See above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.					**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible					**E= Extremely High Risk** **H= High Risk**
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.					**M= Moderate Risk** **L = Low Riak**

JOB STEPS	HAZARDS	CONTROLS	RAC
Personal Decontamination • Equipment drop • Segregated removal of PPE (wash and rinse reusable items, dispose of non-reusable items)	1. Slips, Trips, Falls 2. Exposure to contaminated media	1. Clear intended deacon area location of ground hazards. Practice good housekeeping to keep the site clear of obstructions, materials, equipment and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet surfaces. 2. Follow good decontamination practices (work from top down and outside in). Nitrile gloves are to be the last item of PPE removed. Wash hands and face following personal decontamination and prior to performing any hand-to-mouth activity.	**L**
Decontamination of boating equipment and large tooling (e.g., vehicles, etc.) using pressure washer	1. Noise 2. Flying projectiles	1. Pressure washer operator must wear hearing protection (muffs or plugs with NRR of at least 25 dB) 2. Restrict other personnel from decon pad during pressure washing operations. Pressure washer operator must exercise care when directing the wand so that it is not pointing at himself/herself or at any other worker. Pressure washer operator must wear full face shield over safety glasses with side shields and brow protection. At SSO discretion, additional PPE consisting of hardhat, rain suit, apron, and or boot covers may be required during decon operations -	L

JOB STEPS	HAZARDS	CONTROLS	RAC
		depending on observations indicating that significant contact with decon overspray and/or windy conditions during washing activities.	
	3. Falling objects	3. Place items to be decontaminated on ground or on washing/drying racks in a manner that they are secure and will not fall. Wear safety toe safety footwear.	
	4. Strains/sprains from heavy lifting	4. Practice safe lifting techniques (use mechanical lifting devices such as a dolly whenever possible, ensure clear path of travel, good grasp on object, perform "test lift" to gauge ability to safely make the lift, lift with legs not back, obtain help when needed to lift large, bulky, or heavy items).	
	5. Slips/trips/falls	5. Keep decon areas orderly, maintain good housekeeping, spread light coating of sand on decon pad liner to increase traction.	
	6. Exposure to contaminated media	6. Follow good decontamination practices (work from top down and outside in). Surgeon's gloves are to be the last item of PPE removed. Wash hands and face following personal decontamination and prior to performing any hand-to-mouth activity.	

EQUIPMENT	INSPECTION	TRAINING
Hand tools (hand brushes, garden sprayers, etc.)	Visual inspection prior to use by user. Check wooden handles for cracks or splinters.	None required.
Pressure washer	Inspect pressure washer prior to putting into service to ensure that it is in good working order, and ensure that fittings are secure.	Review manufacturer's instructions and safety guidelines prior to use.

EQUIPMENT	INSPECTION	TRAINING
Personal Protective Equipment: <u>Minimum</u>: Safety toe boots, safety glasses **<u>Optional items</u>**: Hardhat, hearing protection. **<u>HTRW</u>**: Decontamination pad pressure washer operators are to wear full face shield over safety glasses with side shields and brow protection, hearing protection, and nitrile gloves. If contact with overspray cannot be avoided, rain suit or moisture-repellant disposable coveralls may be specified by the SSO.	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	OSHA 40 Hazardous Waste Operations and Emergency Response (HAZWOPER) training, plus appropriate 8-hour annual refresher training for all task participants. Supervisors must have completed additional 8 hours of HAZWOPER training. Also Review of AHA during tailgate safety briefing with the intended task participants. PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in site activities, and will be confirmed by visual observations of worker activities.

I have read and understand this AHA:

Name (Printed)	Signature	Date

Tetra Tech, Inc.	ACTIVITY HAZARD ANALYSIS (AHA)	
Activity/Work Task: HSA/DPT drilling, including soil sampling and monitoring well installation, development. This task includes soil lithology and groundwater assessment using Cone Penetrometer Testing (CPT) with an Membrane Interface Probe (MIP). **Project Location:** LMC MSA	**Overall Risk Assessment Code (RAC) (Use highest code)**	**M**

	Severity	Probability				
Site: Martin State Airport		Frequent	Likely	Occasional	Seldom	Unlikely
Date Prepared: January 2016	Catastrophic	E	E	H	H	M
Prepared by: Clyde Snyder	Critical	E	H	H	M	L
Reviewed by: J. Carothers, PhD	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)		
	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (See above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	**E= Extremely High Risk** **H= High Risk**
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	**M= Moderate Risk** **L= Low Risk**

JOB STEPS	HAZARDS	CONTROLS	RAC
Drill Rig set up and operation	1. Struck By	1. Hard hats and high visibility vests for all personnel in work area. 2. Control work area (use flaggers, signage, barricades, and/or other means) and restrict all non-essential personnel from the area. 3. Inspect rig and ensure that all equipment, augers, rods and tools will be properly secured during transport.	M
	2. Tip Over	1. Do not permit rig to attempt to traverse severely sloping terrain. 2. Use a ground guide along with a functioning back-up alarm during equipment backing. 3. Once rig is sited, deploy outriggers to properly block and level the rig and secure parking brake.	L
	3. Slips, Trips, Falls	1. Clear trees, roots, weeds, limbs and other ground hazards from the Drill/DPT location. 2. Practice good housekeeping to keep the ground around the Drill/DPT site clear of obstructions, equipment and other tripping hazards. 3. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces.	L

JOB STEPS	HAZARDS	CONTROLS	RAC
	4. Minor cuts, or abrasions	1. When handling equipment and tools wear cut-resistant gloves when handling items with sharp or rough edges.	L
	5. Heavy lifting (muscle strains and pulls)	1. Practice safe lifting techniques (use mechanical lifting devices such as a dolly whenever possible. 2. Ensure clear path of travel, good grasp on object, perform "test lift" to gauge ability to safely make the lift 3. Lift with legs, obtain help to lift large, bulky, or heavy items.	L
	6. Insect bites	1. Shake out boots before donning. 2. Use insect repellants (products containing DEET should be applied to exposed skin, products containing Permethrin should be applied to clothing only. Follow manufacturer's recommendations for application). 3. Tape up pants leg to work boot joints with duct tape. Wear light-colored clothing to better see and remove any insects. Perform close body inspections at least daily upon leaving the site.	L
	7. Inclement weather	1. The FOL and/or the SSO will temporarily suspend outside activities in the event of electrical storms or high winds. 2. It is preferred that supported systems such as lightning detection devices or emergency weather broadcasts are employed. 3. However, when this is not possible field personnel should use the 30/30 Rule: *"If there is less than 30 seconds between thunder and lightning go inside and stay inside for at least 30 minutes after the last thunder."*	L
Drill Rig Operations	1. Intermittent high noise levels	1. Operators/nearby personnel are to wear hearing protection if noise levels are such that they must raise their voice in order to communicate with someone who is within arm's reach (approx. 2') of them. 2. SSO responsible for determining and designating when hearing protection is required. 3. Hearing protection is to consist of either ear muffs or ear plugs that have an NRR of at least 25 dB.	L
	2. Contact with equipment moving parts	1. Ensure that workers are thoroughly trained and competent to perform their assigned task with the equipment used in investigation. 2. Ensure that back-up alarms are functional on equipment. 3. The equipment operators and Site Supervisors are responsible to ensure that the equipment is properly inspection prior to being permitted onsite. (see Equipment Inspection Checklist)	M

JOB STEPS	HAZARDS	CONTROLS	RAC
		4. Ensure that all moving parts are guarded if such parts are exposed. Check/test all emergency stop controls.	
	3. Contact/striking underground or overhead utilities	1. Movement of rig with mast raised will be strictly prohibited. 2. Inspect for buried and overhead utilities in the vicinity of the Drill/DPT location. Verify the location of utility lines in accordance with the Tetra Tech SOP Utility Location and Excavation Clearance (Attachmnet XV). Plan the move with the local utility companies if utility lines must be moved. 3. Pre-survey the height of equipment and height of utility lines to determine which lines must be removed or raised. Equipment should not come within 20 feet of existing overhead utility lines.	L
	4. Pressurized hydraulic lines could rupture, causing release of hot hydraulic fluid.	1. Inspect all hydraulic lines before placing rig in service. Any damaged hoses or connections must be replaced before unit is used. 2. Immediately shut down equipment if lines rupture. If rupture occurs, as quickly as possible, berm the liquid to minimize the area over which the liquid spreads. 3. Ensure that all pressurized lines have whip checks.	L
	5. Workers could trip or fall by the borehole	1. Cap and flag open boreholes. If left unattended, protect all open boreholes as any open excavation.	L
Handling drill rods and augers and MIP Installation	1. Struck by/entanglement	1. Be prepared for sudden shifting when removing rod sections. 2. Restrict non-essential personnel from approaching working area.	L
	2. Overhead hazards	1. All personnel within the radius of the Drill/DPT rig must wear ANSI approved hard hats.	L
	3. Slips, Trips, Falls	1. Clear trees, roots, weeds, limbs and other ground hazards from the location. 2. Practice good housekeeping to keep the ground around the site clear of obstructions, equipment and other tripping hazards. 3. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces. Keep a wide base and assure secure footing while attempting to handler auger flights and tooling.	L
	4. Contusions, cuts, or abrasions	1. When handling auger flights, MIPS and tools, wear cut-resistant heavy cotton or leather work gloves when handling items with sharp or rough edges.	L
	5. Heavy lifting (muscle strains and pulls).	1. Practice safe lifting techniques by using mechanical lifting devices such as a dolly whenever possible. 2. Ensure clear path of travel	L

JOB STEPS	HAZARDS	CONTROLS	RAC
		3. Have a good grasp on object. Perform "test lift" to gauge ability to safely make the lift. 4. Lift with legs not back. Obtain help when needed to lift large, bulky, or heavy items	
HSA Operations	1. Auger start up and operation	1. Auger will be engaged only when the hot zone is cleared and site personnel notified. 2. Site personnel will not approach a rotating auger. 3. Use a long handled flat head shovel when removing auger cuttings. Stay away from the augers when rotating. 4. Prevent shovel from lodging into the augers and kicking out. 5. Do not wear loose clothing when working with augers.	L
	2. Cleaning augers	1. Augers will be cleaned only when they are stopped and in neutral. 2. They will not be restarted until the worker has given a verbal “all clear” to the operator, and the operator has visually determined that the worker is clear of the auger. 3. Only long-handled shovels will be used to remove cuttings from the auger.	L
Monitoring Well installation	1. Slips, Trips, Falls	1. Clear trees, roots, weeds, limbs and other ground hazards from the location. 2. Practice good housekeeping to keep the ground around the site clear of obstructions, equipment and other tripping hazards. 3. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces. Keep a wide base and assure secure footing while attempting to handler auger flights and tooling.	L
	2. Contusions, cuts, or abrasions	1. When handling auger flights and tools, wear cut-resistant heavy cotton or leather work gloves when handling items with sharp or rough edges.	L
	3. Heavy lifting (muscle strains and pulls).	1. Practice safe lifting techniques by using mechanical lifting devices such as a dolly whenever possible. 2. Ensure clear path of travel 3. Have a good grasp on object. Perform "test lift" to gauge ability to safely make the lift. 4. Lift with legs not back. Obtain help when needed to lift large, bulky, or heavy items	L
	4. Exposure to potential site contaminants (VOC’s, Metals, PCB’s)	7. Monitoring with portable photoionization detector (PID)Calibrate monitoring equipment twice/day. • In the morning prior to use to ensure the operational status	**L**

JOB STEPS	HAZARDS	CONTROLS	RAC
	• Inhalation • Skin contact • Absorption • Ingestion	• In the evening in order to compensate results for any instrument drift due to battery loss. 8. Establish background levels to be incorporated into the monitoring results. 9. Periodically screen the borehole and any samples collected with a PID equipped with a 11.7eV Ultra Violet (UV) lamp. 10. If readings above daily-established background levels (BGLs) are noted in borehole, monitor worker breathing zone (BZ) areas. 11. If readings in worker BZ areas exceed: • PID Action Level: >1 ppm above BG sustained for 1 minute in BZ areas for 4 exposures of 5 minutes in one work day for VOC's. • Visible Dust employ dust suppression area wetting 12. Monitoring will be conducted in the breathing zone of the Driller to collect data for the worst case scenario in order to evaluate air emissions from this source point.	
Soil sampling	1. Cuts and lacerations – when cutting acetate liners without the proper material handling devices.	1. Always cut away from yourself and others. Do not place items to be cut in your hand or on your knee. 2. Change blades as necessary to maintain a sharp cutting edge as many accidents result dull cutting attachments. 3. Wear cut-resistant gloves (leather or heavy cotton) at least on the non-knife/saw hand, where possible. When cutting acetate liners use the tubing retention tub to secure the tube. 4. Use the knife intended for that purpose. Geoprobe® makes a kit for this purpose.	L
	2. Chemical exposure	1. Wear surgeons' gloves when handling potentially-contaminated media and samples. Avoid contact with potentially-contaminated media to the extent possible. 2. Practice good personal hygiene (hands and face washing) when exiting work area. Hand-to-mouth activities in the work area are prohibited (eating, drinking, smoking, etc.). 3. Exposure via dermal contact and ingestion represent some limited concern during this task. 4. Periodically screen sample with monitoring equipment. If readings above daily-established background levels (BGLs) are noted in borehole, monitor worker breathing zone (BZ) areas. If readings in worker BZ areas exceed the action level: • After at least 5 minutes, SSO will approach from upwind direction screening BZ areas.	L

JOB STEPS	HAZARDS	CONTROLS	RAC
		• Work may resume when readings in the BZ return to BGLs.	
Decontamination	1. Chemical spread	1. When handling soils and potentially contaminated equipment 2. Wear surgeon's gloves when handling potentially-contaminated media and samples 3. Avoid contact with potentially-contaminated media to the extent possible. 4. These are disposable, change out as necessary to avoid break through. 5. When exiting the exclusion zone, wash the outer gloves to remove any residual contamination. 6. This will also permit disposal in the general refuse. 7. Remove gloves, wash hands and face to minimize any potential introduction of contaminants into the body. 8. Leave consumable materials such as cigarettes, snuff chewing tobacco, candies, medications, etc. in the break area to avoid potential contact. 9. Practice good personal hygiene (hands and face washing) when exiting work area, avoiding any hand-to-mouth activities in the work (eating, drinking, smoking, etc.). 10. Practice good housekeeping to avoid the spread of contamination.	L

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
DPT Rig, bore rods, auger flights, acetate cutting device and sharp knives, hand tools (dollies, hand carts, etc.) **Safety Equipment:** 1. A 20-pound dry chemical ABC fire extinguisher readily available. 2. Spill-control kit available at drilling location. 3. First-aid kit, eyewash (meeting the ANSI Z358.1 criteria), and an emergency air horn nearby. **Monitoring Instruments: None**	Visual inspection prior to use by user. PID must be calibrated as per the manufacturer's recommendations and documented on each use.	1. Review of AHA during pre-task tailgate safety briefing with all intended task participants. 2. Personnel must be trained in use of drilling equipment. 3. The Drill/DPT operator must have current certifications to operate the equipment.
Personal Protective Equipment: <u>Minimum</u>: Safety toe boots, safety glasses, Hardhat, hearing protection Nitrile surgeon's style gloves. **<u>Optional items:</u>** Tyvek if there is a change to soil clothing. **<u>HTRW</u>**: VOC's, Metals/dust, PCB's	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in any onsite activities, and will be confirmed by visual observations of worker activities.

I have read and understand this AHA:

Name (Printed)	Signature	Date

ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task: Concrete Chipping and Coring activities	Overall Risk Assessment Code (RAC) (Use highest code)	**M**
Project Location: Lockheed Martin		
Site: Martin State Airport		
Date Prepared: January 2016		
Prepared by: C. Snyder		
Reviewed by: J. Carothers, PhD		
Notes: (Field Notes, Review Comments, etc.)		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	**E**	**E**	**H**	**H**	**M**
Critical	**E**	**H**	**H**	**M**	**L**
Marginal	**H**	**M**	**M**	**L**	**L**
Negligible	**M**	**L**	**L**	**L**	**L**

Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (See above)

	RAC Chart
"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	
"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	**E= Extremely High Risk** **H= High Risk**
Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	**M= Moderate Risk** **L = Low Risk**

JOB STEPS	HAZARDS	CONTROLS	RAC
Qualified and trained personnel shall utilize a powered coring/cutting machine to saw cut and remove concrete cores and chips. Hand tools and or drills may also be used for this activity.	1. Crushing, pinching, cutting, amputation and bruising hazards as well as caught-on and struck-by and flying debris hazards are associated with powered handheld equipment usage.	1. Workers shall inspect, test, and determine safe operating condition of all power tools prior to use. 2. Continued, periodic inspections shall be performed assure safe operating condition and proper maintenance. 3. Utilize a coring machine in a well ventilated environment. 4. Prior to use, the operator shall check the blade for damage and ensure that the blade arbor is the proper size and is seated securely on the hub. 5. Use the proper blade for the material being cut. 6. The operator shall use the correct size blade guard for the blade in use. 7. Intentional forcing of the coring tool bit may cause the blade to shatter.	M

JOB STEPS	HAZARDS	CONTROLS	RAC
		8. The operator shall make shallow cuts with the blade to avoid overheating. 9. Overheating may cause the blade to fail resulting in serious injury. 10. The operator shall lift blade from cutting surface before stopping the machine.If hand tools (hammers, chisels etc.) are used to clear brush and small trees the following precautions should be followed:	
	Hand Tool Use	1. Inspect handles are they in good condition (no cracks, splinters, loose heads. 2. Check tool edges all blades should be sharp without knicks or gouges in the blade. 3. All hand tools should be controlled when not in use to prevent tripping. 4. A 10-foot perimeter will be established around areas where concrete chipping is being conducted.	
	Dust generation	1. Visible Dust employ dust suppression area wetting 2. When handling soils and potentially contaminated equipment 3. Wear surgeon's gloves when handling potentially-contaminated media and samples 4. Avoid contact with potentially-contaminated media to the extent possible. 5. These are disposable, change out as necessary to avoid break through. 6. When exiting the exclusion zone, wash the outer gloves to remove any residual contamination. 7. This will also permit disposal in the general refuse. 8. Remove gloves, wash hands and face to minimize any potential introduction of contaminants into the body. 9. Leave consumable materials such as cigarettes, snuff chewing tobacco, candies, medications, etc. in the break area to avoid potential contact. 10. Practice good personal hygiene (hands and face washing) when exiting work area, avoiding any hand-to-	

JOB STEPS	HAZARDS	CONTROLS	RAC
		mouth activities in the work (eating, drinking, smoking, etc.). 11. Practice good housekeeping to avoid the spread of contamination.	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Coring tool, concrete coring bit, hand tools.	Visual inspection prior to use by user.	Review of AHA during pre-task tailgate safety briefing with all intended task participants.
Personal Protective Equipment: **<u>Minimum</u>**: Safety toe boots, safety glasses, face shield, and hearing protection, cotton or leather work gloves. <u>Optional items:</u> Hardhat, **<u>HTRW</u>**: possible dust	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in any onsite activities, and will be confirmed by visual observations of worker activities.

I have read and understand this AHA:

Name (Printed)	Signature	Date

ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task: Excavation activities	Overall Risk Assessment Code (RAC) (Use highest code)					L
Project Location: LMC/MSA	**Risk Assessment Code (RAC) Matrix**					
	Severity	**Probability**				
Date Prepared: January 2016		**Frequent**	**Likely**	**Occasional**	**Seldom**	**Unlikely**
Prepared by: C. Snyder	**Catastrophic**	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by: M. Soltis, CIH, CSP	**Marginal**	H	M	M	L	L
	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (see above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.				**RAC Chart**	
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				**E= Extremely High Risk** **H= High Risk**	
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				**M= Moderate Risk** **L = Low risk**	

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
Excavation and Trenching	Struck by Heavy Equipment/Vehicles	1. Operators/Drivers will submit a copy of their valid driver's license on initial arrival for each vehicle brought on site. 2. Drivers will maintain workers on foot in sight, if you lose sight of someone, Stop! 3. Design the site traffic controls to minimize backing operations. 4. Personnel are not allowed to use a cellular phone while driving a vehicle on-site. 5. Use spotters for traffic control whenever there is "blind spots", backing in congested areas, or where there are road hazards or unsafe road conditions. 6. Be aware of heavy equipment operations. 7. Keep out of the swing radius of heavy equipment. 8. Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times. 9. Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. 10. Ground personnel will not stand directly behind heavy equipment when it is in operation.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		11. Do not approach heavy equipment unless eye contact with appropriate hand signals has been made with the operator to cease activity. Equipment operators will confirm that eye contact had been made by stopping operation and clearly showing their hands are off of the controls.	
	Rollovers	1. Equipment will have rollover protective structures and seat belts. 2. Operators will wear seat belts when operating equipment. 3. Equipment will not be operated on grades which exceed manufacturer's recommendations. 4. Run articulated equipment (i.e., rollers, trucks) up and down slopes – not at an angle.	L
	Unstable Soils	1. During hauling operations, keep soft areas/ruts filled and graded. Do not allow off-road trucks to continually run over ruts. 2. Off-road trucks should vary their path on the haul roads. 3. Prior to beginning any grading activities in potentially unstable areas, an operator experienced with working on unstable material will run a LGP dozer over the entire area to evaluate for signs of unstable areas.	L
	Underground Utilities	1. Check all available information for location of possible underground obstruction, (e.g., buried pipe, conduit, cable, and telephone lines), especially at sites where plants or structures already exist. 2. Contact local utility companies, landowners, and organizations such as 'dig safe' to assure identification of all buried utilities and obstacles. 3. In planning size of work area at toe of slope, allow for accessibility and maneuverability of equipment planned for construction activities.	L
	Slopes	1. Earth slopes for trenches and other embankments must be in accordance with OSHA regulations. 2. Locate borrow and waste areas to maximize downhill hauls. 3. Consider use of "reinforced earth" retaining walls. 4. Ensure erosion control materials comply with the E&S Plan. 5. Consider use of geotextiles, erosion control blankets, hay bales or other means to maintain drainage areas and prevent wastage.	L
	Noise	1. Where provided close the cab to reduce noise levels associated with the machinery operation. 2. Wear hearing protection when operating noise levels exceed 85dBA. 3. SSO will be responsible for implementing the Site Specific Hearing Conservation Program. 4. Provisions for initial monitoring; selection of types of hearing protection and performance requirements are provided there.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
	Eye Injuries	1. Wear safety eye ware	L
	Struck By/Against	1. Personnel will understand and review hand signals. 2. All machines will be equipped with backup alarms.	L
Excavation	Excavation Hazards	1. Prior to beginning work, the competent person shall complete a Checklist for any excavation 4 feet or greater. 2. Do not leave excavations open overnight whenever possible fill them. 3. Install open trench warning devices/barricades. 4. Excavated and loose materials should be kept at least 4 feet from the edge of excavations. The spoils shall be properly slope at a safe angle. 5. If the excavated site is large enough for employees to bodily enter and perform work, and has limited means for entry or exit, and is not designed for continuous employee occupancy, it falls under OSHA confined space regulations. 6. If deemed necessary, use the benching and sloping methods to prevent cave-ins (29 CFR 1926.652, Appendix B). 7. If personnel entry is necessary, stairways, ladders, or ramps shall be provided as means of egress in all trenches 4 feet or more in depth. 8. Travel distance shall be no more than 25 feet between means of exit. 9. Protective systems are required on all excavations over 5 feet in depth or in excavations less than 5 feet when examination of the ground by a competent person reveals conditions that may result in cave-ins (29 CFR 1926.652, Appendices C & D). 10. Excavations will be inspected by a competent person prior to personnel entering the excavation. Continuous air monitoring will be performed in accordance with Section 6.0 if personnel are required to enter the excavation. The competent person shall have completed an accredited excavation safety course.	L
	Slips, Trips, Falls Insect bites, snake bites, and contact with poisonous plants.	• Clear intended work areas and walking paths of roots, weeds, limbs and other ground hazards. • Practice good housekeeping to keep the site clear of obstructions, materials, equipment and other tripping hazards. • Ensure that work boots have adequately-aggressive sole design. • Use caution when working on uneven and wet ground. • Shake out boots before donning. • Use insect repellants (products containing DEET should be applied to exposed skin, products containing Permethrin should be applied to clothing only. • Follow manufacturer's recommendations.	M

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC

	1. Chemical contaminants (VOC's, Metals, PCB's)	• Tape up pants leg to work boot joints with duct tape.
		• Wear light-colored clothing to better see and remove any insects.
		• Perform close body inspections at least daily upon leaving the site.
		• Avoid potential nesting areas (brush, deadfall, etc.) where insects or snakes may be present.
		• Review Natural Hazards information in the TtSOP with field team as appropriate based on site observations and conditions.
		
		• Use the PID (11.7eV) to check for background levels in the breathing zone. If following action levels will be observed:
		  o PID Action Level: >1 ppm above BG sustained for 1 minute in BZ areas for 4 exposures of 5 minutes in one work day for VOC's.
		  o Visible Dust employ dust suppression area wetting	

	Encumbrance	1. Utility clearances must be in place prior to the beginning of excavation (in accordance with the Tetra Tech Utility Locating SOP. 2. Excavation boundaries must be demarcated with appropriate warning signs (e.g., construction activities in progress). 3. Traffic patterns for equipment and the loading of trucks must be established. This pattern should form a loop to minimize backing, an activity which causes many accidents. 4. Traffic patterns for foot and small vehicular traffic must keep workers away from heavy equipment. 5. Traffic patterns for heavy equipment must be constructed to maintain traffic flow a minimum of 10 feet from unsupported walls or excavation boundaries. 6. Excavation along thoroughfares will require the use of warning signs, barricades and flag-persons for alteration of traffic patterns, as necessary. 7. Ground personnel should be provided with reflective vests to increase visibility and air horns to signal loud trucks and heavy equipment. 8. Ground activities with heavy equipment must be supported with a ground spotter. The operators should be instructed that they are to follow the instructions provided by the ground spotter unless another party is otherwise authorized. 9. Surface encumbrances within the intended work area of the excavation will be removed or supported, as necessary, in accordance with OSHA 1926.651(a). 10. Prior to being put into service at the site, the excavator will be inspected by the SSO, and this inspection will be documented using the applicable forms in Attachment XI.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		11. Heavy equipment will be positioned and operated so that it never approaches closer than 4 feet from the edge of an open excavation (other than the boom and bucket portion of the excavator). 12. A decontamination station should be established at the loading and off-loading areas to flush mud and dirt from the wheels and tires as well as any areas of the vehicle impacted during the loading operation.Tetra Tech personnel WILL NOT enter a trench past 4 feet deep	
	Heavy Equipment Operation	1. Reference General Site Hazards. 2. Only operators trained and experienced with the specific equipment will operate that equipment. 3. Equipment will have guards, canopies or grills to protect from flying objects. 4. Ground personnel will stay clear of all suspended loads. 5. Eye contact with operators will be made before approaching equipment. Equipment will not be approached on blind sides. 6. Avoid equipment swing radius. This area will be delineated with cones. 7. Know hand signals. 8. All equipment will be equipped with backup alarms. 9. The use of headphones for entertainment purposes is prohibited. 10. A 15 foot minimum safe separation distance (boom fully extended) will be maintained between equipment and overhead utility lines. 11. Equipment will be shut down before and during fueling operations.	L
	Exposure to Contaminants	1. Site personnel will wear PPE as required. 2. Site personnel will make an effort to stay clean and use good hygiene practices during work activities. 3. Minimize the amount of work that must be performed in excavations.	L
Trenching	Confined Space Entry	1. Personnel entry into the excavation or trench is not planned 2. A permit is required for any confined space entry that has one or more of the following characteristics: • Contains or has the potential to contain a hazardous atmosphere. • Contains a material that has the potential for engulfing the Entrant. • Has an internal configuration that can cause a person to be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller area. • Contains any other recognized serious safety or health hazard. 3. Complete the Non-Permit Confined Space Pre-Entry Checklist Form prior to entry to assure that all conditions for a Non-PRCS are met. 4. All hazardous energy sources shall be isolated before entry is permitted.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		5. Provide safe access into the work area (e.g., ladders, scaffolding, or guarded platforms). Where possible, multiple openings for entry/exit shall be provided for access to confined spaces. 6. Prior to entry, perform air monitoring in accordance with Section 6.0 and inspections to ensure no atmospheric hazards or other safety hazards exist. 7. Perform on-going visual inspections of the Non-PRCS during entry to ensure all health and safety hazards are identified and mitigated. 8. If performing hot work in a relative small/restricted confined space, an attendant will be stationed outside and be capable of executing pre-planned rescue operations. 9. If any condition or hazard is detected that would cause the Non-PRCS to meet the definition of a PRCS, all entrants will evacuate the space and PRCS procedures will be employed prior to re-entry or until that condition/hazard is eliminated. 10. All site personnel involved in confined space entry (i.e., Entry Supervisors, Entrants, Attendants, and Rescue Teams) will receive confined space entry training.	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Excavators and transport trucks	SSO to inspect each vehicle prior to permitting site access using Heavy Equipment Inspection Checklist provided in Attachment XI.	Heavy equipment operators must demonstrate experience in proper vehicle/equipment operations. Over the road heavy motorized vehicle operators must possess appropriate DOT licenses.
Personal Protective Equipment: **Minimum**: Hard hats, steel toe boots, sleeved shirt, long pants, safety glasses, high visibility vests **Optional items**: Hearing protection when required and surgeons gloves when sampling **HTRW**: VOC's, Metals/dust, PCB's	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations.

All persons working within the operation will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training

ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech, Inc.

Activity/Work Task: Sediment Dewatering activities and Transportation	Overall Risk Assessment Code (RAC) (Use highest code)					**M**
Project Location: LMC MSA	**Risk Assessment Code (RAC) Matrix**					
Date Prepared: January 2016	**Severity**	**Probability**				
		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: C. Snyder	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by: J. Carothers, PhD	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (See above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.					**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible					**E= Extremely High Risk**
						H= High Risk
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.					**M= Moderate Risk**
						L = Low Risk

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
1. Site set up – Dewatering Pad placement Duties will include • Receiving sediments. • Draining water from the sediment pumping and containing water in Frac Tanks. • Servicing electrical and gas operated pumps	1. Slip, trip and fall hazards	1. During set up, in order to minimize slip trip and fall hazards • The SSO will survey the area to ensure areas prone to slip, trip, and fall hazards are flagged or removed. • Entry/access routes will be determined as well as schedules. • All workers are to wear sturdy work shoes that are outfitted with slip resistant aggressive tread. • Provide hose and piping guards at crossing points to protect piping and hoses and to minimize trips and falls. • Conduct leak tests on all hoses and connections. Clean up spills and releases when they occur to eliminate slippery surfaces • Step ladder(s) will be maintained in the dewatering area or access platforms will be constructed to permit	M

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
Dewatering Pad will be built to drain water to a Central Location		monitoring of dewatering. If ladders are employed they will be o Fully extended o Placed on a flat surface or secured to the box. o Personnel will be instructed in the proper use of ladders by a Competent Person. o Ladders will be inspected by a Competent Person periodically. Users will inspect before each use. o It is strongly recommended that climbing on the roll box frame is discouraged	
2. Pump water operation and maintenance	1. Contaminant contact during hose change out and flushing	1. To minimize contact • All high pressure hose connections will either be mechanical connections or will be pinned to prevent inadvertent disconnect. • Periodically flush feed and discharge lines and pumps. Flush at the end of the work day. • Establish spill provision materials and PPE within the area of the feed discharge and discharge to the frac tanks. This includes o Hard hats; Safety Glasses, Steel toed/shank boots, suitable work attire; nitrile surgeons and nitrile supported gloves. o During hose or pump opening – Rain suit, chemical resistant over boots, and splash shield • Maintain hoses roll off boxes within secondary containment area accessible by truck. • Anytime direct contact is anticipated, personnel will o Flush the pump and lines out before servicing to remove contaminated sediments and waters. o Wear protective clothing to prevent direct contact. This includes ▪ Rain suit is splashing potential exists. ▪ Impermeable aprons if incidental contact is anticipated. ▪ For activities require tactile control, wear nitrile surgeons gloves, layered where necessary.	L
3. Pumps	1. Electrical hazards	1. To control electrical hazards, the following measures will be employed. • Route all plug in pumps through a Ground Fault Circuit	M

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		Interrupter (GFCI) to detect and isolate potential stray currents in these wet areas. • Keep power feeds out of standing water. • Use flexible cords o Inspect all cords and equipment before each use. Cords will be physically intact and will have a grounding pin. o The cords to be used will have been inspected by a competent person and will have the appropriate color coding indicating continuity testing has been conducted and the cord is approved for use. o All cords will be approved for outdoor use. o Insure all flexible cords are adequately rated for intended use. See designation provided in Section 5.1.2 concerning Electrical safety. Excerpts of this information are also provided in the Mobilization/Demobilization AHA. o The Flexible cord will have an adequate rating based on pump configuration/draw and the length of the extension cord. o Provide environmental isolation at all connection points. • The pumps casing will be intact and internal grounding connection tested to insure continuity.	
4. Weight assessment and load inspection –	1. Overweight trucks – Road hazards	1. To avoid overloading the following is recommended: • Conduct weight determination based on sediment as densities may vary. As sediments are removed an average over the profile should be determined. • Based on the above determination, load the trucks to a suitable limit to avoid over loading. Based on the density of the materials this may be only 75%. • Weight limits can be confirmed through the use of portable scales.	M
4A. Load Inspection	1A.Leaking materials; Qualification of drivers	1A. To avoid leaking and release of materials • The trucks during transport may continue to weep water. This is created by the vibratory actions (bumpy roads) and the load settling in the truck. Due to this continue release,	M

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		Tail gates shall be sealable to prevent liquid separation and leaking from the box during transport. • Add sufficient polymer to permit remaining water to coagulase to prevent separation of water and sediments during transport. • All boxes will be tarped or covered.	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
transfer pumps; associated hoses; Polymer Gas or electric pumps/generators, etc.	Visual inspection of hand tools will be performed by the SSO. Each time a tool is used it will undergo a cursory inspection by the user. SM and SSO to perform regular (e.g., daily) inspections for housekeeping issues. The results of these efforts will be corrected as necessary and will be documented in the Field Logbook	All personnel • 40-Hour General Site Worker Training [OSHA 29 CFR 1910.120 (e)] • 8-Hour General Site Worker Refresher Training [OSHA 29 CFR 1910.120 (e)(8)] • Site Specific Training – All personnel shall review this Abbreviated Health and Safety Plan prior to the commencement of on-site activity. • Participate in a Medical Clearance/Surveillance Program as described in OSHA 29 CFR 1910.120 (f). • Complete a Medical Data Sheet • Review applicable MSDSs if you are unaware of the hazards and recommended control measures for diesel fuel and grout. Supervisory personnel: 8-Hour General Site Worker Supervisory Training [OSHA 29 CFR 1910.120 (e)(4)]
Personal Protective Equipment: <u>Minimum</u>: • Hard hats; Safety Glasses, Steel toed/shank boots, suitable work attire; nitrile surgeons and nitrile supported gloves. • During hose or pump opening – Rain suit, chemical resistant over boots, and splash shield	Initial and ongoing PPE inspections will be done so by the users. The SSO will perform periodic inspections to determine the effectiveness of selected PPE and if there are better options.	PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in site activities, and will be confirmed by visual observations of worker activities. The SSO will be responsible for the implementation of the following Site Specific Health and Safety Programs: • Hazard Communication – Polymer and supporting petroleum products where employed. • Heat stress monitoring will be conducted at the SSOs discretion based on ambient conditions.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
HTRW: VOCs, Metals, and PCBs		**AHA Assessment -** During the initial walk through the SM and/or the SSO shall review the AHA to determine applicability or information that will need added given site specific conditions.

All persons working within the operational will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training

Tetra Tech, Inc.	ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task: Excavation and loading of dewatered sediment using heavy equipment	**Overall Risk Assessment Code (RAC) (Use highest code)**					**M**
Project Location: LMC MSA	**Risk Assessment Code (RAC) Matrix**					
	Severity	**Probability**				
Date Prepared: January 2016		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: C. Snyder	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by: J. Carothers, PhD	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**

Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (see above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	**E= Extremely High Risk** **H= High Risk**
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	**M= Moderate Risk** **L = Low risk**

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
Transporting Heavy Equipment to the Site	1. Vehicle accident; Damaged over-passes, power lines traffic lights and signs, etc.; roadways, etc.; Load Restrictions; Permit restricted transport routes	1. Confirm permitted travel route and access points and times when oversized equipment may be moved. 2. The travel route, loading and off-loading area should be identified. • To ensure adequate clearance is maintained along the route (over-passes, traffic lights, power lines, etc.) personnel should drive the route the vehicles will take. • Make sure turns and routes provide sufficient clearance to movement the transport truck and trailer with load. • Confirm there are no load restrictions along the travel route. 3. Do not exceed prescribed weight limits.	L
Positioning and moving excavators and transport trucks. Positioning Spill Plate	2. Struck by moving vehicles/ caught between	1. Restrict non-essential personnel from operating area. 2. Ensure that excavators and trucks are equipped with audible back-up motion alarms. 3. Spotters or other ground crew are responsible for positioning themselves in view of vehicle operators (stay out of operators' blind spots). 4. DO NOT get in-between trucks or operating equipment or under spill plate. 5. Do not walk behind operating equipment with a restricted view when moving backwards 6. Always leave yourself and escape route.	M

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		7. If you activity places you in the area of operating equipment carry a whistle or air horn to alert operators should you find yourself in a compromised position. 8. Wear a high visibility clothing to increase visual recognition. 9. Hard hats and safety glasses, standard work attire are required in the operating area. 10. Structural traffic routes in a single direction where possible. 11. Dump trucks will be equipped with over cab protection. 12. Drivers will remain in the truck during loading or move away • Boom length + 10-feet. • When exiting the vehicle drivers must comply with PPE requirements. 13. Equipment operators should NOT swing loads over personnel 14. Personnel on the ground should NOT walk under elevated loads.	
Excavating and loading soils onto haul vehicles	1. Over loading vehicles	1. Trucks will be loaded, tarps put into place, decontaminated (as necessary) and weighed prior to leaving the site en-route to the landfill or disposal area.	M
	2. Falling objects – From transporting vehicles	1. Use the excavator to level the load during placement of the excavated materials in the truck to ensure proper balance of the load while also applying slight compaction. 2. Use the excavator to knock the load down below and compress as necessary below the side boards. 3. When loading soil attempt to mix dry and wet materials. Although materials will be dewatered there is a possibility that some sediment may remain wet. Mix quicklime with sediment to displace or absorb water. • During transport it is the intent to prevent loaded materials from settling resulting in water collection on top of the load or at and along the Tail Gate. • When this condition may be suspected mix with dry materials or quicklime to absorb any water separated from the solids. • If the materials cannot be dried enough by mixing, then return to the dewatering pad and further actions determined to dry sediment.. 4. The vehicles will be covered with tarps to control and contain any debris potentially blowing out during transport and prevent rain or snow from entering sediment. 5. During backfilling personnel will be kept away from the off-loading area to avoid be struck by materials being placed.	M
	3. Elevated noise levels	1. Where provided close the cab to reduce noise levels associated with the machinery operation. 2. Wear hearing protection when operating noise levels exceed 85dBA. 3. SSO will be responsible for implementing the Site Specific Hearing Conservation Program.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		4. Provisions for initial monitoring; selection of types of hearing protection and performance requirements are provided there. Tetra Tech SOPS	
Loading soils into truck transport	1. Airborne dust, exposure to PCB's, VOCs	1. Sediments will be dewatered and are not expected to be dry enough to create dust. As a precaution if dust is created use water to control dust emissions during loading activities. 2. Personnel shall remain to the extent possible upwind. 3. If water suppression is unsuccessful at controlling dust emissions a particulate meter will be employed to quantify airborne levels. 4. Contaminant exposure will be calculated based on individual contaminant concentration. 5. The use of these instruments will be performed until sufficient data is accumulated as determined by the SSO.	L
Sampling activities	1. Chemical exposure	1. Wear surgeons' gloves when handling potentially-contaminated media and samples. Avoid contact with potentially-contaminated media to the extent possible. 2. Practice good personal hygiene (hands and face washing) when exiting work area. Hand-to-mouth activities in the work area are prohibited (eating, drinking, smoking, etc.). 3. Exposure via dermal contact and ingestion represent some limited concern during this task. 4. Periodically screen sample with monitoring equipment. If readings above daily-established background levels (BGLs) are noted in borehole, monitor worker breathing zone (BZ) areas. If readings in worker BZ areas exceed the action level: 5. After at least 5 minutes, SSO will approach from upwind direction screening BZ areas. 6. Work may resume when readings in the BZ return to BGLs. 7. When handling soils and potentially contaminated equipment 8. Wear surgeon's gloves when handling potentially-contaminated media and samples 9. Avoid contact with potentially-contaminated media to the extent possible. 10. These are disposable, change out as necessary to avoid break through. 11. When exiting the exclusion zone, wash the outer gloves to remove any residual contamination. 12. This will also permit disposal in the general refuse. 13. Remove gloves, wash hands and face to minimize any potential introduction of contaminants into the body. 14. Leave consumable materials such as cigarettes, snuff chewing tobacco, candies, medications, etc. in the break area to avoid potential contact.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		15. Practice good personal hygiene (hands and face washing) when exiting work area, avoiding any hand-to-mouth activities in the work (eating, drinking, smoking, etc.). 16. Practice good housekeeping to avoid the spread of contamination. •	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Excavators and transport trucks	SSO to inspect each vehicle prior to permitting site access using Heavy Equipment Inspection Checklist provided in Attachment XI.	Heavy equipment operators must demonstrate experience in proper vehicle/equipment operations. Over the road heavy motorized vehicle operators must possess appropriate DOT licenses.
Personal Protective Equipment: <u>Minimum</u>: Hard hats, steel toe boots, sleeved shirt, long pants, safety glasses, high visibility vests **<u>Optional items</u>**: Hearing protection when required and surgeons gloves when sampling **<u>HTRW:</u>** VOCs, PCBs, metals	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations.

All persons working within the operation will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training

Tetra Tech, Inc.	ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task Sediment Sampling	Overall Risk Assessment Code (RAC) (Use highest code)					**L**
Project Location: LMC MSA	**Risk Assessment Code (RAC) Matrix**					
Site: Martin State Airport						
Date Prepared: January 2016		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: C. Snyder	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by: J. Carothers, PhD	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**

Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (See above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	**E= Extremely High Risk** **H= High Risk**
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	**M= Moderate Risk** **L = Low Risk**

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC

1. Initial Site Surveys - Access/egress into Controlled areas
 	
As part of this sampling effort, the following measures will be conducted.
An initial site survey will be conducted to
• Select the best sample locations based on
  o sedimentary deposits, wetland delineation markers, such as depositional areas
	1. Coordinate efforts with facility personnel
	• Inherent hazards or restrictions
		1. In order to address the potential hazards associated with the initial entry
		• The FOL and/or the SSO will meet with the restricted area personnel/operators to ensure they are aware of planned activities.
		• As part of these discussions, inquire of the potential hazard in the area and areas to avoid.
		• Inquire as to what the facilities Emergency Action Requirements are should there be an emergency and where you should go as an assembly point.
		• PPE requirements for the location, if any
		• Restriction boundaries
		• The FOL and/or the SSO will survey the area to ensure areas prone to slip, trip, and fall hazards are flagged or removed.
		  o Entry/access routes will be determined as well as schedules.
			L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
Associated with this activity will require travel over the intended sampling or delineation boundaries.			
2. Initial site survey of the intended work areas	1. Slip, trip, fall	1. Controlling Slip, trip, and fall hazards • All workers are to wear sturdy work shoes that are outfitted with slip resistant aggressive tread. • Select the best route to access (not over steep or uneven terrain). Where there is no other option, install rope ladders to assist in entry and exit. • Movement through the Marsh area may require the use of Mudders to allow movement over soft terrain or hip waders. This footwear may exacerbate this hazard. • Use the Buddy System. To sink in soft ground and not to be able to extract one's self is a possibility. • Samples collected for Geotechnical description will be placed in ZipLoc Bags for later transfer to glassware when possible.	L
3. Clearing vegetation	1. Cuts/lacerations	1. To control cuts/laceration hazards • Inspect cutting implement to insure handle is intact, no splinters or other structural deficiencies. • Always use a sharp cutting instrument. Many accidents result from struggling with dull cutting implements. • When using machetes, use ones with a sufficient hilt to avoid potential having your hand slide down the blade. • When not in use, place the cutting implement into a protective sheath. Many injuries reported are a result of falling onto unprotected cutting implements. • Wear cut-resistant gloves and safety glasses, when using cutting implements due to flying projectiles and sharp edges created as a result of the cutting. This will also permit you to handle vegetation removed to provide access. • Always cut away from yourself and others. Maintain at least a 15-foot radius around someone employing a machete or Brush Hook.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
4. Sample site preparation	1. Electrical storms/ Inclement weather (high winds, heavy rains, etc.)	• Inclement weather – Nothing makes a better ground rod than the hand auger in the ground with your hands contacting that hand auger during an electrical storm. Stop all hand augering when approaching storms are evident. If a supported means are not available to track the storm use the 30/30 rule. *If there is less than 30 seconds between thunder and lightning, go inside a protected shelter for at least 30 minutes from the last thunder*	L
5. Sampling - Surface soil, sediment, and wetland delineation soil sample collection. Using hand augers – Collecting soil and/or sediment core samples will require using a large diameter hand auger for the collection of 0 to 1 foot; Per the SOP, then the diameter employed for one to two feet will be reduced to avoid cross contamination.	1. Punctures/lacerations Encountering roots, rocks, and other obstructions - The hand auger is constructed of an auger section; auger flight or extension made from thin walled metal tubing; and a T-Handle also made of thin walled metal tubing. Care must be exercised as not to apply too much pressure as the tubing wall can fail. Should this occur, the person twisting and applying downward pressure would fall onto the extension rod, potentially resulting in impalement.	1. To control punctures/lacerations hazards • When using dedicated (plastic) trowels or spatulas, do not exert too much downward pressure as these devices can fail and result in an injury to your hand. Controlling hand auger hazards - • Inspect the hand auger for structural deficiencies. Replace as necessary. • To control potential impalement hazards, do not exert an overabundant amount of force downward or twisting onto the hand auger or use cheater pipes that would result in structure collapse. • If significant resistance is met, move the location slightly to more accommodating ground. The obstruction could be a utility.	L
6. Sampling (continued)	1. Strains or sprains during hand augering, manual lifting and carrying activities	1. Controlling muscle strains and sprains – Hand augering can be physically taxing. While this hazard is considered minimal given the number of points and depths, the following control measures will be employed • Your muscles, tendons, and ligaments are not as flexible in the early morning hours. Stretch before physical taxing activities to avoid potential injury. In the later afternoon, your muscles, tendons, and ligaments maybe stressed from fatigue. Take breaks as necessary to avoid injury. • Rotate duties with your buddy. Additional measures	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
	6A. Lifting and carrying sample supplies and equipment through the marsh area	• Practice safe lifting techniques • Inspect/clear the intended path of travel and areas where loads will be deposited, • test lift each object to ensure you can without injuring yourself, • ensure good grasp is obtainable on object, • keep back straight and lift with legs not back, • obtain help when needed to lift large, bulky, or heavy items. • Where necessary break loads in smaller groups for transport. **Remember:** It is not always the weight of an object to cause a lifting injury, but also how your body is positioned making it more vulnerable to injury even from light loads.	
7. Sample collection (continued)	1. Contaminant Exposure The COCs of concern include: All hazards are contact based hazards along with hand to mouth transfer and ingestion. This hazard can be more significant during wetland delineation as the sedimentary and soil samples must be closely examined including the texture of the materials. This is usually done by applying some into the palm of the hand and rubbing to determine grain type and consistency. While this can be done with surgeon's gloves, some prefer not to.	1. Wear surgeons' gloves when handling potentially-contaminated media and samples. Avoid contact with potentially-contaminated media to the extent possible. 2. Practice good personal hygiene (hands and face washing) when exiting work area. Hand-to-mouth activities in the work area are prohibited (eating, drinking, smoking, etc.). 3. Exposure via dermal contact and ingestion represent some limited concern during this task. 4. Periodically screen sample with monitoring equipment. If readings above daily-established background levels (BGLs) are noted in borehole, monitor worker breathing zone (BZ) areas. If readings in worker BZ areas exceed the action level: • After at least 5 minutes, SSO will approach from upwind direction screening BZ areas. • Work may resume when readings in the BZ return to BGLs. 1. When handling soils and potentially contaminated equipment 2. Wear surgeon's gloves when handling potentially-contaminated media and samples 3. Avoid contact with potentially-contaminated media to the extent possible. 4. These are disposable, change out as necessary to avoid break through. 5. When exiting the exclusion zone, wash the outer gloves to	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		remove any residual contamination. 6. This will also permit disposal in the general refuse. 7. Remove gloves, wash hands and face to minimize any potential introduction of contaminants into the body. 8. Leave consumable materials such as cigarettes, snuff chewing tobacco, candies, medications, etc. in the break area to avoid potential contact. 9. Practice good personal hygiene (hands and face washing) when exiting work area, avoiding any hand-to-mouth activities in the work (eating, drinking, smoking, etc.). 10. Practice good housekeeping to avoid the spread of contamination. Where possible the FOL shall arrange work to proceed from the least contaminated area to the greatest contaminated area thereby reducing the potential for cross contamination. • After placing sample media inside the sample container, wipe down the outside of the container to minimize contact with contaminated media when handling the sample containers.	
Surface water Sampling	Drowning Infectious water borne diseases	1. Wear appropriate personal flotation device (PFD). 2. Don't lean over the side of bridge. 3. Wear appropriate gloves. Prevent contaminated water from contacting your skin. 4. Snagging sampling device on floating or submerged debris 5. Be alert to boat traffic. Have a horn to signal a boat within reach. 6. Wear safety goggles and safety clothing to prevent water contact with skin.	L
8. Sampling/delineation/ surveying	8. Natural hazards – Insect stings and bites; snake bites - The season in which the execution of this project will take place is approaching_spring and summer. Many of the reptiles that present a limited hazard will be nesting. Insect populations will be dramatically reduced making some of these hazards inconsequential.	8. Controlling natural hazards - In a scenario in which immediate response is required the following measures will be employed • Ensure field personnel that are allergic to bee stings are identified and have their Doctor prescribed antidote. • If snake sightings occur – o Wear snake chaps when moving through heavy brush. o Know the habitat – Where hunting, ambush will occur o Prepare for Snake bite – ▪ Apply a pressure wrap above the bite site, moving downward. ▪ Keep the victim calm, attempt to minimize physical	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		exertion as this may mobilize the venom. ▪ Gather a description of the snake so the proper anti-venom may be administered. Again this is considered unlikely but cannot be ruled out.	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Hand tools (hand augers, soil corers, spatulas, etc.); machetes, brush hooks.	Visual inspection of hand tools will be performed by the SSO. Each time a tool is used it will undergo a cursory inspection by the user. Noted damage (mushroomed head, splintered handle, etc.) will require removal from service. FOL and SSO to perform regular (e.g., daily) inspections for housekeeping issues. The results of these efforts will be documented in the Field Logbook	All personnel • 40-Hour General Site Worker Training [OSHA 29 CFR 1910.120 (e)] • 8-Hour General Site Worker Refresher Training [OSHA 29 CFR 1910.120 (e)(8)] • Site Specific Training – All personnel shall review this Abbreviated Health and Safety Plan prior to the commencement of on-site activity. • Participate in a Medical Clearance/Surveillance Program as described in OSHA 29 CFR 1910.120 (f). • Complete a Medical Data Sheet • Review applicable MSDSs if you are unaware of the hazards and recommended control measures for diesel fuel and grout. Supervisory personnel: 8-Hour General Site Worker Supervisory Training [OSHA 29 CFR 1910.120 (e)(4)]
Personal Protective Equipment: <u>Minimum</u>: Work boots; rubber over boots (marsh area) safety glasses, work gloves for clearing access routes; nitrile surgeons for sampling activities. High visibility vest (if hunting is allowed on the facility) and to increase visual recognition; carry a whistle or similar noise producing device when in remote areas to signal for help should it be necessary.	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in site activities, and will be confirmed by visual observations of worker activities. The SSO will be responsible for the implementation of the following Site Specific Health and Safety Programs: • Hazard Communication **AHA Assessment** - During the initial walk through the FOL and/or the SSO shall review the AHA to determine applicability or information that will need added given site specific conditions.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Optional items: Hip waders; mudders; snake chaps **<u>HTRW</u>**: VOCs, Metals, PCB's		

All persons working within the operational will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training

Tetra Tech, Inc.	**ACTIVITY HAZARD ANALYSIS (AHA)**

Activity/Work Task: IDW Management and Drum Handling Procedures	Overall Risk Assessment Code (RAC) (Use highest code)					**M**
Project Location: Lockheed Martin	**Risk Assessment Code (RAC) Matrix**					
Site: Martin State Airport	**Severity**	**Probability**				
Date Prepared: January 2015		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: Clyde Snyder	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by: Jennifer Carothers, PhD	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (See above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	**E= Extremely High Risk** **H= High Risk**
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	**M= Moderate Risk** **L = Low Risk**

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
1. Storage Area set up	1. Traffic hazards; Material handling hazards	1. Traffic hazards/Material Handling hazards – This area should be easily accessible in order to place and remove the drums accumulated. To further reduce material handling hazards, support spill containment and control, and sampling when necessary, the IDW storage area should be structured as follows: • Maximum 4-drums to a pallet with retaining ring bolt and label on the outside for easy access/reference. • Maintain a minimum of 4-feet between each row of pallets. This is the minimum distance necessary to wheel drums on a drum dolly. • If the site is not secured, the satellite storage area shall be fenced and signs placed indicating the following: a. Primary Point of Contact (make sure they know they been identified as the primary point of contact). b. Phone Number c. Emergency Contact (If different from the primary)	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		• Provide a Drum/Container Inventory to the Primary Point of Contact and to Emergency Services, if they deem it necessary. The inventory should contain: a. Each drum shall be assigned a unique identification number. This number shall be placed on the label and drum shell using a paint marker (Note: Do not paint the number on the lid as these have a tendency to get exchanged from time to time.) b. Types of waste materials (decontamination waters; purge waters, etc.) c. Volumes (Full or level associated with the container after completion of the project location) d. Where it was derived from (The site and/or wells) e. Dates (When filling began) f. Contact – For more information • Ensure all lids are secured.	
2. Material Handling	1. Lifting (strain/muscle pulls)	1. Lifting (strain/muscle pulls) • Use mechanical means (i.e. dollies, etc.) to move and handle containers. Use proper lifting techniques described in TtSOP. • Fill drums and buckets only to 80% to minimize some of the weight and incidental spill issues. • Use help to move and place drums **Reminder:** The drums you are attempting to move, lift and/or relocate may weigh on the average of • 55-Gallon container of purge or decontamination waters = ~500 lbs. (including the container)	M
3. Placing the drums	1. Pinches and compressions	1. Pinches and compressions – During placement of drums/containers on pallets use machinery or assistance from another person where possible. Keeps hand out of the area between drums during placement. • It is best to place the drums and pallets then transport buckets to fill the drums already placed. • Wear steel toed shoes with adequate lug to support traction when moving heavy containers. • If drums are used at the wells, Whale pumps may be used to transfer contents to a drum in the pick up and then again at the storage area. • If necessary buckets can also be used to transfer materials.	M

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
4. Spill prevention and protection • Staging and Labeling Containers.	1. Chemical contaminants exposure	1. Chemical hazards – Generally encountering contaminants during this activity is low unless the contents of a container must be transferred due to a faulty container [leak(s)]. The outside of containers should be cleaned of residual waters (e.g. splashes, etc.) to avoid potentially exposing all who come in contact. The FOL and/or the SSO will • Ensure the outsides of all drums moved to the staging area are washed/wiped clean.	L

Spill Containment - The primary area of concern regarding spills and/or releases are:

- Collection point –Use mortar tubs as secondary containment. In addition, keep the buckets in the mortar tubs during transport in your vehicle.
- Keep the buckets closed during transport.
- Avoid leaving containers open that may off gas during transport.
- Moving/Handling the drums/containers of waste materials. Minimize handling drums as much as possible and:.
  - o Use proper lifting appliances such as drum grapplers, drum dollies, etc.,. Secure containers for movement over long distances.
  - o Exercise care when using a backhoe or similar device to lift the drums. This could result in a bucket tooth puncturing the drum resulting in a release.
  - o Place the drums onto a lift gate and flat bed with removable sides for transport to the staging area.

This section describes the procedures the Tetra Tech field personnel will institute when a spill or leak is detected:

- Initiate incidental response measures, including:
  - o Employ personal protective equipment (see below). Take actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel (for containers). Spread the absorbent material in the area of the spill, covering it completely.
  - o Transfer material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment and disposal options.
- Re-containerize spills, including 2-inch of top cover (if over soils) impacted by the spill. Await test results for treatment or disposal options.
- Notify the SSO or FOL immediately upon detection of a leak or spill and actions taken or employed.
  - Personal Protective Equipment
  - \- Nitrile outer gloves
  - \- Splash Shield
  - \- Impermeable over-boots
  - \- Rain suits

Hazard Monitoring Required:	**Decontamination Procedures:**	**Permits/Requirements:**
Visual observation of work practices by the FOL and/or the SSO to minimize potential physical hazards (i.e., improper lifting, unsecured loads, cutting practices, etc.). Monitoring will only be employed if Spill Containment is implemented. Periodic visual inspection for leaks when filling drums or those at the staging area.	Not required, unless spill containment protocol is implemented. Then the following will apply • Once the spill is secured and all of the spill equipment has been through a soap and water wash and rinse. • Personnel will wash/rinse outer protective garment with soap and water. • Remove outer protective garments. • Wash hands and face.	• Complete IDW Inventory List

Training Required	**Emergency Equipment**	**H&S Supporting Program Requirements**
• 29 CFR 1910.120 (e) Site Specific Training, See Figure 8-1 **Medical Clearance/Surveillance Required** • Completed a Medical Data Sheet	- First Aid Kit - Fire Extinguisher - Map to Hospital and Emergency Contact List (Posted and a copy placed in your First-Aid Kit. - Spill Kit (Oil dry, wood shavings, or other absorbent materials, Shovels, brooms, Oil absorbent pads	None required.

All persons upon review will sign off on this AHA prior to participating in these activities.

Name (Printed)	Signature	Occupation	Date of Review or Training

ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech, Inc.

Activity/Work Task: Geophysical, Soil Gas and Land Surveying	**Overall Risk Assessment Code (RAC) (Use highest code)**	**M**

	Risk Assessment Code (RAC) Matrix					
Project Location: Lockheed Martin	**Severity**	**Probability**				
Site: Martin State Airport		Frequent	Likely	Occasional	Seldom	Unlikely
Date Prepared: January 2016	Catastrophic	E	E	H	H	M
Prepared by: Clyde Snyder	Critical	E	H	H	M	L
Reviewed by: Jennifer Carothers, PhD.	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (See above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	**E= Extremely High Risk** **H= High Risk**
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	**M= Moderate Risk** **L = Low Risk**

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
1. Mobilization to the site.	1. Driving	1. See Mobilization/demobilization AHA for control measures pertaining to • Driver qualifications • Distracted driving control measures • What to do if you are in an accident	L
2. Placement of vehicle	1. Struck by – Traffic hazards	1. Struck by To minimize potential Vehicle Traffic Hazards • Use caution around heavy and/or other fast-moving equipment. Be aware of blind spots in and around drill rigs and support vehicles. They may not see you or your equipment. • DO NOT place obstructions along the sides of the service or access roads that may cause personnel to move into the flow of traffic. **Provide a required Free Space of Travel.** This includes your support vehicle.	M

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		• Required “Free Space”: Maintain at least 6-feet of space between you and moving traffic. • Where this is not possible, use flaggers and/or signs to warn oncoming traffic of activities near or within the travel lanes. • Face Traffic: Whenever feasible, if you must move within the 6-feet of required space, or into traffic attempt to face moving traffic at all times. Always leave yourself an escape route. • Wear High Visibility Vests to increase visual recognition by motorist. • Do not rely on the operator’s visibility, judgment, or ability. Make eye contact with the driver. • Carefully and deliberately use hand signals so they will not startle or confuse motorists or be mistaken for a flagger’s direction before moving into traffic. • Move Deliberately: Do not make sudden movements that might confuse a motorist. • Avoid where possible interrupting Traffic Flow: Minimize crossing traffic lanes. • Warning signs shall be placed indicating surveyors working from all approach venues where applicable. Where free space of travel cannot be maintained a Traffic Control Plan will be required. This not anticipated.	
3. Surveying	1. Surveying – Vehicle and or traffic distraction. - Wondering into traffic pattern or flow.	1. Distraction – Control measures • Restrict flow and speed of traffic when working in traffic patterns or within the Free Space of Travel. • Minimize activities during high traffic periods or when visibility maybe affected such as early morning and near dusk. • Use the Buddy System, if you see a Team member not paying attention – Radio and remind. • Secure all loose articles – Papers, maps, etc. – Persons will run into traffic not intentionally but to chase a piece of paper blowing away. • Always wear High Visibility Vests, jackets, etc. to increase visual detection.	M

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
4. Surveying - Driving hubs into the ground using hammers to mark identifying control points	1. Flying projectiles/Struck by/ impaled	1. Flying projectiles/Struck by • To protect from projectiles eye injuries personnel will wear safety glasses. • Crack or damage hubs will not be used. • Use a suitable hammer to drive the hubs. The hammer shouldn't be so heavy that and additional person must hold the hub while you drive it into the ground. • Ensure the hammer head is attached tightly and has no indication of a mushrooming head that could also become a flying projectile. • Hub covers with extended handles are recommended for this task. These steel caps fit over hubs to prevent the ejection of shards while the extension handle takes your hands and fingers out of the strike point or area. The down slide, it is another piece of equipment to carry. • Place the hubs in a bucket or similar device to prevent an impalement injury.	L
5. Surveying - Movement over various terrain types, through various vegetation	1. Slips, trips, and falls	1. Slips, trips, and falls • Remove/identify trip hazards from the work area, so they may be avoided. • Maintain good housekeeping within the work area. • Select the best route possible for moving over various terrain types and vegetation (See biological hazards, Section 4.0, subsection 5.0 of the HSGM.). • Work boots with a rugged lug is recommended to minimize slips, trip, and falls. • Lace up boots providing a ankle support is recommended for movement over various terrain. Steel toed boots are not required for this task.	L
6. Cutting site lines, where necessary using hand tools.	1. Cuts/Lacerations	1. Cuts/lacerations; Struck by • See Hand tool use for removal of vegetation – Cutting site lines • Wear hard hat, safety glasses, and leather gloves when cutting and removing vegetation. • Keep cutting tools within their sheath during periods of travel or non-use. • Machetes will be equipped with an adequate hilt to avoid the hand sliding down the blade in the event of a fall.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		This provision has been added should minor clearing be required.	
7. Surveying points	1. Natural hazards – Irritating plants, insects, snakes and other reptiles.	1. Poisonous plants/Insect Bites Insects populations can vary from ants, bees, spiders, ticks, and mosquitoes, etc.. These populations within certain regions are prevalent in all areas other regions are not as prevalent to certain populations. This will also be affected by the season in which the work is being conducted. Additional information may be found in the Tetra Tech SOP's.	M
8. Surveying	1. Inclement weather	1. In order to respond to inclement weather scenarios, the following actions will be employed: • Electrical/Thunderstorms – Where possible employ a lightning detection equipment to warn field personnel of approaching storms. Where this is not possible, use the 30/30 rule *If there is 30 seconds or less between thunder and lightning go inside for 30 minutes or more since the last thunder.* • Heavy rains/Winter storms – The survey team leader shall assess conditions and determine whether work will continue. This action shall include and assessment concerning traffic in the area and that traffics ability to control their vehicle's and not slide into work crews. In these cases, work will be restricted from along traffic travel patterns.	M
Preparation and Set up for Geophysical Screening. This will include laying out a grid, removing obstacles where possible	1. Slips, trips, and falls -	1. Slips, trips, and falls • Remove/identify trip hazards from the work area so they may be avoided. • Earthen depressions (sink holes) caused through previous excavation activities and settling will present trip and fall hazards. These areas should be flagged so the surveyor knows he/she is approaching a hazard. This is especially prevalent when dragging or pulling the GPR unit. • Maintain good housekeeping within the work area. Remove ground litter and debris that may exacerbate this hazard while also interfering with the screening results. • Wear boots with an adequate lug to minimize slipping potential when rains have created slippery conditions.	L
Equipment handling	1. Lifting (strain/muscle pulls)	1. Lifting (strain/muscle pulls) • Seek assistance when moving the GPR unit due to size configuration and sensitivity in and out of transport vehicles.	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		• Take breaks as often as necessary when carrying the unit for extended periods of time • Use proper lifting techniques described in the TtSOP's.	
Marking subsurface anomalies	1. Flying projectiles; struck by broken hubs	1. Flying projectiles/Struck by • When hammering wooden hubs into the ground there is a possibility that shards may break off. To protect from potential eye injury during this activity personnel will wear safety glasses. • Crack or damage hubs will not be used. • Use a suitable hammer to drive the hubs. The hammer shouldn't be so heavy that and additional person must hold the hub while you drive it into the ground. • Inspect the hammer to insure the head is attached tightly and there are no indication of mushrooming head that could also become a flying projectile should it break off. • Use paint with an extend paint spray attachment, then come back and drive the hubs using a hub cap driving implement. This removes hands and protects against shards being splintered and driven off. • Wear safety glasses anytime you are engaged impact related activities such as driving hubs.	L
Conducting soil gas, EM and GPR Surveys	1. Traffic hazards/Struck by	1. To minimize potential Vehicle Traffic Hazards • Be extremely cautious around heavy and/or fast-moving equipment. • DO NOT place obstructions along the sides of the service or access roads that may cause personnel to move into the flow of traffic. **Provide a required Free Space of Travel.** • Required "Free Space": Maintain at least 6-feet of space between you and moving traffic. • Where this is not possible, use flaggers and/or signs to warn oncoming traffic of activities near or within the travel lanes. • Face Traffic: Whenever feasible, if you must move within the 6-feet of required space, or into traffic attempt to face moving traffic at all times. Always leave yourself an escape route. • Wear High Visibility Vests to increase visual recognition.	L

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Machetes; brush axes; sledge hammers; Survey equipment.	Inspect handles; heads; cutting implements	General operating/demonstrated skill of the survey personnel.
Personal Protective Equipment: <u>**Minimum**</u>: Hard hat and safety glasses when removing vegetation; Safety glasses and leather or similar material work gloves; footwear with adequate Lug and ankle support; leather/canvas work gloves for moving over various terrain. <u>**Optional items**</u>: High visibility vests are recommended for these activities in high traffic areas. **Emergency Equipment** - First Aid Kit - Fire Extinguisher - Map to Hospital - Emergency Contact List	Inspect PPE to Ensure it is in adequate condition	All personnel • Site Specific Training – All personnel shall be instructed and attest to the review and understanding of this HASP prior to the commencement of on-site activity. • Periodically, Tailgate Training Sessions will be conducted to review activities in progress, results of site surveys, and upcoming tasks. It is recommended that AHAs be reviewed prior to conducting the identified task. • Complete a Medical Data Sheet Survey License and/or Certification Proof **Decontamination Procedures:** Not required. Good personal hygiene practices are to be employed prior to breaks lunch or other period when hand to mouth contact occurs. This will minimize potential ingestion exposures. Perform a close body inspection to remove ticks and associated insects when exiting unimproved areas (heavy vegetation).

All persons will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training

ACTIVITY HAZARD ANALYSIS (AHA)

Tetra Tech, Inc.

Activity/Work Task: Multi-media sampling activities	Overall Risk Assessment Code (RAC) (Use highest code)					**L**
Project Location: LMC MSA	**Risk Assessment Code (RAC) Matrix**					
Site: Martin State Airport	**Severity**	**Probability**				
Date Prepared: January 2016		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: C. Snyder	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by: J. Carothers, PhD	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (See above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.				**RAC Chart**	
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				**E= Extremely High Risk**	
					H= High Risk	
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				**M= Moderate Risk**	
					L= Low Risk	

JOB STEPS	**HAZARDS**	**CONTROLS**	**RAC**
Site Set Up	1. Inclement weather	1. If electrical storms or inclement weather are in the area, as determined through local forecasting or weather alerts issued, the FOL/SSO will suspend outside activities. 2. The 30-30 rule shall be applied, which is "if a time interval of 30 seconds or less is between lightning and its thunder, go inside (building/vehicle) and stay inside for at least 30 minutes." 3. If no additional lightning and/or thunder is noted within this 30 minutes, work may resume at the FOL/SSO direction. 4. Personnel will be directed to seek suitable shelter that will provide adequate protection from the elements. 5. Lightning threat detection will be coordinated within MCAS Beaufort existing systems.	**L**
	2. Minor cuts abrasions handling equipment and tools	1. Wear cut-resistant gloves when handling items with sharp or rough edges.	**L**

JOB STEPS	HAZARDS	CONTROLS	RAC
	3. Slips, Trips, Falls	1. Clear intended work areas and walking paths of roots, weeds, limbs and other ground hazards. 2. Practice good housekeeping to keep the site clear of obstructions, materials, equipment and other tripping hazards. 3. Ensure that work boots have adequately-aggressive sole design. 4. Use caution when working on uneven and wet ground.	**L**
	4. Insect bites, snake bites, and contact with poisonous plants.	1. Shake out boots before donning. 2. Use insect repellants. • Products containing DEET should be applied to exposed skin. • Products containing Permethrin should be applied to clothing only. • Follow manufacturer's recommendations. 3. Tape up pants leg to work boot joints with duct tape and wear light-colored clothing to better see and remove any insects. 4. Avoid potential nesting areas (brush, deadfall, etc.) where insects or snakes may be present. 5. Perform close body inspections at least daily upon leaving the site.	**L**
Taking groundwater samples using a small battery-operated pump and placing into sample containers	1. Exposure to contaminants of concern	1. Wear surgeon's gloves when handling potentially-contaminated media and samples. 2. Avoid contact with potentially-contaminated media to the extent possible. 3. Follow good decontamination and practice good personal hygiene (hands and face washing) when exiting work area. 4. Hand-to-mouth activities in the work area will be prohibited (eating, drinking, smoking, etc.). 5. Exposure via dermal contact and ingestion represent some limited concern during this task. 6. Air Monitoring PID with 11.7 ev lamp Action Level: • PID Action Level: >1 ppm above BG sustained for for 4 exposures of 5 minutes in the BZ areas in any one work day for VOC's. • Visible Dust employ dust suppression area wetting • Monitoring will be conducted in the breathing zone of the Driller to collect data for the worst case scenario in order to evaluate air emissions from this source point.	**L**
	3. Contact with utilities	1. Inspect for buried and overhead utilities in the vicinity of the sampling location. 2. Verify the location of utility lines in accordance with Tetra Tech SOP Utility Locating and Excavation Clearance.	**L**

JOB STEPS	HAZARDS	CONTROLS	RAC
Soil and sediment sampling (surface and subsurface)	1. Cuts and lacerations – when cutting acetate liners without the proper material handling devices.	1. Always cut away from yourself and others. Do not place items to be cut in your hand or on your knee. 2. Change blades as necessary to maintain a sharp cutting edge as many accidents result dull cutting attachments. 3. Wear cut-resistant gloves (leather or heavy cotton) at least on the non-knife/saw hand, where possible. When cutting acetate liners use the tubing retention tub to secure the tube. 4. Use the knife intended for that purpose. Geoprobe® makes a kit for this purpose.	L
	2. Chemical exposure	1. Wear surgeon's gloves when handling potentially-contaminated media and samples. 2. Avoid contact with potentially-contaminated media to the extent possible. 3. Follow good decontamination and practice good personal hygiene (hands and face washing) when exiting work area. 4. Hand-to-mouth activities in the work area will be prohibited (eating, drinking, smoking, etc.). 5. Exposure via dermal contact and ingestion represent some limited concern during this task. 6. Air Monitoring PID with 11.7 ev lamp Action Level: 7. PID Action Level: >1 ppm above BG sustained for for 4 exposures of 5 minutes in the BZ areas in any one work day for VOC's. 8. Visible Dust employ dust suppression area wetting 9. Monitoring will be conducted in the breathing zone of the Driller to collect data for the worst case scenario in order to evaluate air emissions from this source point.	L
Decontamination:	1. Chemical spread	1. When handling soils and potentially contaminated equipment 2. Wear surgeon's gloves when handling potentially-contaminated media and samples 3. Avoid contact with potentially-contaminated media to the extent possible. 4. These are disposable, change out as necessary to avoid break through. 5. When exiting the exclusion zone, wash the outer gloves to remove any residual contamination. 6. This will also permit disposal in the general refuse.	L

JOB STEPS	HAZARDS	CONTROLS	RAC
		7. Remove gloves, wash hands and face to minimize any potential introduction of contaminants into the body. 8. Leave consumable materials such as cigarettes, snuff chewing tobacco, candies, medications, etc. in the break area to avoid potential contact. 9. Practice good personal hygiene (hands and face washing) when exiting work area, avoiding any hand-to-mouth activities in the work (eating, drinking, smoking, etc.). 10. Practice good housekeeping to avoid the spread of contamination.	

EQUIPMENT	INSPECTION	TRAINING
Peristaltic pump, tubing, sample collection tools and containers (jars, spatulas, spoons, etc.) **Safety Equipment:** Portable eye wash bottle **Monitoring Instruments:** PID (11.7eV)	Visual inspection prior to use by user.	Training/experience in proper sample collection, handling and chain of custody requirements.
Personal Protective Equipment: <u>Minimum</u>: nitrile surgeon's type gloves, safety toe boots, safety glasses **<u>Optional items</u>**: Hardhat, hearing protection. Wear chemical-resistant coveralls (e.g., Tyvek) or aprons and surgeon's nitrile gloves under leather/cotton work gloves. , High-visibility vests when near active traffic areas. Steel toe/shank boots are required when working in areas where there is a danger of foot injuries due to falling or rolling objects or of objects piercing the sole.(provided that the footwear satisfies ANSI Z-41 requirements for protective footwear) shall be used **<u>HTRW</u>**: VOC's, Metals and PCB's	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	OSHA 40 hour HAZWOPER training, plus appropriate 8-hour annual refresher training for the task participants. Supervisors must have completed additional 8 hours of HAZWOPER training. ALSO: Review of AHA during pre-task tailgate safety briefing with the intended task participants. PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in site activities, and will be confirmed by visual observations of worker activities.

I have read and understand this AHA:

Name (Printed)	Signature	Date

ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task: Monitor Gamma Radiation Survey During Intrusive Work	Overall Risk Assessment Code (RAC) (Use highest code)					**M**
Project Location: LMC MSA	**Risk Assessment Code (RAC) Matrix**					
Site: Martin State Airport	**Severity**	**Probability**				
Date Prepared: January 2016		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: C. Snyder	Catastrophic	**E**	**E**	**H**	**H**	**M**
	Critical	**E**	**H**	**H**	**M**	**L**
Reviewed by:	Marginal	**H**	**M**	**M**	**L**	**L**
	Negligible	**M**	**L**	**L**	**L**	**L**

Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each **"Hazard"** with identified safety "Controls" and determine RAC (See above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	**RAC Chart**
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	**E= Extremely High Risk** **H= High Risk**
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	**M= Moderate Risk** **L= Low Risk**

JOB STEPS	HAZARDS	CONTROLS	RAC
Gamma Radiation Survey Survey	1. Radiation Exposure	1. Direct exposure contact will be avoided due to the: • Radiation Protection Plan, TSP and this HASP • Availability of radiation detection equipment.	**L**
	2. Exposure Surveys	1. When excavating or drilling in unknown areas, the instrument range selector switch (if applicable) shall be selected to the highest range and moved down through the lower ranges until the meter indicates on scale per RSO. 2. Always survey a sufficient number of locations to determine average and maximum general area and contact radiation levels. 3. A Ludlum Model-19 or equivalent should be used for performing exposure rate surveys for gamma radiation. The instrument should be operated in accordance with the manufacturer supplied operations manual and any applicable requirements from work specific documents (i.e. work instructions or TSPs). Care should be taken to ensure that the instrument has been allowed to stabilize between individual measurements. 4. When performing a gamma survey, the RCT should:	**L**

JOB STEPS	HAZARDS	CONTROLS	RAC
		• Attempt to determine the source of radiation fields. • Record the highest level as the general area exposure rate. • Perform contact exposure rate measurements with the detector within 1 inch of the surface to be surveyed. • Perform surveys at approximately 1 meter (waist level) from surface to establish posting requirements for the area. 5. Verify the exposure rates of known hot spots.	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Sample collection tools and containers (bags, putty knives scrapers, spatulas, spoons, etc.) **Safety Equipment:** **Monitoring Instruments:** PSPCs, hand-held instruments, Radiation Scaler/Sample Counter and alpha-beta scintillation detectors (See Section 7.1 and 7.2 of this HASP)	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	Radiation Worker, Supervisor and Inspector Initial and Refresher Training as required. OSHA 40 Hazardous Waste Operations and Emergency Response (HAZWOPER) training, plus appropriate 8-hour annual refresher training for the task participants. Supervisors must have completed additional 8 hours of HAZWOPER training. ALSO: Review of AHA during pre-task tailgate safety briefing with the intended task participants. PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' site and 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in site activities, and will be confirmed by visual observations of worker activities. SSO trained in proper calibration, use, and care of air monitoring devices used. This is a general component of 40 hour HAZWOPER training, and SSO must become very familiar with the Operator's Manual for any instrument used.
Personal Protective Equipment: **Minimum**: nitrile surgeon's type gloves, safety toe boots, safety glasses **Optional items**: Hardhat when in overhead hazard areas, hearing protection in high noise areas. If contact with contaminants is likely, wear chemical-resistant coveralls (e.g., Tyvek) or aprons and leather/cotton work gloves over the surgeon's nitrile gloves **HTRW**: Cs-137; Co-60;Sr-90; H-3; Pu-239; Ra-226; Th-232; U-235; U-238		

I have read and understand this AHA:

Name (Printed)	Signature	Date

ATTACHMENT V

EQUIPMENT INSPECTION CHECKLIST FOR DRILL/DPT RIGS

Equipment Inspection Checklist for Drill/DPT Rigs

Company:____ **Unit/Serial No#:________________________________**

Inspection Date: _____/_____/_____ **Time:_______:______** **Equipment Type:______________________________**
(e.g., Drill Rigs Hollow Stem, Mud Rotary, Direct Push, HDD)

Project Name:______________________________________ **Project No#:__________________________________**

Yes	No	NA	Requirement	Comments
			Emergency Stop Devices	
☐	☐	☐	• Emergency Stop Devices (At points of operation)	
☐	☐	☐	• Have all emergency shut offs identified been communicated to the field crew?	
☐	☐	☐	• Has a person been designated as the Emergency Stop Device Operator?	
			Highway Use	
☐	☐	☐	• Cab, mirrors, safety glass?	
☐	☐	☐	• Turn signals, lights, brake lights, etc. (front/rear) for equipment approved for highway use?	
☐	☐	☐	• Seat Belts?	
☐	☐	☐	• Is the equipment equipped with audible back-up alarms and back-up lights?	
☐	☐	☐	• Horn and gauges	
☐	☐	☐	• Brake condition (dynamic, park, etc.)	
☐	☐	☐	• Tires (Tread) or tracks	
☐	☐	☐	• Windshield wipers	
☐	☐	☐	• Exhaust system	
☐	☐	☐	• Steering (standard and emergency)	
☐	☐	☐	• Wheel Chocks?	
☐	☐	☐	• Are tools and material secured to prevent movement during transport? Especially those within the cab?	
☐	☐	☐	• Are there flammables or solvents or other prohibited substances stored within the cab?	
☐	☐	☐	• Are tools or debris in the cab that may adversely influence operation of the vehicle (in and around brakes, clutch, gas pedals)	

Unit/Serial No#:____ **Inspection Date:** ______/_____/_____

Yes	No	NA	Requirement	Comments
☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	Fluid Levels: • Engine oil • Transmission fluid • Brake fluid • Cooling system fluid • Hoses and belts • Hydraulic oil	
☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐	High Pressure Hydraulic Lines • Obvious damage • Operator protected from accidental release • Coupling devices, connectors, retention cables/pins are in good condition and in place	
☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	Mast Condition • Structural components/tubing • Connection points • Pins • Welds • Outriggers • Operational • Plumb (when raised)	
☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐	Hooks • Are the hooks equipped with Safety Latches? • Does it appear that the hook is showing signs of wear in excess of 10% original dimension? • Is there a bend or twist exceeding 10% from the plane of an unbent hook? • Increase in throat opening exceeding 15% from new condition • Excessive nicks and/or gouges • Clips • Number of U-Type (Crosby) Clips (cable size 5/16 – 5/8 = 3 clips minimum) (cable size 3/4 – 1 inch = 4 clips minimum) (cable size 1 1/8 – 1 3/8 inch = 5 clips minimum)	

Unit/Serial No#:____________________________________ **Inspection Date:** _____/_____/_____

Yes	No	NA	Requirement	Comments
			Power cable and/or hoist cable	
☐	☐	☐	• Reduction in Rope diameter π (5/16 wire rope>1/64 reduction nominal size -replace) (3/8 to 1/2 wire rope>1/32 reduction nominal size-replace) (9/16 to 3/4 wire rope>3/64 reduction nominal size-replace)	
☐	☐	☐	• Number of broken wires (6 randomly broken wires in one rope lay) (3 broken wires in one strand)	
☐	☐	☐	• Number of wire rope wraps left on the Running Drum at nominal use ($\geq$3 required)	
☐	☐	☐	- Lead (primary) sheave is centered on the running drum	
☐	☐	☐	• Lubrication of wire rope (adequate?)	
☐	☐	☐	• Kinks, bends – Flattened to > 50% diameter	
			Hemp/Fiber rope (Cathead/Split Spoon Hammer)	
☐	☐	☐	• Minimum ¾; maximum 1 inch rope diameter (Inspect for physical damage)	
☐	☐	☐	• Rope to hammer is securely fastened	
			Safety Guards –	
☐	☐	☐	• Around rotating apparatus (belts, pulleys, sprockets, spindles, drums, flywheels, chains) all points of operations protected from accidental contact?	
☐	☐	☐	• Hot pipes and surfaces exposed to accidental contact?	
☐	☐	☐	• High pressure lines	
☐	☐	☐	• Nip/pinch points	
			Operator Qualifications	
☐	☐	☐	• Does the operator have proper licensing where applicable, (e.g., CDL)?	
☐	☐	☐	• Does the operator, understand the equipment's operating instructions?	
☐	☐	☐	• Is the operator experienced with this equipment?	
☐	☐	☐	• Is the operator 21 years of age or more?	

Unit/Serial No#:_______________________________________ **Inspection Date: ______/______/______**

Yes	No	NA	Requirement	Comments
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	PPE Required for Drill Rig Exclusion Zone • Hardhat • Safety glasses • Work gloves • Chemical resistant gloves________________________________ • Steel toed Work Boots • Chemical resistant Boot Covers • Apron • Coveralls Tyvek, Saranex, cotton)____ ____ ____ ____	
☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐	Other Hazards • Excessive Noise Levels? ____________dBA • Chemical hazards (Drilling supplies - Sand, bentonite, grout, fuel, etc.) - SDS available? • Will On-site fueling occur - Safety cans available? - Fire extinguisher (Type/Rating -__________ _)	

Approved for Use ☐ Yes ☐ No ☐ See Comments

____ ____
Site Health and Safety Officer Operator

ATTACHMENT VI

TETRA TECH RADIATION AND CONTAMINATION SURVEY STANDARD OPERATING PROCEDURE

Standard Operating Procedure

RADIATION AND CONTAMINATION SURVEYS

SOP 006

Revision 0

Prepared By:

	3/16/2012
Project Health Physicist	Date

Approved By:

	3/16/2012
Project Radiation Safety Officer	Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
March 16, 2012	0	L. Bailey	Final Issue	All

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this procedure is to specify methods and requirements for radiological surveys and documentation of acquired data.

Adherence to this procedure will provide reasonable assurance that the surveys performed have reproducible results. This guidance for control of radiation exposures provided in this procedure is in accordance with the as low as reasonably achievable (ALARA) philosophy.

This procedure will be used by Tetra Tech (Tt) personnel and its subcontractors to perform radiation and contamination surveys.

2.0 SCOPE

This procedure shall be implemented by Tt staff and subcontractor personnel when conducting radiation or contamination surveys.

Subcontractors may use their procedures for conditions or activities not covered by this procedure following approval by Tt and the Radiological Affairs Support Office (RASO).

3.0 MAINTENANCE

The Project Health Physicist (PHP) is designated the procedure owner and is responsible for updating this procedure.

4.0 RESPONSIBILITIES

The following personnel (or their qualified designee) will be directly involved with the procedures discussed herein.

Project Radiation Safety Officer – The PRSO has the authority to control all radiation safety onsite. All changes to procedures require approval by the PRSO. All incidents/notifications shall be reported to the PRSO.

Project Health Physicist - The PHP is responsible for the overall implementation and compliance with this procedure during all project operations. The PHP or designee shall ensure that personnel are adhering to the requirements of this procedure. The PHP or designee shall review and approve documentation generated by this procedure.

Site Project Manager - The Site Project Manager (SPM), if applicable, is responsible for ensuring that personnel performing the tasks required by this procedure are properly assigned. The SPM is responsible for the training of personnel working with radioactive materials. The SPM is responsible for ensuring that personnel conducting radiation and contamination surveys are familiar with the requirements of this SOP and have access to a copy of the Radiation Work Permits (RWPs). Survey documentation will be reviewed SPM or designee.

Site Supervisor - The Site Supervisor (SS), if applicable, is responsible for assisting in the assignment of personnel that will perform the tasks required by this procedure. The SS is responsible for the control of radioactive material, coverage of radiation workers, and to ensure that personnel under their cognizance observe proper precautions.

Radiological Control Technician - The Radiological Control Technician (RCT) shall be responsible for the performance of the requirements of this procedure and documentation of work performed.

5.0 DEFINITIONS AND ABBREVIATIONS

Activity - The rate of disintegration (transformation) or decay of radioactive material. The units of activity for the purpose of this procedure are disintegrations per minute (dpm) for loose and fixed surface contamination, picocuries per gram (pCi/g) for soil, or microcuries per milliliter (μCi/mL) for airborne contamination.

Contamination - Deposition of radioactive material in any place it is not desired. Contamination may be due to the presence of alpha particle, beta particle or gamma ray emitting radionuclides.

Exposure Rate - The amount of radiation (exposure) delivered at a given point per unit time. Typical units are microroentgen per hour (μR/hr).

Fixed Contamination - Radioactive contamination that is not readily removed from a surface by applying light to moderate pressure when wiping with a paper or cloth disk swipe, or masslin.

Minimum Detectable Activity (MDA) - For purposes of this procedure, MDA for removable radioactive contamination is defined as the smallest amount of sample activity that will yield a net count with a 95 percent confidence level based upon the background count rate of the laboratory counting instrument used.

Minimum Detectable Concentration (MDC) - For purposes of this procedure, MDC is the *a priori* activity level that a specific instrument and technique can be expected to detect 95 percent of the time for portable survey instruments.

Radiation Work Permit (RWP) - A document generated in accordance with SOP 002 to provide:

- A description and scope of the work to be performed
- The existing radiological conditions in the work area
- The radiological limits of applicability for the RWP, if radiation levels exceed limits then a new RWP or a modification to the existing RWP must be made
- The protective measures to be employed during the work to protect the worker(s)
- The period of time the RWP is valid
- Special instructions to workers and RCTs during the course of work
- The proper approvals required to begin work

Radiologically Controlled Area (RCA) – An area containing radioactive materials (in excess of the levels provided in Table 1 of Standard Operating Procedure SOP 010, *Radiologically Controlled Areas – Posting and Access Control*) to which access is controlled to protect individuals from exposure to contamination and ionizing radiation.

Removable Surface Contamination - Radioactive contamination that is readily removed from a surface by applying light to moderate pressure when wiping with a paper or cloth disk swipe, or masslin.

Uncontrolled Area - An uncontrolled area is any area where access is not controlled for radiological purposes.

6.0 PROCEDURE DETAILS

6.1 GENERAL

Radiation surveys are performed to identify radiation areas, measure the exposure rate, and assess the intensity and shape of those areas to determine control requirements at the worksite.

Contamination surveys are conducted to detect loose surface contamination and fixed contamination. Loose surface contamination is normally detected indirectly by a swipe sample or wipe performed on the item or surface of interest. Fixed contamination levels are measured directly.

Survey results, locations, and any unusual conditions shall be documented and described on Attachments 1 and 2, Radiation/Contamination Survey Form and Radiation/Contamination Survey Supplement, respectively.

When performing surveys, express readings as the actual observed number. Do not report “<MDA” or “<Bkg”. When background corrections are made, results may be expressed as negative numbers as applicable.

6.1.1 Discussion

Radiation and contamination surveys shall be performed on an as-needed basis. The need for performing a survey is identified by, but not limited to the following conditions:

- An RWP is needed to perform an approved job.
- A condition exists where radiological data are needed.
- An investigation is required due to abnormal conditions or indications.
- An ongoing job requires a survey to update radiological postings and/or an RWP.
- As required to support *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM; NUREG-1575) based survey activities.

6.1.2 Planning and Prerequisites

Instruments used to perform radiation and contamination surveys shall be operated in accordance with their operation procedure. Steps to be completed during the planning phase include the following:

- Obtain and review any site-specific survey plans [such as a Task-specific Plan (TSP), work instruction, and time-critical removal action (TCRA) Work Plan] and previous surveys performed in the area.
- Obtain appropriate survey instruments and prepare the instruments for use.
- Obtain the necessary forms, swipes, and protective clothing that will be used during the survey.

Prior to entering an area to perform a survey, each radiation detection instrument shall be:

- Battery Checked.
- Checked for obvious physical damage.
- Quantitatively response-checked daily, prior to use.
- Checked to ensure that the instrument calibration is current.

If any of the above conditions are unsatisfactory, the instrument shall be tagged out of service and not used.

6.2 PROCEDURE PROCESS

6.2.1 Exposure Surveys

When entering posted or suspected high radiation areas, or unknown areas, the instrument range selector switch (if applicable) shall be selected to the highest range and moved down through the lower ranges until the meter indicates on scale.

Always survey a sufficient number of locations to determine average and maximum general area and contact radiation levels.

A Ludlum Model-19 or equivalent should be used for performing exposure rate surveys for gamma radiation. The instrument should be operated in accordance with the manufacturer supplied operations manual and any applicable requirements from work specific documents (i.e. work instructions or TSPs). Care should be taken to ensure that the instrument has been allowed to stabilize between individual measurements.

When performing general area exposure rate surveys, the RCT should:

- Attempt to determine the source of radiation fields.
- Record the highest level as the general area exposure rate.
- Perform contact exposure rate measurements with the detector within 1 inch of the surface to be surveyed.
- Perform surveys at approximately 1 meter (waist level) from surface to establish posting requirements for the area.
- Verify the exposure rates of known hot spots.

6.2.2 Removable Contamination Surveys

6.2.2.1 Removable Contamination Swipe

The following guidance shall be used unless an approved site-specific survey/work instruction directs otherwise. Specific survey instructions will be prepared and given in work specific documents (i.e. work instructions or TSPs) for radioisotopes requiring unusual sampling techniques, such as tritium (^3H).

6.2.2.2 Swipe Surveys

1. Label or number swipes, as necessary, to identify each swipe.
2. Wipe the swipes over approximately 100 square centimeters (cm^2) (16 square inches) of the surface to be sampled.
3. Apply moderate pressure.
4. Exercise care on rough surfaces so as not to tear the swipes.
5. Exercise care on wet surfaces so as not to degrade the swipes. Ensure that surfaces are not submerged in water and that cloth swipes or similar are used on wet/damp surfaces.

When surveying an area:

1. Obtain swipes from sample points, which are representative of the average and maximum contamination levels in the area, as identified during preliminary surveys. These areas could include:
   a. Areas of high traffic
   b. On and under benches or tables
   c. Beneath piping and components
   d. On accessible wall surfaces
   e. On piping and significant components
   f. Near drains, sumps and low spots
2. Swipe floor and component surfaces, which display evidence of (potentially) contaminated water leakage.
3. Ensure contamination is not spread to clean areas when obtaining swipes.

When surveying equipment:

1. Obtain swipes on large surfaces.
2. Obtain swipes in cracks or crevices where contamination may have settled.
3. Obtain swipes on openings to internal surfaces.
4. Handle swipes in a manner that will prevent cross-contamination such as by placing each swipe in a separate envelope.

6.2.2.3 Counting Swipes

A Ludlum Model 2929 scaler with a Model 43-10-1 ZnS(Ag) scintillation probe (or equivalent) will normally be used for counting swipes.

Swipes will be counted in the field with a portable instrument. If high levels are identified the counting lab will be notified.

1. Count the swipes in accordance with the operating procedure for the instrument.
2. Record swipe results in dpm/100 cm^2.
3. Store/archive used swipes as radioactive material until disposal is approved by RASO.

6.2.2.4 Removable Contamination Surveys Using Large-area Wipes (LAWs)

Large-area contamination surveys using LAWs are appropriate for monitoring the radiological cleanliness of non-contaminated areas or equipment, to track area decontamination progress, or for initially verifying that surfaces are free from contamination.

There are no specific requirements concerning the amount of area to be wiped when performing LAWs. The area wiped should be determined based on the use of the survey data and the dust loading of the LAW material.

6.2.2.5 Performing LAWs

Use masslin, oil-impregnated cloths, or equivalent media to perform LAWs. Select an appropriate collection material and method based upon the survey conditions such as wet surfaces, rough surfaces, heavily soiled area and oily and greasy surfaces.

1. Label or number the cloths, as necessary, to assist in determining the location of the sample.
2. Determine the size of the area to be sampled based on the results of the survey.
3. Wipe the collection media over the surface using moderate pressure by hand, with a masslin mop, or other approved techniques.

6.2.2.6 Evaluating LAWs

1. Allow wet swipe to dry prior to counting.
2. Scan the swipe with an appropriate field instrument (2221/43-68, or equivalent), in an area with a low background.
3. Hold the detector within ½ inch or less above the swipe and move the detector over the swipe at a maximum rate of 1 inch per second.
4. If any indication of an increased count rate is noted, pause to allow the meter reading to stabilize.
5. If the swipe reading is indistinguishable from background, consider the surveyed surface to be free from contamination. If the LAW reading is greater, conduct further surveys, using swipes over a 100 cm^2 area, to isolate the boundaries of the contamination.
6. Dispose of used LAW media as radioactive waste if there is any detectable activity observed above background.

6.2.3 SURVEYS FOR FIXED ALPHA/BETA CONTAMINATION

Fixed contamination surveys are used to obtain indications of fixed contamination levels on surface areas, pieces of equipment, or tools for characterization and/or release surveys. Fixed contamination surveys are also performed to assess if residual contamination is present greater than the release criteria for the radionuclide(s) of concern.

A Ludlum Model-2221/43-68 or equivalent should be used for performing fixed contamination surveys for alpha and beta radiation.

6.2.3.1 Scan Surveys

1. When surveying for fixed alpha/beta contamination, the probe should be held within 1/4 inch or less from the surface being surveyed. The movement rate of the detector probe should be 1 inch per second or slower.
2. Whenever practical, 100 percent of accessible areas being surveyed should be direct scan surveyed, unless the applicable work planning document indicates otherwise.
3. Scan ranges are documented as the range from the lowest measurement to the highest measurement observed.

6.2.3.2 Static Surveys

1. Count time for conducting static measurements will be dependent upon the isotope of concern and the MDA for the instrument being used.
2. Static measurements should be performed at regions showing the highest indicated reading during the scan survey or as required by a work specific document (i.e. TSP or work instruction) or frequently enough to ensure the detection of residual activity.
3. When taking a static measurement for fixed alpha/beta contamination, the probe should be held within 1/4 inch or less from the surface being surveyed.
4. Results should be reported in units of net counts per minute (cpm) above background or dpm/100 cm^2.

The following formula should be used for converting direct probe readings from cpm to dpm/100 cm^2:

$$A_S = \frac{R_{S+B} - R_B}{\varepsilon_i \varepsilon_S \frac{W_A}{100\,cm^2}}$$

where,

A_S = total surface activity (dpm/100 cm^2)
R_{S+B} = the gross count rate of the measurement in cpm,
R_B = the background count rate in cpm
ε_i = the instrument efficiency (counts per particle)
ε_S = the contaminated surface efficiency (particles per disintegration)

W_A = the physical area of the detector window (cm^2)

In the absence of experimentally determined surface efficiencies, ISO-7503-1 and NUREG-1507, provide conservative recommendations for surface efficiencies. ISO-7503-1, recommends a surface efficiency of 0.25 for alpha emitters. NUREG-1507 provides surface efficiencies based on studies performed primarily at Oak Ridge Institute for Science and Education (ORISE). A surface efficiency of 0.25 will be used for alpha/beta emitters.

6.2.4 GAMMA SURVEYS

A Ludlum Model 12 or equivalent should be used for gamma radiation surveys.

A single detector or an array of detectors may be used to perform gamma scans.

6.2.4.1 Scan Surveys

1. Set the audio response switch to the “on” position.
2. If a single detector is used, traverse a path at a maximum speed of approximately 0.5 meters per second and slowly move the detector assembly in a serpentine (S-shaped) pattern, while maintaining the detector approximately 10 centimeters (cm) (4 inches) from the area being surveyed.
3. If a detector array is used, it will be pushed or pulled in a straight line with the detector centers positioned approximately 30 cm apart.
4. Scan ranges should be recorded from the lowest reading to the highest reading noted.
5. If data logging is being performed, the scan data will be collected at the time interval necessary to obtain the measurements required for the survey.
6. Locations of radiation levels greater than 3 standard deviations above background shall be marked and identified for further investigations.
7. Measurement results are recorded in cpm.

6.2.4.2 Static Surveys

1. Static gamma measurements require positioning the detector assembly approximately 10 cm (4 inches) above the surface and completing a stationary 60-second survey.
2. Static measurements should be performed as required in the applicable work planning document or frequently enough to ensure the detection of residual activity.
3. Measurement results are recorded in cpm.

6.2.5 Routine Radiological Surveys

6.2.5.1 Frequency Requirements for Routine Surveys

Appropriate routine radiological surveys shall be performed at the following frequencies unless directed otherwise by the applicable work planning document or the PHP or designee.

Exposure Rate Surveys

Surveys should be performed as frequently as necessary to ensure that radiological postings accurately reflect actual conditions during activities that have the potential to change exposure rates. Additionally, radiation surveys should be performed under the following circumstances:

- Upon initial entry into potential radiation areas after extended periods of closure.
- Daily, in the vicinity of contamination concentration points on operating high-efficiency particulate air (HEPA)-filtered ventilation units.
- Weekly, in occupied office spaces located inside radiologically controlled areas.
- Weekly, or upon entry if entries are less frequent than weekly, inside radiation areas and radioactive material storage areas.
- Weekly, along radiation area boundaries to ensure that the radiation areas do not extend beyond the posted boundaries.

Contamination Surveys

- Daily when in use, or once per shift in high-use situations at contamination control points, radiological change areas, or step-off pads.
- Daily, in count rooms and laboratories that are used to analyze potentially contaminated samples.
- Daily, in office spaces located inside radiologically controlled areas.
- Daily, in lunchrooms, eating areas, locker rooms and shower areas adjacent to radiologically controlled areas.
- Weekly, for all designated lunchrooms and offices for the project.
- Weekly, or upon entry if entries are less frequent, in the areas where radioactive materials are handled or stored.
- Weekly, or upon entry if entries are less frequent, in posted contamination areas.

6.2.5.2 Identifying and Scheduling Routine Radiological Surveys

The PHP or designee shall identify and schedule routine surveys as required by the radiological conditions and work activities.

Routine survey schedules shall be developed using a standard system for designating surveys as follows:

Frequency of survey:

Daily	D
Weekly	W
Monthly	M
Quarterly	Q
Semiannually	S
Annually	A
Upon Entry	U

Routine survey schedules shall be submitted to and approved by the PHP or designee.

Routine survey tracking forms should be prepared using the approved routine survey schedules.

Changes to any routine survey schedule shall be submitted to and approved by the PHP, or designee.

6.2.5.3 Survey Log

Completion of surveys shall be documented using the assigned survey log (see Attachment 3) for the project. This is not limited to initial surveys but includes routine surveys. Each survey shall be assigned a unique tracking number consistent with the practices of the project.

6.2.5.4 Performance of Routine Surveys

RCTs shall perform routine surveys in accordance with the RWP and the other applicable procedures.

Upon completion of a routine survey, the RCT shall initial the appropriate Survey Log.

6.2.5.5 Periodic Evaluation of Routine Surveys

Routine survey schedules (see Attachment 4) shall be reviewed and updated periodically to ensure that all areas within the project boundaries are receiving appropriate routine survey coverage.

Changes of conditions within the project area will be reported to the PHP or designee and may require a modification of the routine radiological survey schedule and/or RWP.

6.2.5.6 Management Notification

The PHP shall be notified, in writing by the SPM, of any failure to complete a routine survey as scheduled. The missed survey will be completed as soon as possible after the discovery that it was missed.

7.0 RECORDS

Radiation/Contamination Survey Form

Radiation/Contamination Survey Supplement

Survey Log

Routine Survey Schedule

8.0 REFERENCES

Number	***Title***
10 CFR 20	*Standards for Protection Against Radiation*
ISO-7503-1	*Evaluation of Surface Contamination*
NUREG-1507	*Minimum Detectable Concentration/Activities for Typical Radiation Survey Instruments for Various Contaminants and Field Conditions*
NUREG-1575	*Multi-Agency Radiation Survey and Site Investigation Manual*
SOP 002	*Issue and Use of Radiation Work Permits*

9.0 ATTACHMENTS

Forms provided in this section illustrate the minimum requirements for their respective subject matter. Alternative documents or electronic data logging may be used providing the information is presented in a clear and concise manner and the content meets or exceeds the information required to complete these documents.

Attachment 1, Radiation/Contamination Survey Form

Attachment 2, Radiation/Contamination Survey Supplement

Attachment 3, Survey Log

Attachment 4, Routine Survey Schedule

ATTACHMENT 1 – RADIATION/CONTAMINATION SURVEY FORM

DATE: TIME:	INSTRUMENTATION USED					
SURVEY NUMBER:	**Model Inst/Det.**	**Serial Number**	**Calibration Due Date**	**% Efficiency**	**MDC/MDA ($dpm/100cm^2$)**	**Background ($dpm/100cm^2$)**
LOCATION:						
SURVEYOR:						
REVIEWED BY:						
PHP/SPM:						

Isotopes of Concern:

Description or drawing:

Routine (Daily / Weekly / Monthly) ☐ Non-routine ☐

All radiation readings in μr/hr unless otherwise noted.
\#….denotes swipe location or fixed α/β readings.
\#…….denotes G/A radiation readings.
\# / #…denotes contact / 1 meter radiation readings.
*………denotes highest radiation reading on contact.
Δ……...denotes static location.

ATTACHMENT 2 - RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER:									
SURVEYOR:				LOCATION:					
Location	**Exposure Rate (μR/hr)**		**Fixed + Removable**			**Removable**		**Comments**
	Contact	**1 Meter**	**Gamma (cpm)**	**Alpha dpm/probe**	**Beta/Gamma dpm/probe**	**Alpha dpm/100cm^2**	**Beta/Gamma dpm/100cm^2**	
1								
2								
3								
4								
5								
6								
7								
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22								
23								
24								
25								

Reviewer	Date/Time:	PHP/SPM	Date/Time:

ATTACHMENT 3 – SURVEY LOG

Project: **Location:**

Survey Number			Date	Survey Description	Surveyor (Init.)
Project	#	Year			

Reviewed/Approved By: ______________________________ / __________

PHP/SPM Date

ATTACHMENT 4 – ROUTINE SURVEY SCHEDULE

Survey Description	January	February	March	April	May	June	July	August	September	October	November	December
	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init
	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	#	#	#	#	#	#	#	#	#	#	#	#
	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init
	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	#	#	#	#	#	#	#	#	#	#	#	#
	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init
	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	#	#	#	#	#	#	#	#	#	#	#	#
	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init
	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	#	#	#	#	#	#	#	#	#	#	#	#
	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init	Surveyor Init
	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	#	#	#	#	#	#	#	#	#	#	#	#

Prepared/Submitted By: ______________________________ / ________
Technician Date

Reviewed/Approved By: ______________________________ / ________
PHP/SPM Date

ATTACHMENT VII

TETRA TECH RADIOLOGICAL CLOTHING SELECTION, MONITORING, AND DECONTAMINATION

Standard Operating Procedure

RADIOLOGICAL PROTECTIVE CLOTHING SELECTION, MONITORING AND DECONTAMINATION

SOP 022

Revision 0

Prepared By:

Project Health Physicist	3/16/2012 Date

Approved By:

Project Radiation Safety Officer	3/16/2012 Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
March 16, 2012	0	L. Bailey	Final Issue	All

TABLE OF CONTENTS

1.0 PURPOSE

This procedure provides the methods for donning, wearing, and removing protective clothing while working within, accessing or leaving known or suspected areas with radioactive contamination.

2.0 SCOPE

This procedure will be used by Tetra Tech (Tt) personnel and its subcontractors while performing activities in known or suspected areas with radioactive contamination.

3.0 MAINTENANCE

The Project Health Physicist (PHP) maintains and is responsible for updating this procedure.

4.0 RESPONSIBILITIES

The following personnel (or their qualified designee) will be directly involved with the procedures discussed herein.

Project Radiation Safety Officer – The PRSO has the authority to control all radiation safety onsite. All changes to procedures require approval by the PRSO. All incidents/notifications shall be reported to the PRSO.

Project Health Physicist – The PHP is responsible for the overall implementation and compliance with this procedure during all project operations. The PHP or designee shall ensure that personnel are adhering to the requirements of this procedure. The PHP or designee shall review and approve documentation generated by this procedure.

Site Project Manager – The Site Project Manager (SPM), if applicable, is responsible the overall implementation and compliance with this procedure during all project operations. The SPM is responsible for ensuring that personnel assigned tasks involving access to radiological controlled areas (RCAs) are adequately trained in the use of protective clothing, are familiar with the requirements of this SOP, and have access to a copy of the associated Radiation Work Permits (RWPs).

Site Supervisor – The Site Supervisor (SS), if applicable, is responsible for the control of radioactive material, coverage of radiation workers, and assuring that personnel under their cognizance observe proper precautions. Documentation required by this procedure will be reviewed by the SS, or designee.

Radiological Control Technician – The Radiological Control Technician (RCT) shall be responsible for the performance of the requirements of this procedure and documentation of work performed.

5.0 DEFINITIONS AND ABBREVIATIONS

Contaminated Area – Any area where removable surface contamination levels exceed the following limits:

EQUIPMENT AND MATERIAL SURFACE CONTAMINATION LIMITS

Radionuclide	Removable[1] (dpm/100 cm^2)	Fixed[1] (dpm/100 cm^2)
Alpha	20 α	100 α
Beta (Strontium-90)	200 β^-	1,000 β^-
Beta / Gamma	1,000 β^-, γ	5,000 β^-,γ

Notes:

[1] Limits for equipment and materials based on Regulatory Guide 1.86 (AEC, 1974)
AEC – Atomic Energy Commission
cm^2 – square centimeters
dpm – disintegrations per minute

Hot Particle – A discrete, minute, fragment of radioactive material.

Radiologically Controlled Area (RCA) – An area containing radioactive materials to which access is controlled to protect individuals from exposure to contamination and ionizing radiation.

6.0 PROCEDURE DETAILS

6.1 SELECTION OF PROTECTIVE CLOTHING

The following factors should be considered when selecting protective clothing (PC):

- The levels and types of radiological material present or expected in the work area.
- The presence of chemical hazards.
- The base in which the contamination is carried (dry, wet, oily).
- The work to be performed or work in progress.

- The location of the contamination (e.g. floor, walls, overhead, air handling systems, sewer systems).
- The physical configuration of the work area.
- Environmental conditions such as heat and humidity.
- Exposure situation (vapor, pressured splash, liquid splash, intermittent liquid contact, and continuous liquid contact).
- Toxicity of the radioactive materials and/or chemical(s) (ability to permeate the skin and systemic toxicity).
- Physical properties of the contaminant (vapor pressure, molecular weight, and polarity).
- Functional requirements of the task (dexterity, thermal protection, fire protection, and mechanical durability requirements).

Table 6-1 provides guidance for the selection of protective clothing when radiological hazards are present or suspected.

TABLE 6-1

GUIDE FOR THE SELECTION OF RADIOLOGICAL PROTECTIVE CLOTHING

Removable Contamination Levels	Clothing for Access Only <u>No Work *</u>	Clothing for Work or Access During Work *
General contamination levels < 1000 dpm/100 cm^2	Level D PPE	Level D PPE
General contamination levels > 1000 dpm/100 cm^2, but ≤ 10,000 dpm/100 cm^2	Glove liners Gloves Booties, cloth or PVC Tyvek Rubber shoe covers**	Glove liners Gloves Booties, cloth or PVC Tyvek Rubber shoe covers**
General contamination levels > 10,000 dpm/ 100 cm^2, but ≤ 100,000 dpm/100 cm^2 .	Glove liners Gloves Booties, cloth or PVC Tyvek Cap (or hood) Rubber shoe covers**	Glove liners Gloves Booties, cloth or PVC Tyvek Cap (optional) Hood Rubber shoe covers**
General contamination levels > 100,000 dpm/100 cm^2 .	Glove liners Gloves (2 pair) Booties, cloth or PVC Tyvek Cap (optional) Hood Rubber shoe covers**	Glove liners Gloves (2 pair) Booties (2 pair), cloth or PVC Tyvek (2 pair) Cap Hood Rubber shoe covers**

Notes:

* Plastics or partial plastics may be required anytime water or liquid chemicals are present, such as when handling wet components.

** Composition of Rubber shoe covers will be selected based on work area conditions and presence of any chemical hazards.

cm^2 – square centimeters
dpm – disintegration per minute
PPE – personal protective clothing
PVC – polyvinyl chloride

The guidelines specified in Table 6-1 for protective clothing selection may be modified under unusual circumstances. The following are examples:

- Wet areas - Where splashing water or spray is present, use rain suits in addition to the protective clothing listed in Table 6-1. A second set of coveralls may not be necessary when a rain suit is worn.
- Standing water - In addition to the clothing requirements for wet areas, use hip boots or waders for deep standing water areas.
- Face shields – Consider for use when there is significant beta radiation or a likelihood of water splashing and respirators are not required.
- High temperature areas - Consult with the SPM and Site Safety Officer (SSO).

Actual requirements will be specified in the RWP.

6.2 PROCEDURE PROCESS

6.2.1 DONNING PROTECTIVE CLOTHING

1. Select the protective clothing specified on the RWP.
2. Inspect the clothing for holes, tears, or other indications of damage. If damaged, remove protective clothing from service.
3. Put on any additional required special dosimetry (for example, finger rings) prior to donning protective clothing.
4. Place dosimetry, if worn, in the upper body area on interior portion of the breast tab with the window of the dosimeter facing out. When Tyvek is worn that does not have a breast tab or pocket, dosimetry should be attached per the direction of the SPM, or designee.
    - The dosimeter shall not be worn inside clothing or placed in pockets if exposure of bare skin to beta radiation is expected.
5. If a respirator is specified on the RWP, then:
    - Ensure that any required surgeons cap or hood is situated such that it will not interfere with the respirator face to facepiece seal area.
    - Don the respirator.
    - Don the hood if required, allowing it to overlap the rubber around the lens of the face piece and fall over the shoulder.
    - If required, tape the hood to the respirator and to the coveralls.
    - Ensure that any required hood is slack enough around the shoulders to allow for full head movement.
6. Don rubber gloves.

- More than one pair of rubber gloves may be required for certain jobs.
- Tape the innermost pair of rubber gloves to the coverall sleeves.
- Leather work gloves may be substituted for outer rubber gloves on some jobs as specified by the corresponding RWP.

7. If specified on the RWP, then don additional PPE as required.

6.2.2 Removal of Protective Clothing

1. Remove any tape and place in the designated collection receptacle.
2. Remove outer gloves, if worn.
3. If worn remove the hood and place it in the designated collection receptacle.
4. If worn, then remove respirator.
5. Remove dosimetry if worn and place on the final step-off-pad.
6. Remove coveralls by peeling off inside out and rolling downward over the shoes or inner booties.
7. Carefully place coveralls in the designated collection receptacle.

> **CAUTION**: Pushing clothing or trash into an already full collection container to compress the contents is forbidden as the act can result in the potential for airborne radioactivity.

8. Perform a personal self frisk, or be frisked by an RCT, in accordance with corresponding RWP requirements and check dosimetry, if worn.

The sequence for protective clothing removal may vary from that described above:

- At the discretion of the RCT providing job coverage.
- As designated on the assigned RWP.
- Dependent upon radiological and hazardous material conditions encountered during the work evolution.

6.2.3 Monitoring

6.2.3.1 Exit Surveys

1. Use the portable instrument staged for the area of concern, which should have both a visual and an audible response.

2. Ensure that the instrument is set on slow response, if available, and operating with an audible response.
3. Verify that the instrument is operational on the lowest scale and that the area background count rate is acceptable.
4. Hold the detector with the window at approximately ½ inch from the surface being monitored.
5. Move the detector over the surface being monitored at a rate not to exceed 2 to 3 inches per second.
6. If an increase in the audible response is noted, then cease detector movement and allow the meter 5 to 10 seconds to stabilize.
7. Pause (approximately 5 seconds) at the nose and mouth area to check for indications of inhalation/ingestion of radioactive material.
8. Pay particular attention to hands, feet (shoes), elbows, knees, or other areas with a high potential for contamination.
9. If no contamination can be detected as indicated by an alarm or by an audible or visual response distinguishable from background, then exit the area.
10. If an audible or visual response distinguishable from background is noted, then notify the RCT.
11. Remain in the area until a RCT arrives to provide assistance.
12. If personnel are found to be contaminated, proceed to the procedures outlined in Section 6.2.3.2.

6.2.3.2 Contaminated Personnel

1. Notify the SPM or SS of any individual with known or suspected contamination.
2. If the contamination is on a personal article of clothing, then perform the following:
    - Survey the inside surface(s) which was against the skin.
    - Verify that no contamination was transferred to the skin.
3. If the contamination is on the skin, then determine if the contamination is in the form of a hot particle.
4. If the contamination is a hot particle, then:
    - Quickly evaluate the particle.
        - Particle size
        - Radiation type
        - Visible characteristics
    - Attempt to collect and retain the particle for subsequent evaluation.

- Decontaminate the individual in accordance with Section 6.2.4.

5. If the contamination is not a particle, then:
   - Evaluate the contamination levels.
   - Decontaminate the individual in accordance with Section 6.2.4.
6. Complete the applicable parts of the Personnel Contamination Report (Attachment 1).

6.2.4 PERSONNEL DECONTAMINATION

> **NOTE**: First aid measures take precedence over decontamination efforts. The SS shall request support from qualified medical personnel when an injured person requires decontamination.

1. Perform personnel decontamination in a manner that prevents the spread of contamination to other body parts or the ingestion or inhalation of radioactive material.
2. Take appropriate precautions to minimize the spread of contamination when proceeding from the control point or step-off pad to the decontamination area.
3. Personnel will not be released if detectable skin contamination is present unless authorized by the PHP or designee.
4. When performing skin decontamination:
   - Exercise care to avoid damaging the skin.
   - If skin irritation becomes apparent, then discontinue the decontamination and notify the SPM and PHP.
   - Record results after each decontamination attempt.
   - Indicate the method of decontamination used.
   - Decontamination of ears, eyes and mouth shall be limited to damp swabs, water or saline solution rinses conducted by the individual. Further decontamination shall be performed under the direction of qualified medical personnel.
   - Decontamination of nasal passages shall be limited to repeated nose blowing by the individual. Supplemental nasal irrigations shall be performed under the direction of qualified medical personnel, as required.
   - Use of decontamination processes or materials other than those listed in Table 6-2 will only be performed under the specific direction of qualified medical personnel.

- Immediately report incidents of individual contamination to the SPM and PHP.
- Note the final survey results and time of survey.
- Record the area of the skin contaminated in cm^2 on Attachment 1.
- For contamination distributed over an area greater than or equal to the area of the probe, the measured activity may be assumed to be distributed over the probe area (area of typical pancake probe is 15.5 cm^2).
- If the area of contamination is less than the area of the probe but greater than 1 cm^2, the actual area of the activity must be determined.
- If the contamination area is less than or equal to 1 cm^2, assume an area of 1 cm^2.
- When skin decontamination has been successfully completed, obtain the information needed to complete the Personnel Contamination Report.
- Complete the applicable parts of the Personnel Contamination Report (Attachment 1).

TABLE 6-2

PERSONNEL DECONTAMINATION METHODS

METHOD	EFFECTIVE FOR	INSTRUCTIONS
Masking Tape	Dry contamination, Hot particles	Apply tape to skin by lightly patting. Remove carefully.
Waterless Hand Cleaner	All skin contamination	Apply to affected area and allow it to melt onto the skin. Remove with cotton or soft disposable towel.
Soap and Tepid Water	All skin contamination except tritium	Wash area with soap and lukewarm water. Repeat until further attempts do not reduce the level. A cloth or surgical hand brush may be used with moderate pressure.
Soap and Cool Water	Tritium contamination	Wash area with soap and cool water. Repeat until further attempts do not reduce the level. A cloth may be used with moderate pressure.
Carbonated Water	All skin contamination	Apply to affected area with cotton or soft disposable towel and wipe with dry towel.
Cornmeal Detergent Paste	All skin contamination	Mix cornmeal and powder detergent in equal parts with enough water to form a paste. Rub onto affected area for 5 minutes. Remove with cotton or disposable towel. Rinse skin.
Shampoo	Hair contamination	Wash hair and rinse. Repeat as necessary.
Parafilm	All particulate contamination	Apply to affected area of skin. Remove.
Sweating	All skin contaminations	Cover affected area with impermeable cover (plastic, glove, Parafilm) to cause sweating. Remove after sweating has occurred and wipe area.

6.2.5 RADIOLOGICAL FOLLOW-UP

The RCT shall:

1. Ensure that the Personnel Contamination Report (Attachment 1) has been completed.

2. Check the location of the contamination event - Contaminated Area, Hot Particle Area, clean area inside a radiological control area (RCA), or clean area outside RCA.
3. Enter any additional information felt to be pertinent.
4. Complete the "Contamination Event Description and Cause" sections of Attachment 1.
5. If the event was directly related to wearing protective clothing, then complete Section A, “Event Directly Related to Wearing PC”.
    - Check the appropriate Contamination Event Description.
    - Check the appropriate Basic Cause.
6. If the contamination occurred while removing protective clothing, then complete Section B, “Event Occurred While Removing PC”.
    - Check the appropriate “Contaminating Event Description”.
    - Check the appropriate “Basic Cause”.
7. If the contamination event was not related to wearing protective clothing, then complete Section C, “Event Not Directly Related to Using PC”.
    - Check the appropriate “Contaminating Event Description”.
    - Check the appropriate “Basic Cause”.
8. Review the report with the individual and have them sign and date the form.
9. Sign and date the form.

The SS shall:

1. Review the Personnel Contamination Report to verify that all required information has been accurately recorded.
2. Complete the “Radiological Task Supervisor” section.
    - Check the appropriate brackets ([ ]) to indicate actions taken.
    - Enter any comments.
3. Sign and date the form.
4. Request support from the qualified medical personnel when:
    - The personnel decontamination methods provided in this procedure are ineffective; or
    - Injured personnel require decontamination.

5. Determine reimbursements and disposition of personal property that cannot be decontaminated.
6. Forward the completed Personnel Contamination Report to the SPM for review.

The SPM and Site Safety Officer shall:

1. Review and sign the Personnel Contamination Report.
2. Conduct an investigation into the cause of the contamination.
3. Conduct training on the cause of the contamination and lessons learned and preventive measures.
4. Sign and transmit the Personnel Contamination Report to the PHP or designee for review.

7.0 RECORDS

The administrative form included in this procedure (Personnel Contamination Report) shall not be modified without the written authorization of the SPM and the documented concurrence of the PHP or designee. In no case shall modifications reduce the content required by the original form.

8.0 REFERENCES

Number	***Title***
None	

9.0 ATTACHMENTS

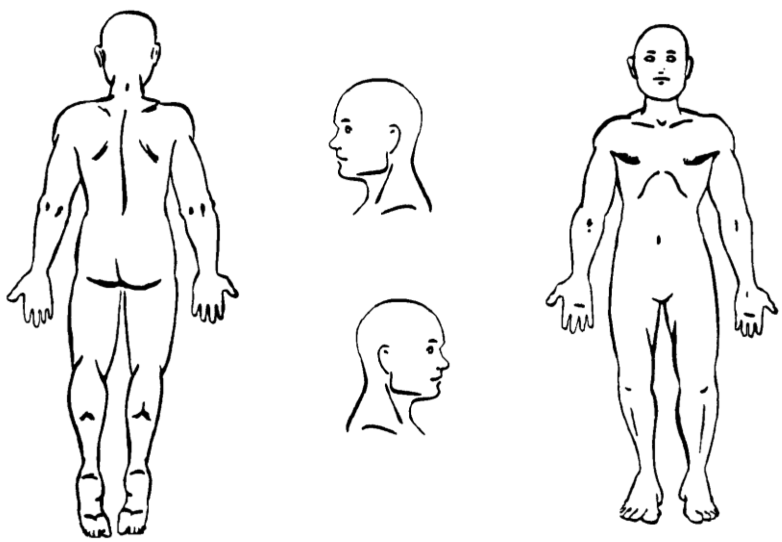
The following form is attached to this procedure:

Attachment 1, Personnel Contamination Report

ATTACHMENT 1

PERSONNEL CONTAMINATION REPORT

Name		Company	Date	Time
EID	Dosimeter#	Dept.	Supervisor	
Instrument		Serial #	Cal. Due Date	
Probe		Serial #	Cal. Due Date	
Location of Personnel Contamination			RWP # Survey #	



Contamination Levels (Use # to reference drawing)					
Number	Time	Initial Count Rate	Size of Area (cm^2)	Time	Final Count Rate

Decontamination Methods	__ Wash __ Number of washes __ Shower __ Number of showers	__ Other:
Radiological Control Technician Signature:		Date
I acknowledge the above information represents the contamination event.		
Individual Signature:		Date

Name EID

CLOTHING CONTAMINATION

Item:	Max cpm	[ ] Decon/Return	[ ] Contaminated/Retained
Item:	Max cpm	[ ] Decon/Return	[ ] Contaminated/Retained
Item:	Max cpm	[ ] Decon/Return	[ ] Contaminated/Retained

RADIOLOGICAL FOLLOW-UP

Location of Event:	[ ] Contamination Area	[ ] Clean area inside RCA	[ ] Clean area outside RCA

Follow-up actions:

Additional information:

CONTAMINATION EVENT DESCRIPTION and CAUSE

A - Event Directly Related To Wearing PC

Contaminating Event Description

[ ] Contaminated by physical compromise of PC (tear, etc.)
[ ] Contamination penetration of intact PC
[ ] Contamination came from PC
[ ] Contaminated skin by touching contaminated item
[ ] Contamination came from contaminated liquid
[ ] Contamination came from airborne radioactivity

Basic Cause

[ ] Improper donning of PC
[ ] Improper PC use related to worker knowledge/experience
[ ] Work area not deconned to extent practicable
[ ] Practical limitation of available alternatives
[ ] Improper PC requirement on RWP
[ ] Improper control by RCT of worker activity in PC
[ ] Improper laundry/monitoring of PC

B - Event Occurred While Removing PC

Contaminating Event Description

[ ] Contaminated during removal of hood
[ ] Contaminated during removal of respiratory equipment
[ ] Contaminated during removal of outer PC
[ ] Contaminated during removal of inner PC
[ ] Contaminated during removal of plastics
[ ] Contamination came from airborne radioactivity

Basic Cause

[ ] Lack of knowledge in proper methods to remove PC
[ ] Lack of knowledge in proper methods to remove respirator
[ ] [ ] Worker actions while removing PC - accident
[ ] RCT technician actions
[ ] [ ] Improper monitoring of PC

C - Event Not Directly Related To Using PC

Contaminating Event Description

[ ] Contaminated while in area designated as clean RCA
[ ] Contaminated while in area designated clean non - RCA
[ ] Contaminated by liquid
[ ] Contamination spread to area and not identified
[ ] Improper control of airborne radioactive material

Basic Cause

[ ] Noncompliance with postings/rad controls
[ ] Improper monitoring/control of rad material by worker
[ ] Improper actions at work area (sitting, lying)
[ ] Accidental contact with contamination beyond worker control
[ ] Surveys not appropriate for existing conditions

Health Physics Supervisor

[ ] Interview with job coverage RCT
[ ] Exclude individual from further RCA access
[ ] Discussed with individual and supervisor
[ ] Released with residual contamination
[ ] Initiated skin dose calculation
[ ] No further action required, routine close out

Site Supervisor	Print	/ Sign	Date
Site Project Manager	Print	/ Sign	Date
Radiation Safety Officer	Print	/ Sign	Date

ATTACHMENT VIII

EXCAVATION SAFETY PROCEDURES

This program outlines minimum requirements to protect employees who may be exposed to hazards during trenching and excavation activities and to provide general guidance for compliance with Title 29 of the *Code of Federal Regulations* (CFR), Part 1926, Subpart P, "Excavations."

1.0 SCOPE

This program and procedures applies to all sites and activities involving excavation or trenching as defined in 29 CFR 1926 Subpart P.

2.0 RESPONSIBILITIES

Project managers (PMs) shall ensure that all excavation, shoring, and trenching activities are conducted in accordance with the requirements outlined in this document and Subpart P of 29 CFR 1926. Project managers must also ensure that projects involving trenching and excavation are staffed by an individual trained and qualified to perform "competent person" duties as described in this procedure. Operating unit health and safety managers (HSMs) will provide assistance to PMs in implementing this SWP.

The site safety coordinator (SSC) is responsible for on-site enforcement of this SWP.

3.0 DEFINITIONS

The following definitions apply to this SWP:

Benching: Forming one or a series of horizontal levels or steps in the sides of an excavation to protect employees from cave-ins.

Competent Person: One capable of identifying existing or predictable hazards in the work environment that are unsanitary or dangerous to employees and who has authorization to take prompt corrective measures to eliminate the hazards.

Excavation: Any manmade cut, cavity, trench, or depression in an earth surface formed by earth removal.

Shoring: Metal, hydraulic, mechanical, or timber system that supports the sides of an excavation and that is designed to prevent cave-ins.

Sloping: Sloping the sides of an excavation at an incline away from the excavation to protect employees from cave-ins.

Trench: A narrow excavation (in relation to its length) that is usually deeper than it is wide but less than 15 feet wide.

4.0 PROCEDURES

Described below are the general safety requirements and protective system requirements for trenching and excavation activities.

4.1 General Safety Requirements

General safety requirements that must be in place before work begins are as follows:

- Utility companies or a utilities locating service in the area must be notified **before excavation or trenching activities begin** to arrange for locating and protecting underground utilities.

- Access to trenching areas must be controlled and limited to authorized personnel. Prior to entering a trench or excavation, workers must notify the project manager, SSC, and nearby equipment operators whose activities could affect the trench or excavation.

- No person may enter a trench or work at the foot of the face of an excavation until a qualified, competent person has inspected the excavation and determined whether sloping or shoring is required to protect against cave-in or subsidence and the appropriate protection has subsequently been installed.

- Trenches and excavations must be assessed by a qualified, competent person, even in the absence of working personnel, whenever heavy equipment will be operating nearby in order to ensure that the trench or excavation will support the weight of the equipment without subsistence or causing the accidental overturning of machinery.

- Trenches and excavations must be inspected regularly (daily at a minimum) to ensure that changes in temperature, precipitation, shallow groundwater, overburden, nearby building weight, vibration, or nearby equipment operation have not caused weakening of the sides, faces, and floors and to ensure that personnel protection is being maintained. Form TEC – Trenching and Excavation Checklist or its equivalent is to be used to document inspections.

- When subsidence or tension cracks are apparent anywhere in an excavation, all work should be stopped until the problem is corrected.

- The competent person must inspect trenches or excavations after any precipitation event to ensure integrity has been maintained.

- Sufficient ramps or ladders must be provided in excavations 4 or more feet deep to allow quick egress. Ramps or ladders may be placed no more than 25 feet apart, must be secured from shifting, and must extend at least 3 feet above the top of the trench or excavation. Structural ramps must be designed by a competent person.

- Material removed from an excavation or trench must be placed far enough from the edge (at least 2 feet) to prevent it from sliding into the excavation or trench or from stressing the trench or excavation walls. Worker protection must also be provided from loose rock or soil on the excavation faces.

- If trenches or excavations are near walkways or roadways, guards or warning barriers must be placed to alert pedestrians and drivers of the presence of the trench or excavation.

- If possible, trenches or excavations should be covered or filled in when unattended. Otherwise, strong barriers must be placed around the trench or excavation and lighting must be provided at night if the trench or excavation is near a walkway or roadway.

- When a hazardous atmosphere could exist, the excavation must be tested for appropriate hazardous substances and oxygen level before personnel entry. Excavation where hazardous atmospheres exist must be treated as a confined space. Entry must follow procedures outlined in "Confined Spaced Entry Program," Document Control No. 2-5.

- Entry is not allowed into excavations where water has accumulated.

4.2 Protective System Requirements

Protective systems protect employees from cave-ins, material that could fall in or roll off the face of the excavation, and collapse of adjacent structures. Protective systems include shoring, shielding, sloping and benching, and other systems. Sloping and benching and shoring system requirements are described below.

4.2.1 Sloping and Benching Requirements

Sloping and benching system construction must follow the guidelines established in Appendix B to Subpart P of 29 CFR 1926. Maximum allowable slopes for excavations are summarized below. All slopes indicated are expressed as the ratio of horizontal distance (H) to vertical rise (V).

Soil or Rock Type	Maximum Allowable Slope (H:V) for Excavations Less than 20 Feet Deep
Stable Rock	Vertical (90°)
Type A	0.75:1 (53°)
Type B	1:1 (45°)
Type C	1.5:1 (34°)

Soil types are defined in Appendix A to Subpart P of 29 CFR 1926 and are summarized below.

Type A: Cohesive soils with an unconfined compression strength of 1.5 tons per square foot (ton/ft^2) or greater (such as clay, silty clay, sandy clay, or clay loam)

Type B: Cohesive soils with unconfined compression strength of greater than 0.5 but less than 1.5 ton/ft^2 (such as angular gravel, silt, silt loam, or sandy loam)

Type C: Cohesive soils with an unconfined compression strength of less than 0.5 ton/ft^2 (such as gravel, sand, loamy sand, submerged soil, or unstable submerged rock)

Sloping and benching for excavations greater than 20 feet deep must be designed by a registered professional engineer.

Soil types must be determined by the competent person using at least one visual and one manual test. Manual tests include plasticity, dry strength, thumb penetration, and drying tests.

4.2.2 Shoring System Requirements

Appendixes C, D, and E to Subpart P of 29 CFR 1926 outline requirements for timber shoring for trenches, aluminum hydraulic shoring for trenches, and alternatives to timber shoring, respectively. Guidelines for shoring systems are listed below.

- If it is not economically feasible or there are space restrictions to prevent cutting the trench or excavation walls back to a safe angle of repose, all trenches or excavations 5 feet deep or more must be shored.
- Shoring should be erected as trenching or excavation progresses and as closely as possible to the excavation floor.
- Shoring timber dimensions must meet the minimum timber requirements specified in Tables C1.1 through C1.3 of Appendix C to Subpart P 29 CFR 1926. Aluminum hydraulic shoring must be constructed using the guidelines and dimension requirements specified in Appendix D of the same standard.
- Trench shields may be used instead of shoring or bracing. Shields must be constructed of steel flat sides welded to a heavy framework of structural pipe. Shields should be moved along by the excavator as trenching or excavation proceeds.

Revision Date	Document Authorizer	Revision Details
10/1/2008	Chris McClain	Update from 1998 format

ATTACHMENT IX

TRENCHING AND EXCAVATION COMPETENT PERSON CHECKLIST

TRENCHING AND EXCAVATION COMPETENT PERSON CHECKLIST				
Contract Name and Number:	Contractor/Subcontractor:			
Government Inspector:	Location:			
Contractor Inspector:	Date:			
Weather (circle one) Dry Raining Previous Rain Freezing				

COMPETENT PERSON INFORMATION	**Yes**	**No**	**N/A**
Competent Persons Name: ____ Length of experience in this occupation: _________________ Length of experience with this employer: ________________			
Does the designated individual have training in:			
Soil Analysis?			
Use of protective Systems?			
Requirements of 29 CFR 1926.650-652?			
List Training Experience:			
Does the designated individual have knowledge about:			
Soil Analysis? *(Describe types of soils and properties)*			
Use of protective systems? *(What method is being used and how was it determined)*			
Requirements of 29 CFR 1926.650-652?			
Does the designated individual have authority to:			
Take prompt corrective action to eliminate existing and predictable hazards?			
Stop work?			
GENERAL			
When was the last inspection of the excavation conducted?			
Was an inspection done and documented prior to the start of work?			
Were inspections done and documented as needed throughout the work shift?			

This checklist is based on OSHA requirements. Use of this checklist is optional.

TRENCHING AND EXCAVATION COMPETENT PERSON CHECKLIST (con.)			
GENERAL (con.)	**Yes**	**No**	**N/A**
Were inspections done and documented after rainstorms or other hazard-increasing occurrence?			
Is the excavation deeper than 4 feet?			
WATER CONDITIONS			
Is dewatering equipment being used on the site?			
If yes is the competent person monitoring the equipment and it's proper operation?			
Has the excavation been subject to water accumulation?			
Has the soil in the trench been adversely affected?			
If yes has the competent person inspected the excavation and taken action?			
EGRESS			
Is a means of egress provided every 25 feet?			
Is a ramp used for access or egress to the excavation? (if no skip to the next section.			
Is the ramp used solely for employee access?			
If yes was it designed by competent person for safe access and egress?			
If yes, is the competent person who designed the ramp qualified?			
Does the ramp meet specifications?			
CONFINED SPACES			
Is there a potential for a hazardous atmosphere in the trench? If not, why?			
Is air monitoring equipment on site?			
Has a qualified person been assigned to assess the hazards of confined space? *(OSHA Definition: A Qualified Person is designed by the employer in writing, as capable (by education and/or specialized training) of anticipating, recognizing and evaluating employee exposure to hazardous substances or other unsafe conditions in a confined space. This person shall be capable of specifying necessary control and/or protective section to ensure safety.)*			
Is emergency rescue equipment as outlined in 29 CFR 1926.651(g)(2)(I) readily accessible to employees?			

Government Inspector — Date

Signature of Competent person (contractor — Date

Printed Name of Competent person

This checklist is based on OSHA requirements. Use of this checklist is optional.

ATTACHMENT X

TETRA TECH, INC.

CONFINED SPACE ENTRY

PROGRAM

TABLE OF CONTENTS

TETRA TECH
CONFINED SPACE ENTRY PROGRAM

1.0 PURPOSE

To establish a uniform procedure specifying the minimum requirements for confined space entry operations performed by (or managed by) Tetra Tech, Inc.

2.0 SCOPE

For the purpose of clarification, this program applies to confined space operations which falls within the definitions provided below for confined spaces and permit required confined spaces.

2.1 **Confined space** A confined space means a space that:

- Is large enough and so configured to permit an employee to enter and perform work; and,
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, pits, etc.); and,
- Is not designed for continuous employee occupancy.

2.2 **Permit required confined space (PRCS).** A confined space having one or more of the following characteristics:

- Contains a hazardous atmosphere, or possesses the potential to contain a hazardous atmosphere.
- Contains a material which has the potential for engulfing an entrant.
- Has an internal configuration such that an entrant entering the PRCS could become entrapped or asphyxiated by inwardly converging walls or a floor which slopes downward, tapering to a smaller cross-section.
- Contains any other recognized serious safety or health hazard, or by virtue of the task to be undertaken, may generate unsafe conditions.

This procedure applies to projects with a scope of work that includes the performance of confined space entry operations by Tetra Tech or subcontracted personnel. This program has been developed on the basis of two principle requirements. These are as follows:

- That this program will be implemented on a **SITE SPECIFIC** basis, establishing flexibility to provide for the protection of the health and safety of Tetra Tech and subcontractor personnel, as well as for internal and regulatory compliance. This concept recognizes that Tetra Tech personnel work on many different sites, often with only brief field operations tasks, as opposed to longer term project sites. Therefore, this performance-based program has been developed to establish the minimum requirements for confined space entry operations at any individual Tetra Tech office location or project site.
- That confined space entry operations will be performed using a **PERMIT-REQUIRED** system, with the requirements of this procedure followed as minimum

requirements. Recognizing the Federal OSHA regulatory delineation between a Non-permit Confined Space and a Permit-Required Confined Space[1], and also recognizing that OSHA standards are minimum requirements. It is Tetra Tech policy that confined space entry operations will be performed in accordance with the written permit system specified in this procedure.

3.0 RESPONSIBILITIES

Project Manager (PM)/Task Order Manager (TOM) - The PM/TOM is also ultimately responsible for the effective compliance with these requirements. The PM/TOM will ensure that sufficient information has been provided to the PHSO to develop a site-specific Confined Space Entry Program appropriate for the nature of the planned activities. This is to be accomplished in conjunction with the preparation of the site-specific Health and Safety Plan (HASP). In addition, the PM/TOM will ensure that confined space entry is only considered as a last resort.

[1] Occupational Safety and Health Administration Title 29 CFR 1910.146, Permit-Required Confined Spaces, paragraph (b) “Definitions”.

Tetra Tech Health and Safety Manager (HSM): Provide technical management and oversight of this program, and to aid Tetra Tech employees in effectively implementing these requirements. The Tetra Tech HSM will also be responsible for monitoring the overall effectiveness of this program. This will be accomplished by:

- Reviewing completed permits on an annual basis.
- Performing field audits of select project sites where confined space entry operations are performed.
- Maintaining proficiency in regulatory requirements on confined space entry matters.
- Modifying elements of this program, when or as appropriate.
- Establishing minimum components of confined space entry training course material, both for in-house and subcontractor-provided training courses
- Maintaining appropriate record-keeping for this program.

Project Health and Safety Officer (PHSO) - The PHSO shall ensure that confined space activities are adequately addressed in the Site Specific Health and Safety Plan for assigned projects. In addition, it is the PHSO responsibility to provide technical assistance to the SSO and/or the Field Operations Leader. The PHSO must also ensure that the requirements of this program are satisfied for confined space entry operations performed or managed at their location, whether by Tetra Tech personnel or by subcontractors. Other responsibilities include ensuring that:

- If training is provided by subcontractors, that an appropriate organization is selected, and that the training course material satisfies the Tetra Tech requirements.
- No individual participates in any confined space entry operations unless they are fully compliant with program requirements.
- The HSM is alerted when activities at a project site will involve confined space entry operations.
- A properly completed written program is present at every site where confined spaces exist.
- Appropriate documentation is maintained for that office, and that written permits are submitted to the HSM at the conclusion of project activities to facilitate the annual permit review requirement.

Site Safety Officers (SSO): Ensure that the requirements of this program are satisfied for confined space entry operations performed or managed at their site location, whether by Tetra Tech personnel or by subcontractors. Other responsibilities include ensuring that:

- Confined spaces are identified and labeled as such.

- Personnel to participate in confined space are trained to the appropriate level for the tasks to be performed and documentation certifying this training is obtained and maintained on site. In addition, ensure drilling/practice requirements to establish proficiency are up to date.

- Personnel meet the necessary medical qualifications for this type of activity.

- Rescue services are established and confirmed on the dates the confined space operations will be conducted.

- Provide the intended rescue services, the necessary information concerning the hazards associated with the confined space operations. This includes Material Safety Data Sheets, where available, information concerning hazard atmospheres and any associated physical hazards.

- The duties of the Entry Supervisor is completed in their entirety. In many cases the SSO will serve as the Entry Supervisor.

- The site-specific program for confined space operations is completed at each site, where applicable.

Field Operations Leader (FOL) – The FOL may share responsibility with the SSO or in the absence of an SSO ensure the implementation of this program for operations conducted under their direction. Substitution for the SSO will depend on the nature of the confined space operations and the anticipated severity of the hazards conveyed in the confined space. Substitution shall proceed based on the PHSO recommendation.

Tetra Tech Employees - The employees are responsible for following the tenets of this Confined Space Entry Program and/or conditions or modifications of this program, that may be site-specific in nature. In addition the employees are responsible for reporting any deficiencies or inadequacies of these program or site-specific elements to the SSO and/or the FOL.

4.0 PROCEDURES

4.1 Introduction

Tetra Tech recognizes that the participation of Tetra Tech personnel in confined space entry operations can be one of the most potentially dangerous types of field activities that they may encounter in their work. The risks associated with this type of work are most remarkable because they can be immediate and severe. It is for this reason that the requirements of this program will be strictly enforced at Tetra Tech locations.

There are two commonly encountered situations in which Tetra Tech field personal operate. These include project sites where we are the contractor performing work at a client location, and project sites where we are the prime contractor, and we have a subcontractor working under our direction. Also, specific to addressing confined space concerns, we need to address sites where confined spaces exist but our work scope will not involve entry versus sites where actual entry is necessary. As the regulatory requirements for each of these scenarios vary, separate procedures are established in the following sections of this overall program. These procedures involve the use of a simple, fill-in-the-blank written program that is to be completed

4.2 General Requirements

The following are General Requirements for each Tetra Tech Confined Space Entry policy and program.

Confined space entry operations on any Tetra Tech project site will be performed only a last resort. Available alternative means to accomplish the task objectives must be exhausted before commencing any confined space entry activities.

The following represents scenarios where Tetra Tech, Inc. personnel and/or subcontractor personnel working under the direction of Tetra Tech , Inc. would require the use of this program.

- Tetra Tech, Inc. personnel will enter a confined space.

- There are confined spaces in the area of operation under the guidance/control of Tetra Tech, Inc.

- Subcontractor personnel will enter a confined space under the guidance and/or direction of Tetra Tech, Inc.

Therefore, any project site where planned activities may involve work in or near a confined space must have a written Confined Space Entry Program completed on site and available prior to the commencement of site activities. The program must be attached to the Health and Safety Plan prepared for that project. The written program shall be completed by the assigned SSO, and will be kept current and available for review by the Tetra Tech HSM.

Work involving entry into a confined space will be performed by written permit only. There will be no exceptions to this requirement without the express, written consent of the Tetra Tech HSM.

4.2.1 Role and Responsibility of the Site Safety Officer

For applicable projects, the assigned SSO must be thoroughly familiar with this procedure and with the OSHA regulation on Permit-Required Confined Spaces, and will be responsible for completing the on-site elements of this program. The SSO will also be responsible for implementing the specific requirements of the program on his/her site, including ensuring that:

- Confined spaces at the site are properly identified, labeled, and inventoried. Signs should be appropriate size (12x18 minimum or greater) and color designation

- Site personnel are made aware of these spaces, and that unauthorized entry is prohibited. This is to be covered as part of the site-specific health and safety training.

- Entries are performed using the written permit system specified in the site written program.

- Necessary training requirements are satisfied, and that appropriate training documents are collected and maintained.

- Personnel participating in the confined space operation are medically (physically and psychologically) qualified to do so. Documentation to be provided are the medical surveillance clearance and the ability to wear respiratory protection.

- Necessary entry equipment is on hand, and maintained in proper working order. Equipment will be inspected by the SSO to ensure operation status.

- Permits are completed specifying a duration only long enough to perform the job.

- A trained and equipped rescue team is on standby prior to the beginning of the confined space activity. It will be the SSO responsibility to ensure the rescue teams capabilities and equipment resources to support the planned operation.

- The rescue team is fully aware of the potential hazards which may be encountered and pertinent information has been provided by the SSO.

The SSO will, in the majority of cases, serve as the Entry Supervisor. This means that he/she is responsible for determining that acceptable entry conditions are present before and during entry, for authorizing (by completing and signing the written permits) and overseeing entries, and for terminating entries and canceling permits.

4.2.2 Testing and Monitoring of Confined Spaces

Air monitoring in the confined space must be performed before and periodically during entry operations. The frequency, types, and sequence of air monitoring are clearly specified in the site specific program included as Attachment I. While that program specifies that periodic air monitoring during an entry may be acceptable for an isolated space, it is recommended that continuous monitoring always be performed, even for a completely isolated space. Acceptable entry conditions are as specified in Table 1, below.

Table 1
Acceptable Entry Conditions

Testing Sequence	Atmospheric Parameter	Acceptable Entry Condition
1st	Oxygen content in air	≥ 19.5% and ≤ 23.5%
2nd	Flammable or explosive conditions	≤ 10% of an LEL* for gases, vapors or mists ≤ LEL for airborne combustible dusts
3rd	Toxic concentrations of chemical hazards	Any exposure reaching a substances published Action Level, Permissible Exposure Limit, Threshold Limit Value, or Recommended Exposure Limit. These will be specified in the site Health and Safety Plan
4th	Any other atmospheric condition that is Immediately Dangerous to Life or Health	Varies by specific parameter

*LEL = Lower Explosive Limit, sometimes also referred to as LFL for Lower Flammability Limit. For dusts, this may be approximated as a visual condition where the dust obscures vision at a distance of 5 feet or less.

If the acceptable entry conditions do not exist, or appear that they may not be constant throughout the entry, the SSO can use the following approach:

- Ensure that the space is properly isolated (block and bleed lines, use Lockout/Tagout procedures, etc.
- Purge, inert, flush, or ventilate the space to control or eliminate the hazard.

If acceptable entry conditions still do not exist due to flammability or explosive concerns, the entry must not be authorized. If the limiting factor is toxic airborne concerns, appropriate PPE may be used to allow the entry (Note: PPE is chosen as a control option always only as a last resort. Efforts should be made to control hazards through engineering controls).

4.2.3 Rescue

When confined space entry operations are performed, personnel and equipment must be adequate and available to effect non-entry rescue operations in the event of an emergency. This shall include items such as body harnesses (or wristlets, as a second choice), tie-offs, mechanical retrieval apparatus, etc. This equipment must be available and in use during entry operations. This will enable the Attendant and other authorized personnel to perform an emergency rescue and extract an injured person from outside of the space. Rescue procedures requiring other personnel to enter a space to assist or evacuate an injured or incapacitated entrant are expressly prohibited. Also, unauthorized personnel must be prohibited from participating in emergency rescue operations.

It is anticipated that in most instances, we will be prepared to provide non-entry emergency rescue services ourselves, at least to the point of removing an injured person and stabilizing them until professional emergency services can be summoned. The identity of the specific emergency response service and the method for contacting them will be clearly identified on the permit completed by the SSO. At least one member of the team serving in the role of Attendant or Rescue member (a non-entrant) must have current certification in First Aid and CPR. (Note: The person of choice must ensure that Bloodborne Pathogen Program requirements are satisfied whenever First Aid or CPR practice is authorized.)

4.3 <u>Employee Training</u>

Personnel must be adequately trained in order to be authorized to participate in confined space operations. Training must be performance-based so that participants can successfully demonstrate proficiency in performing their assigned duties. Training shall take place before an individuals first assignment, when their assigned duties change, or when changes occur in the site's written program. Also, if a new hazard is suspected that was not addressed in the employee's training, supplemental training will be required. Retraining may also be conducted when through periodic inspections or reviews identify deficiencies in confined space operations.

Whether training is provided in-house or by a training contractor, the contents of the training must satisfy the requirements of this program, and will be held to the criteria published by the Hazardous Waste Action Coalition Risk Management Committee, Health and Safety Subcommittee (entitled "Confined Space Entry Training Courses", published in 1996). A copy of these criteria are available from the Tetra Tech HSM. These criteria are directly applicable as they have been specifically developed by health and safety representatives of firms from within our industry (hazardous waste/environmental consulting).

The SSO will ensure that appropriate training has taken place for authorized individuals, and will have on-hand at the site documentation for each involved employee attesting to:

- Employee name
- Signature or initials of the instructor
- Dates of training

Site-specific training for authorized individuals will cover the duties of the entrants and attendants. This will address the aspects for each of these positions as presented below.

4.3.1 Authorized Entrants Training

- Hazards that may be encountered in the space
- How to properly use the necessary equipment
- Communication methods with the Attendant
- Recognizing when emergency exit of the space is necessary

4.3.2 Attendant Training

- Hazards that may be encountered in the space
- Behavioral effects of hazard exposure
- To continuously maintain an accurate count of entrants and know their identity
- To never leave the space unless relieved by another attendant
- Communication methods and aspects with Entrants
- Monitoring of the space
- How and when to summon emergency services

- Control unauthorized personnel issues
- Performance of non-entry rescues

4.3.3 Entry Supervisor Training

- Hazards that may be encountered in the space
- Verifies that tests have been conducted (by checking permit entries)
- Verifies that procedures and equipment specified in the permit are in place before signing it and putting it into effect
- When and how to terminate the entry and cancel the permit
- Verify that rescue services are available at the time of the entry and that the means for summoning them are operable
- Removes or prevents unauthorized personnel from entering the space

4.4 Coordination with Clients

Tetra Tech operations will involve arrangements where we are serving as a contractor to a client facility. That is, we will not be addressing entering spaces that we own or control. Therefore, appropriate coordination with the client representative will be essential to properly understand the nature of any confined spaces and to successfully perform the work. When the scope of work entails (or may entail) working in or near confined spaces, the PM/TOM must gather the following information as part of the initial data gathering process:

- Obtain any available information regarding confined spaces, including descriptions, potential or known hazards, and the client's confined space entry program information.
- Determine, if the client has located and designated confined spaces in the work area.
- Establish how the client desires to coordinate our work with their operations, relative to the confined spaces.
- If the scope of work will involve actual entry by Tetra Tech personnel, inform the client of our program.

Gathered information is to be provided to the PHSO responsible for preparing the site-specific Health and Safety Plan.

At the conclusion of any confined space entry work done at a client location, the PM/TOM is to request a debriefing meeting, so that a representative from the project team can communicate hazards that were encountered in the work.

4.5 Project Sites Involving Confined Spaces Where Entries Will Not Be Performed

In many instances, we may be performing work at sites where confined spaces exist and our scope of work does not involve any entry into those spaces. In this application, the SSO has only to ensure that spaces in our work area are adequately identified and posted, and complete the one-page written program in Attachment II and post it on site in the work area.

4.6 Confined Space Entry Operations Involving Subcontractors

For some projects, the scope of work may require a specialized of a subcontractor. When the work involves requiring a subcontractor to perform a confined space entry, the SSO must complete and utilize the written program included as Attachment III. We must provide our subcontractor with the following information:

- Information regarding the confined space(s), including descriptions, potential or known hazards, and the details of our confined space entry program.
- Information on the location and designations (postings) of the confined spaces in the work area.
- Establish how we desire to coordinate our work with their operations, relative to the confined spaces.
- If the scope of work will involve actual entry by subcontractor personnel, inquire if they have their own Permit-Required Confined Space Program and obtain it for our review.
- If the nature of the work is such that Tetra Tech and subcontractor personnel will have to perform concurrent operations in or near a confined space, very close coordination will be necessary and the Tetra Tech HSM must be contacted for guidance.

At the conclusion of any confined space entry work done by a subcontractor, a debriefing meeting will be held by the SSO to learn of any hazards that were encountered in the work.

4.7 <u>Program Evaluations and Availability</u>

The Tetra Tech HSM is responsible for performing evaluations of this overall Program to ensure its continued effectiveness. These reviews will be properly documented, and will occur as follows:

- Annually, at the end of each calendar year.
- At any time when an indication is discovered that a component of the program is not effective.
- In the event of any modifications in the regulatory requirements for confined space operations.
- If the event of changes or mandates from Tetra Tech, Inc. Corporate Health and Safety.

Annual Program evaluations will entail a review of canceled written permits prepared and used during the course of that year by Tetra Tech locations. The various site-specific written programs that these permits were prepared under are also subject to review. Canceled permits will be retained by the Tetra Tech HSM for no less than one calendar year.

Field audits of project work sites where confined space operations are conducted will also be performed. These will be coordinated through the Tetra Tech HSM, and will do on an unannounced, random basis.

Information gathered and program modifications that become necessary will be communicated to Tetra Tech personnel by the Tetra Tech HSM.

4.7.1 Equipment and Evaluation of Confined Spaces

Spaces must be properly evaluated before and during entry operations. Figure 2 specifies the criteria for equipment inspections that will be maintained on this site to evaluate and support Confined Space Entry operations.

4.7.2 Confined Spaced Signage

Each of these spaces have been (or will be, upon creation) clearly posted with signs stating “DANGER - PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER” or “DANGER - CONFINED SPACE - DO NOT ENTER” as applicable.. Unauthorized entry into any of these spaces is strictly prohibited.

The remaining text represents the site-specific portion of this program and the activities to be conducted when involved in one or more of the scenarios defined above.

5.0 DEFINITIONS

Acceptable entry conditions - The conditions that must exist and be maintained in a confined space in order to allow entry and work activities to be performed by personnel. For purposes of this program, this definition will also reflect those conditions which must be maintained and must not be compromised. Therefore, acceptable entry conditions are defined as, but not limited to, the following:

- A "hazardous atmosphere" either does not exist, or it can be adequately controlled to allow entry. Examples of control measures may include ventilating, purging, or inerting the PRCS, or a combination of these measures. Additionally, the use of appropriate personal protective equipment may be considered a control measure when other engineering and administrative controls are not feasible or are unable to be adequately controlled.

- The space to be entered has been properly isolated. This involves ensuring that energy sources have been identified and secured in a zero energy state to the greatest possible extent. This is accomplished through the use of energy control measures such as lockout procedures, blanking or blinding techniques, double block and bleed procedures, or other appropriate energy control methods. This effort must be documented, and members associated with the entry must concur that control sources have been identified, tested, and are disabled.

- The space to be entered does not contain a material that could engulf an entrant. If such a material is involved, adequate control methods such as shoring or sloping of the material must be adequately implemented prior to initiation of the entry.

- The space to be entered does not contain any other serious hazard potential(s) which cannot be contained or controlled to the satisfaction of the entry supervisor.

Attendant - An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs attendant's duties assigned by this Confined Space Entry Program.

Authorized entrant - An employee who is authorized by Tetra Tech to enter a confined space or a permit required confined space.

Blanking or blinding - The absolute closure of a pipe, line, or duct by the fastening of a solid plate that completely covers the bore, which ensures no leakage occurs beyond the plate.

Confined space. A confined space means a space that:

- Is large enough and so configured to permit an employee to enter and perform work; and,
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, pits, etc.); and,
- Is not designed for continuous employee occupancy.

Double block and bleed - The closure of a line, duct, or pipe by closing and locking two in line valves and by opening and locking a drain or vent valve in the line between the two closed valves.

Emergency - Any occurrence (including any failure of hazard control or monitoring equipment) or event internal and/or external of the confined space and/or permit-required confined space, that could endanger entrants.

Entry - The action by which a person passes through an opening into a confined space. Entry includes ensuing work activities that are performed in the confined space. Entry is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the confined space.

Entry permit - The written or printed document which is provided by the employer to allow and control entry into a confined space and/or a permit required confined space. The permit contains pertinent information regarding the space to be entered.

Entry supervisor - The person responsible for determining if acceptable entry conditions are present the confined space and/or the permit required confined space where entry is planned. The Entry supervisor is also responsible for authorizing entry, overseeing entry operations, and for terminating the entry as conditions dictate.

Hazardous atmosphere - An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self rescue, injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10 percent of its lower explosive limit -LEL (sometimes referred to as the lower flammable limit - LFL).

- Airborne combustible dust at a concentration that meets or exceeds 10 percent of its LEL/LFL.

- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent.

- Atmospheric concentration of any substance for which a dose or a permissible exposure limit is established. Also an atmospheric concentration which could impede the entrant's ability to self rescue resulting in employee exposure and adverse health effects associated with that exposure.

- Any other atmospheric condition that is immediately dangerous to life or health.

Hot Work Permit - The employer's written authorization to perform operations (e.g., welding, cutting, burning, heating, etc.) capable of providing a source of ignition.

Immediately Dangerous to Life or Health (IDLH) - Any condition which poses an immediate or delayed threat to life, or a condition that would cause irreversible adverse health effects. In addition, an IDLH condition includes any condition which would interfere or impede an individual's ability to escape unaided from a confined space and/or a permit-required confined space.

Inerting - The displacement of the hazardous atmosphere in a permit-required confined space by introducing a non-reactive gas (such as nitrogen) to such an extent that the resulting hazardous atmosphere would be pushed from the permit-required confined space rendering that permit-required confined space non-reactive. Inert spaces are still considered hazardous due to the displacement of oxygen.

Isolation - The process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as:

- blanking or binding;
- misaligning or removing sections of lines, pipes, or ducts;
- a double block and bleed system;
- lockout of energy sources, and the reduction of potential energy sources to their zero mechanical state;
- blocking or disconnecting mechanical linkages.

Line breaking - The intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or by the SSO.

Lockout - [As defined by OSHA 29 CFR 1910.147 (b)] The placement of a lockout device on an energy isolating device, in accordance with an established procedure, which ensures that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Permit required confined space (PRCS). A confined space having one or more of the following characteristics:

- Contains a hazardous atmosphere, or possesses the potential to contain a hazardous atmosphere.
- Contains a material which has the potential for engulfing an entrant.
- Has an internal configuration such that an entrant entering the PRCS could become entrapped or asphyxiated by inwardly converging walls or a floor which slopes downward, tapering to a smaller cross-section.
- Contains any other recognized serious safety or health hazard, or by virtue of the task to be undertaken, may generate unsafe conditions.

Permit system - The employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

Prohibited condition - Any condition in a confined space and/or a permit-required confined space that is not allowed by the permit during the period when entry is authorized.

Tagout - [As defined by OSHA 29 CFR 1910.147 (b)] The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed. It should be emphasized that any time tagout is employed as an energy control measure, it must offer the same level of protection as its energy control measure counterpart lockout.

Testing - The process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space. Details pertaining to testing methods and procedures are discussed in Section 4.4 of this program.

ATTACHMENT I

TETRA TECH , INC.
CONFINED SPACE
ENTRY OPERATIONS

PROJECTS SITES INVOLVING CONFINED SPACE ENTRY OPERATIONS

The written program presented will be used at Tetra Tech project sites where confined space entry operations are planned. That program has been developed to provide the SSO with a standardized tool to serve two purposes:

- To protect the health and safety of Tetra Tech and subcontractor personnel working in or near confined spaces.
- To comply with Federal regulatory requirements.

PERSONNEL RESPONSIBLE FOR PROGRAM COMPLETION

The following persons are available to provide assistance in elements of this program including question/conflict resolution and modification variances. These persons exercise the primary responsibility for the implementation of this site-specific program.

Site Safety Officer:_________________________________**Phone #:**___________
Field Operations Leader: ________________________**Phone #:**___________
Project Health and Safety Officer:_____________________**Phone #:**___________
Health and Safety Manager: ________________________**Phone #:**___________

PERSONNEL WHO WILL PARTICIPATE IN CONFINED SPACE OPERATIONS

The following list of personnel, represent personnel or subcontractor personnel working under the provision of this confined space entry program. The persons listed below represent only those who will actively engage in confined space operations by way of assignment.

Personnel Name and Signature	**Role in the Confined Space Entry Program**	**Confined Space Training (Dates)**		**Medical Clearance (Date)**	**Comments** *i.e., most recent drill (vertical/horizontal); First-Aid Training*
		Initial	**Refresher**		

RESCUE SERVICES

The ____________________ Rescue Department will serve as the identified rescue service. The rescue service can be obtained at (___) ___-____. The entry operation will be coordinated through the rescue service. Pertinent information will be provided prior to entry. Notification shall take place prior to, and after entry operations cease.

CONFINED SPACE INVENTORY/STATUS

The following inventory represents the confined spaces at this project site. These spaces are listed by way of planned entry or proximity. This list will be updated by the SSO and/or the FOL as necessary.

CONFINED SPACE INVENTORY/STATUS

Confined Space/Permit-Required Confined Space Identified	Location/ Tasks To Be Conducted	Type of Entry	Hazards Identified	1.1.1.1.1.1.1.1 *Control Measures*

CONFINED SPACE ENTRY PERMIT

Entries into Identified Confined Spaces Will Be By Written Permit Only.

The Confined Space Entry Permit will guide and direct field personnel regarding aspects of the entry by using the permit as a checklist. It is based on this application that no spaces on the permit be left unchecked.

The assigned authorized entrant(s) and attendant(s) will complete the Confined Space Entry Permit. However, entry is not permitted until the Entry Supervisor reviews the permit and signs off.

Figure 1 will be used as the written permit on this site. Permits will be reviewed, issued, and canceled by the SSO, who will also serve in the role of Entry Supervisor. Permits must be completed before any entry operations begin. Completed permits will be reviewed with involved personnel as part of their task-specific training, and then posted at or near the entrance to the space.

HAZARD MONITORING

Spaces will be initially evaluated by the Authorized Entrant and Attendant as follows:

- Pre-entry, to determine that satisfactory entry conditions exist
- Continuously, if the space cannot be isolated – For activities at _____
- Periodically, if the space can be isolated (at least once every __ minutes)

The sequence for conducting these evaluations will be (from first to last):

1. Oxygen level
2. Lower Explosive Level (for gases, vapors, mists, or particulates)
3. Toxic gases or vapors

Specific equipment and instrument action levels are specified on the permit.

Information derived from the monitoring activity will be recorded on the Entry Permit. This information will be used to determine if acceptable entry conditions exist and whether entry is permitted. The SSO will review the information collected and authorize entry, if conditions are determine to be acceptable.

Figure 1

CONFINED SPACE ENTRY PERMIT

CONFINED SPACE ENTRY PERMIT ______________________________ No: ___

INITIAL ATMOSPHERIC TESTS PERFORMED

CAUTION: Toxic or flammable gasses or vapors may _________ in the confined space. Be sure to vent at various intervals and locations within the confined space. Always check the oxygen content first.

INITIAL TESTING						
HAZARD TESTED	**ACCEPTABLE RANGE**	**READING**	**DATE AND TIME**	**TESTER INITIALS**	**ACCEPTABLE YES**	**NO**
%Oxygen	19.5-23.5%	%				
%LEL	10% or less	%				
	PEL=	PPM=				
	PEL=	PPM=				
	PEL=	PPM=				

EVACUATION PROCEDURE

Route:______________________________

Assembly Points:______________________________

RESCUE PROCEDURE – Initiate self rescue, if incapacitated; initiate external extraction; If unable to facilitate external extraction; notify the Fire Dept. for entry and removal

PLAN DESCRIPTION

ON-SITE RESCUE CONTACTS			
PHONE NUMBER	RADIO NUMBER	PAGER NUMBER	OUTSIDE SOURCES AND PHONE
(252) 335-6222			FIRE DEPARTMENT
			AMBULANCE
			HOSPITAL
			OTHER

SPECIAL EQUIPMENT NEEDED

- ☐ RESPIRATORS (Type): ______________________________
- ☐ SAFETY HARNESSES/WRISTLETS
- ☐ LIFELINES
- ☐ HOISTING APPARATUS
- ☐ VENTILATION EQUIPMENT:______________________________
- ☐ TEMPORARY LIGHTING (Type/voltage):______________________________
- ☐ NON-SPARKING TOOLS
- ☐ PROTECTIVE CLOTHING:______________________________
- ☐ OTHER:

ENTRY SUPERVISOR'S SIGNATURE	DATE	PERMIT RECEIVER SIGNATURE	DATE

CONFINED SPACE ENTRY PERMIT No: ____

GENERAL INFORMATION:

DESCRIPTION OF THE CONFINED SPACE:

DATE ISSUED	TIME ISSUED	DATE EXPIRES	TIME EXPIRES
	:		:

ENTRY SUPERVISOR

ATTENDANT(S)

COMMUNICATION BETWEEN ATTENDANT(S) – ENTRANTS

‘ VOICE ‘ LIGHT ‘ RADIO ‘ OTHER

DESCRIPTION OF WORK:

CHECKLIST FOR ISOLATION AND UNAUTHORIZED ACCESS PREVENTION

	Yes	NO	NA	INITIAL
External Battery(ies) in Place	☐	☐	☐	______
Mechanical Lockout/Tagout	☐	☐	☐	______
Lines/Pipes Disconnected	☐	☐	☐	______
Lines/Pipes Blocked	☐	☐	☐	______
Lines/Pipes Capped	☐	☐	☐	______
Lines/Pipes Blinded	☐	☐	☐	______
Warning Signs	☐	☐	☐	______
Other:______________________	☐	☐	☐	______

REPORT ANY UNAUTHORIZED ENTRY TO: **Health Sciences Department and Project Management**	PHONE NO.	RADIO NO.	PAGER NO.

PRE-ENTRY CHECKLIST

PURGING, INERTING, OR FLUSHING

PERFORMED ☐ YES ☐ NO ☐ NA

METHOD USED ☐ Nitrogen ☐ steam ☐ Water ☐ Other (specify)

____

____

MECHANICAL VENTILATION

Estimated Confined Space Volume: ______________________

Air Exchange Rate Required: ______________________

	Initial	Continuous	Partial	Description
Fresh Air Injection	☐ ____hrs.	☐	☐	________
General	☐ ____hrs.	☐	☐	________
Local Exhaust	☐ ____hrs.	☐	☐	________

SPECIFIC HAZARDOUS TASKS

Certain tasks performed in confined spaces greatly increase the risks to entrants. Check tasks to be performed.

- ☐ WELDING/GRINDING
- ☐ THERMAL CUTTING
- ☐ SOLDERING/BRAZING
- ☐ ELECTRICAL
- ☐ OTHER, EXPLAIN: ______________________________
- ☐ PAINTING OR CLEANING WITH SOLVENTS
- ☐ CLEANING/SWEEPING/VACUUMING
- ☐ SCRAPING/REMOVING RESIDUE
- ☐ CHEMICAL USE

Additional Permits Required ☐ Hot Work Permit ☐ Utility Locating/Excavation Clearance

ENTRY SUPERVISOR’S SIGNATURE	DATE	PERMIT RECEIVER SIGNATURE	DATE

May 2005

CONFINED SPACE ENTRY PERMIT **No:**

PERIODIC ATMOSPHERIC TEST RESULTS

TESTER INFORMATION	ATMOSPHERIC HAZARD TESTED	ACCEPTABLE RANGE OF HAZARD	HAZARD MONITORING RESULTS	ACCEPTABLE	
				YES	NO
Date	Oxygen Content (%0$_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	Ppm		
Date	Oxygen Content (%0$_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	Ppm		
Date	Oxygen Content (%0$_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	Ppm		
Date	Oxygen Content (%0$_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	Ppm		
Date	Oxygen Content (%0$_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	Ppm		
Date	Oxygen Content (%0$_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	Ppm		
Date	Oxygen Content (%0$_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	Ppm		
Date	Oxygen Content (%0$_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	Ppm		
Date	Oxygen Content (%0$_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	Ppm		
Date	Oxygen Content (%0$_2$)	19.5%-23.5%	%		
Time:	Combustible Gas (%LEL)	0%-10%	%		
Initials:	Other (Specify)	PEL ppm	Ppm		

May 2005

CONFINED SPACE ENTRY PERMIT No:

PERSONNEL ENTRY LOG

DESCRIPTIONOF CONFINED SPACE

ENTRY SUPERVISOR	DATE

ATTENDANT(S)

AUTHORIZED ENTRANT'S NAME	TIMES IN AND OUT							
	IN	OUT	IN	OUT	IN	OUT	IN	OUT

EQUIPMENT INSPECTION

Equipment to be used in support of the confined space operation(s) will be inspected by the SSO or duly appointed representative, prior to initial use. Inspections will entail a physical examination and an operational check. The Confined Space Equipment Inspection Record will be used to document these inspections. Where appropriate existing inspection records for instance Respiratory Equipment Checklist will be used in place of the Confined Space Equipment Inspection Record.

PERMIT TERMINATION

A confined space entry permit can be terminated for a number of reasons. These include, but not limited to, the following:

- Scope of work change

- Acceptable conditions within the space change

- Time limit expires

- Planned activities are completed

Upon termination of an active permit the following steps will take place.

- The Confined Space Permit and any other associated permit (AHA, Hot Work Permit, etc.) or hazard monitoring results will be copied. The copies will be forwarded to the PHSO for evaluation.

- Upon evaluation the PHSO will forward the copied permits to the HSM for record-keeping and review. The PHSO will include any relevant comments for the HSM to be considered during his/her review.

- The HSM will maintain the completed permits and associated materials for a period of one year from the date of issue.

TYPE OF EQUIPMENT	Visual Condition	Operational Status	
Testing and Monitoring Serial # ______________________ ________ ______________________ ________ ______________________ ________ ______________________ ________ ______________________ ________	Acceptable ☐☐☐☐☐ Needs repaired ☐☐☐☐☐ Comments:____________________ ______________________________ ______________________________	Functional Yes ☐☐☐☐☐ No ☐☐☐☐☐ Comments:__________ ____________________ ____________________	Calibrates Yes ☐☐☐☐☐ No ☐☐☐☐☐ Span Concentration ________ ________ ________ ________ ________ Comments:________________________ __________________________________ __________________________________
Ventilation Equipment Fans/blowers (Flow rate/per unit ________) Compressor unit (as applicable) Hoses/Connections (as applicable) Power Cords/Connections (as applicable) Back-up Energy Source	Acceptable ☐☐☐☐ Needs repaired ☐☐☐☐ Comments:____________________ ______________________________ ______________________________	Functional Yes ☐☐☐☐ No ☐☐☐☐ Comments:__________ ____________________ ____________________	Confined Space Estimated Volume:______________ Ventilation Unit Flow Rate Input:__________Exhaust:__________ Estimated Changes/Hour:____________ __________________________________ __________________________________ __________________________________ __________________________________
Lighting Equipment (Intrinsically Safe) Power Cords Connections and Plugs Protective Cages Ground Fault Interrupter Back-up Energy Source	Acceptable ☐☐☐☐☐ Needs repaired ☐☐☐☐☐	Functional Yes ☐☐☐☐☐ No ☐☐☐☐☐	Adequate lighting for safe operations? Yes ☐ No ☐ Comments:________________________ __________________________________ __________________________________ __________________________________
Site Preparation Warning/Hazard Signs (Size, Legible, Correct Color Designation) Barrier Systems (Tape, fencing, etc.) Traffic Control Provisions (Foot & Vehicular) Energy Control Provisions Additional Permits Required (Hot, Excavation, Energy Control, etc.) Permits Posted	Acceptable ☐☐☐ Unacceptable ☐☐☐ ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A	Functional Yes ☐☐☐☐ No ☐☐☐☐ Comments:__________ ____________________	

TYPE OF EQUIPMENT	Visual Condition	Operational Status	
Communications Equipment Type__________________________ Intrinsically Safe? Back-up Communication method? _ Will line of sight be maintained during the entry operations? Will relay points be established to support radio communications?	Acceptable Unacceptable ☐ ☐ ☐ ☐ ☐ Yes ☐ No ☐ Yes ☐ No ☐ N/A	Functional Yes No ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Comments:______________________
Rescue/Emergency Equipment Retrieval/Fall Arresting Systems [Tripods, Hoist(extraction cables, connections), lifeline, harnesses] Stretcher Fire Extinguishment -Type_Rating__ First-Aid Equipment/Supplies	Acceptable Needs repaired ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Functional Yes No ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	Method/Means to summon Rescue Team provided? ☐ Yes ☐ No Hazard Information regarding The space to be entered been Provided to the Rescue Team? ☐ Yes ☐‘ No Procedures for Self or Non-Entry rescue been Accomplished? ☐ Yes ☐ No If no why not?____________________ Comments:______________________
Personal Protective Equipment Hard Hat Safety Glasses Splash Shield Splash Suits Type____________________ Steel Toe Work Boots Chemically Resistant Overboots Hearing Protection Gloves – Type________________________ Heat Shielding	Acceptable Unacceptable N/A ☐	Comments:______________________________________ Respiratory Protection: Attach Respiratory Protection Checklist.	

RECORD KEEPING

The following represent records to be maintained on-site supporting confined space entry operations. As stated in the administrative guidelines, these records will be copied upon completion and submitted to the PHSO and/or the HSM for review and evaluation. Records to be maintained are as follows:

Completed Elements of this Program

- Completed Confined Space Entry Permits

- Associated AHA, Hot Work Permits, Excavation Permits, as applicable.

- Training Records
  - Confined Space Training Records (To define level of training – Entry Supervisor, Authorized Entrant, Attendant, Rescue). These records should identify initial and refresher dates and be accompanied by official Certificates of Training.
  - Site Specific Training Documentation of this completed Program.

- Medical Surveillance Evaluations

GENERAL REQUIREMENTS AND RESPONSIBILITIES

Only properly authorized and trained personnel will be permitted to participate in entry operations. The Entry Supervisor (the site Health and Safety Officer) will be responsible for conducting these authorizations and for ensuring that training requirements are satisfied. Persons involved with entry operations will be properly designated on the Permit. At least one Entry Attendant will be stationed outside of the space at all times during any confined space entry operation. The identity of the Attendant(s) will be clearly indicated on the entry permit. Attendants will not be assigned any additional duties that could interfere with fulfilling their responsibilities as space Attendants. **Multiple spaces will not be monitored by a single attendant**. This type of approach is strictly prohibited.

Emergency rescue operations will be non-entry means only. Emergency procedures will be specified on the entry permit.

If entry operations will involve the use of contractor personnel, the Subcontractor Permit Required Confined Space Program (See Attachment III of the Tetra Tech Confined Space Entry Operations Program) must be completed by the site Health and Safety Officer and maintained onsite.

At the conclusion of entry operations, the SSO will ensure that personnel and equipment have been removed from the space, that a final space evaluation is performed, and the permit will be canceled and filed. A copy of the canceled permit must be sent to the Tetra Tech Health and Safety Manager at the conclusion of the project, and not later than by November 30 for projects where work continues toward the end of a calendar year in order to facilitate the annual program evaluation process.

ATTACHMENT II

CONFINED SPACE ENTRY PROGRAM

For

Project Sites Involving Confined Spaces

Where Entries Will Not be Performed

CONFINED SPACE ENTRY PROGRAM
For
Project Sites Involving Confined Spaces
Where Entries Will Not be Performed

Site Name and Address: ____________________________ Project No.___________

____

Project Manager/Task Order Manager: ___________________________________

Site Manager: ___________________________________

Site Safety Officer: ___________________________________

Confined spaces that exist (or that may be created by project activities) at this site include the following: ____

____

____

____

____

____

____

Each of these spaces have been (or will be, upon creation) clearly posted with signs stating “DANGER - PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER”.

Entry into any of these spaces is NOT permitted by site personnel is for any reason.

Site Manager: ___________________________________ Date / /

Site Safety Officer:_________________________________ Date / /

POST THIS ON SITE

ATTACHMENT III

SUBCONTRACTOR PERMIT-REQUIRED CONFINED SPACE ENTRY OPERATIONS

SUBCONTRACTOR PERMIT-REQUIRED CONFINED SPACE ENTRY OPERATIONS

Site Name and Address:_________________________________ Project No.___________

____

Project Manager/Task Order Manager: ____

Telephone Number: (___) ___-____

Site Manager: ____

Site Safety Officer:____

Subcontractor Performing Confined Space Entry Operations:______________________________

1.0 General

This project site contains the confined spaces specified in Table 1. Entry into any of these spaces will be written permit only, and in compliance with the requirements of OSHA 29 CFR 1910.146. Permits will be coordinated with and submitted to the site Health and Safety Officer.

Table 1
Confined Spaces
at the
__________________________ Site

Space	Reason For Entry	Associated Hazards

2.0 Space Description and History (Note to SSO: this section must be filled out for EACH space to be entered by the subcontractor personnel. Attach additional pages to this program as appropriate.)

The nature of the work to be performed by ____

(name of subcontractor)

is ____

____

____

This will involve/require entry into ____

(description of space)

The hazards recognized or anticipated with this space include or may include (check and describe at apply):

_______a hazardous atmosphere involving ____

_______Material that could engulf an entrant, specifically___________________________

_______An internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section _______

____

_______Other serious safety or health hazards____

____

____

Tetra Tech has implemented the following precautions/procedures for the protection of our employees in or near this space:

- Education and training on confined space recognition
- Posting with "DANGER - PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER" or "DANGER - CONFINED SPACE - DO NOT ENTER" signs
- Other means as follows:____
  ____

If Tetra Tech and _________________________________ will need to perform concurrent operations in or near the space, activities will be conducted in accordance with the following coordinated system:________

____

____

____

____

____

3.0 Subcontractor Debrief

Work was concluded on ______/___/___. The following confined space hazards were confronted or created during entry operations.

____
____
____
____
____
____
____
____

Problems encountered in administering or complying with the site Confined Space Entry Program were as follows:____
____
____

Suggestions for improvements of this program discussed during the debrief included

____
____
____

______________________________	______________________________
Signature of Subcontractor Agent	SSO Signature

ATTACHMENT XI

HEAVY EQUIPMENT INSPECTION CHECKLIST

Heavy Equipment Inspection Checklist

Company:____ **Unit/Serial No#:**_______________________

Inspection Date: ____**/**____**/**____ **Time:**______**:**_____ **Equipment Type:**______________________________
(e.g., earthmoving equipment - tractors backhoes, bulldozers, etc.)

Project Name:__________________________________ **Project No#:**__________________________________

Yes	No	NA	Requirements	Comments
			Seat Belts	
☐	☐	☐	• Are available for intended operator and passengers (where applicable)	
☐	☐	☐	• Seat Belts are operational?	
			Roll-Over Protection (ROPS)	
☐	☐	☐	• Roll-over protection structures (ROPS) are provided on vehicles and heavy equipment (including scrapers, tractors, loaders, bulldozers, carryalls, etc.)	
			Brakes	
☐	☐	☐	• Brake systems capable of stopping and holding fully loaded equipment	
☐	☐	☐	• Parking Brake functions properly	
☐	☐	☐	• Wheel Chocks available (where and as applicable)	
			Access	
☐	☐	☐	• Non-slip steps	
☐	☐	☐	• Grab Handles (3-Point Grab/Step Mounting Points)	

Yes	No	NA	Requirements	Comments
			Audible Alarms	
☐	☐	☐	• Audible alarms – All bidirectional machines, such as rollers, compacters, front-end loaders, bulldozers, and similar equipment, shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction.	
☐	☐	☐	- Back up Alarms – All self propelled equipment with an obstructed view to the rear will be equipped with a reverse gear signal alarm distinguishable from the surrounding noise level.	
☐	☐	☐	• Horn functioning properly	

Yes	No	NA	Requirements	Comments
			Highway Use	
☐	☐	☐	• Fenders for equipment that can exceed 15mph	
☐	☐	☐	• Fire Extinguisher	
☐	☐	☐	• Are exhaust emissions directed away from the Operator?	
☐	☐	☐	• Cab	
☐	☐	☐	- Clean, free from debris, tools or equipment that can interfere with foot Control.	
☐	☐	☐	- Free from storage of flammable material/solvents	
☐	☐	☐	• Mirrors,	
☐	☐	☐	• Safety glass	
☐	☐	☐	- Equipped with defrosters	
☐	☐	☐	- Windshield wipers	
☐	☐	☐	• Turn signals, lights, brake lights, etc. (front/rear) for equipment approved for highway use?	
☐	☐	☐	• Gauges functioning properly	
☐	☐	☐	• Tires (Tread) or tracks	
☐	☐	☐	• Steering (standard and emergency)	
☐	☐	☐	• Are tools and material secured to prevent movement during transport?	
			Fluid Levels:	
☐	☐	☐	• Engine oil	
☐	☐	☐	• Transmission fluid	
☐	☐	☐	• Brake fluid	
☐	☐	☐	• Cooling system fluid	
☐	☐	☐	• Hoses and belts	
☐	☐	☐	• Hydraulic oil	

Yes	No	NA	Requirements	Comments
			Fueling	
☐	☐	☐	• Fueling of vehicles and heavy equipment is done with the engine off.	
☐	☐	☐	• No smoking is permitted at or near the fuel storage or refueling area. A sign is posted stating: NO SMOKING WITHIN 50 FEET.	
☐	☐	☐	• No sources of ignition are present near the fuel storage or refueling area.	
☐	☐	☐	• A dry chemical or carbon dioxide fire extinguisher (rated 6:BC or larger) is in a location accessible to the fueling area, no closer than 50-feet.	
☐	☐	☐	• Safety cans available?	
			Safety Guards –	
☐	☐	☐	• Around rotating apparatus (belts, pulleys, sprockets, spindles, drums, flywheels, chains) all points of operations protected from accidental contact?	
☐	☐	☐	• Hot pipes and surfaces are protected from accidental contact?	
☐	☐	☐	• High pressure pneumatic lines have safety cable to prevent thrashing should it become disconnected?	
			Attachments	
☐	☐	☐	• Have the attachments designed for use (as per manufacturer’s recommendation) with this equipment been inspected and are considered suitable for use?	

Yes	No	NA	Requirements	Comments
			Operator Qualifications	
☐	☐	☐	• Does the operator have proper licensing where applicable, (e.g., CDL)?	
☐	☐	☐	• Does the operator, understand the equipment's operating instructions?	
☐	☐	☐	• Is the operator experienced with this equipment?	
☐	☐	☐	• Is the operator 21 years of age or more?	
			PPE Required	
☐	☐	☐	• Hardhat	
☐	☐	☐	• Safety glasses	
☐	☐	☐	• Work gloves	
☐	☐	☐	• Chemical resistant gloves___________________________	
☐	☐	☐	• Steel toed Work Boots	
☐	☐	☐	• Chemical resistant Boot Covers	
☐	☐	☐	• Apron	
☐	☐	☐	• Coveralls Tyvek, Saranex, cotton)___________________	
☐	☐	☐	Key(s)?	
☐	☐	☐	Operating Manual?	
			Other Hazards	
☐	☐	☐	• Excessive Noise Levels _______________________dBA	
☐	☐	☐	• Chemical hazards (Drilling supplies - Sand, bentonite, grout, fuel, etc.)	
☐	☐	☐	- SDS available?	

Approved for Use ☐ Yes ☐ No ☐ See Comments

____ ____

Site Health and Safety Officer Operator

ATTACHMENT XII

OSHA HEALTH & SAFETY CONSTRUCTION-RELATED REGULATIONS - P - 650 TO 699 SUBPART P - EXCAVATIONS

OSHA Health & Safety Construction-related Regulations - P - 650 to 699

Subpart P - Excavations

§ 1926.650 - Scope, application, and definitions applicable to this subpart.

(a) *Scope and application.* This subpart applies to all open excavations made in the earth's surface. Excavations are defined to include trenches.

(b) *Definitions applicable to this subpart.*

Accepted engineering practices means those requirements which are compatible with standards of practice required by a registered professional engineer.

Aluminum Hydraulic Shoring means a pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (wales). Such system is designed specifically to support the sidewalls of an excavation and prevent cave-ins.

Bell-bottom pier hole means a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

Benching (Benching system) means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Cave-in means 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 other wise injure and immobilize a person.

Competent person means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Cross braces mean the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

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

Faces or *sides* means the vertical or inclined earth surfaces formed as a result of excavation work.

Failure means 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 means 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 means the accidental release or failure of a cross brace.

Protective system means 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 means 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.

Registered Professional Engineer means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

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

Shield (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either premanufactured or job-built in accordance with 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring (Shoring system) means 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.

Sides. See "Faces."

Sloping (Sloping system) means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable rock means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Structural ramp means a ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

Support system means a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated data means tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench (Trench excavation) means 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 (4.6 m). 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 (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Trench box. See "Shield."

Trench shield. See "Shield."

Uprights means the vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called "sheeting."

Wales means horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

§ 1926.651 - Specific excavation requirements.

(a) *Surface encumbrances.* All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.

(b) *Underground installations.*

(b)(1) The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.

(b)(2) Utility companies or owners shall be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of these installations,the employer may proceed, provided the employer does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used.

(b)(3) When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means.

(b)(4) While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.

(c)(2) *Means of egress from trench excavations.* A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

(d) *Exposure to vehicular traffic.* Employees exposed to public vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

(e) *Exposure to falling loads.* No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with 1926.601(b)(6), to provide adequate protection for the operator during loading and unloading operations.

(f) *Warning system for mobile equipment.* When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.

(h) *Protection from hazards associated with water accumulation.*

(h)(1) Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

(h)(2) If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.

(h)(3) If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a competent person and compliance with paragraphs (h)(1) and (h)(2) of this section.

(i) *Stability of adjacent structures.*

(i)(1) Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

(i)(2) Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:

(i)(2)(i) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or

(i)(2)(ii) The excavation is in stable rock; or

(i)(2)(iii) A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

(i)(2)(iv) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

(i)(3) Sidewalks, pavements and appurtenant structure shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

(j) *Protection of employees from loose rock or soil.*

(j)(1) Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.

(j)(2) Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet (.61 m) from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

(k) *Inspections.*

(k)(1) Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

(k)(2) Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

(l) Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Gurardrails which comply with 1926.502(b) shall be provided where walkways are 6 feet (1.8 m) or more above lower levels.

§ 1926.652 - Requirements for protective systems.

(a) *Protection of employees in excavations.*

(a)(1) Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with paragraph (b) or (c) of this section except when:

(a)(1)(i) Excavations are made entirely in stable rock; or

(a)(1)(ii) Excavations are less than 5 feet (1.52 m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.

(a)(2) Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

(b) *Design of sloping and benching systems.* The slopes and configurations of sloping and benching systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (b)(1); or, in the alternative, paragraph (b)(2); or, in the alternative, paragraph (b)(3); or, in the alternative, paragraph (b)(4), as follows:

(b)(1) Option (1) - Allowable configurations and slopes.

(b)(1)(i) Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal), unless the employer uses one of the other options listed below.

(b)(1)(ii) Slopes specified in paragraph (b)(1)(i) of this section, shall be excavated to form configurations that are in accordance with the slopes shown for Type C soil in Appendix B to this subpart.

(b)(2) Option (2) - Determination of slopes and configurations using Appendices A and B. Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in appendices A and B to this subpart.

(b)(4) Option (4) - Design by a registered professional engineer.

(b)(4)(i) Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) under paragraph (b) of this section shall be approved by a registered professional engineer.

(b)(4)(ii) Designs shall be in written form and shall include at least the following:

(b)(4)(ii)(A) The magnitude of the slopes that were determined to be safe for the particular project;

(b)(4)(ii)(B) The configurations that were determined to be safe for the particular project;

(b)(4)(ii)(C) The identity of the registered professional engineer approving the design.

(b)(4)(iii) At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time the design need not be at the jobsite, but a copy shall be made available to the Secretary upon request.

(c) *Design of support systems, shield systems, and other protective systems.* Designs of support systems, shield systems, and other protective systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (c)(2) as follows:

(c)(2) Option (2) - Designs Using Manufacturer's Tabulated Data.

(c)(2)(i) Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.

(c)(2)(ii) Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer shall only be allowed after the manufacturer issues specific written approval.

(c)(2)(iii) Manufacturer's specifications, recommendations, and limitations, and manufacturer's approval to deviate from the specifications, recommendations, and limitations shall be in written form at the jobsite during construction of the protective system. After that time this data may be stored off the jobsite, but a copy shall be made available to the Secretary upon request.

(e) *Installation and removal of support-*

(e)(1) *General.*

(e)(1)(i) Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.

(e)(1)(ii) Support systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.

(e)(1)(iii) Individual members of support systems shall not be subjected to loads exceeding those which those members were designed to withstand.

(e)(1)(iv) Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.

(e)(1)(v) Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.

(e)(1)(vi) Backfilling shall progress together with the removal of support systems from excavations.

(e)(2) *Additional requirements for support systems for trench excavations.*

(e)(2)(i) Excavation of material to a level no greater than 2 feed (.61 m) below the bottom of the members of a support system shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system.

(e)(2)(ii) Installation of a support system shall be closely coordinated with the excavation of trenches.

(f) *Sloping and benching systems.* Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

(g) *Shield systems.*

(g)(1) *General.*

(g)(1)(i) Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.

(g)(1)(ii) Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

(g)(1)(iii) Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.

(g)(1)(iv) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.

(g)(2) *Additional requirement for shield systems used in trench excavations.* Excavations of earth material to a level not greater than 2 feet (.61 m) below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

Subpart P Appendix A - Soil Classification

(a) *Scope and application.*

(a)(1) *Scope.* This appendix describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. The appendix contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

(a)(2) *Application.* This appendix applies when a sloping or benching system is designed in accordance with the requirements set forth in 1926.652(b)(2) as a method of protection for employees from cave-ins. This appendix also applies when timber shoring for excavations is designed as a method of protection from cave-ins in accordance with appendix C to subpart P of part 1926, and when aluminum hydraulic shoring is designed in accordance with appendix D. This Appendix also applies if other protective systems are designed and selected for use from data prepared in accordance with the requirements set forth in 1926.652(c), and the use of the data is predicated on the use of the soil classification system set forth in this appendix.

(b) *Definitions.* The definitions and examples given below are based on, in whole or in part, the following; American Society for Testing Materials (ASTM) Standards D653-85 and D2488; The Unified Soils Classification System; The U.S. Department of Agriculture (USDA) Textural Classification Scheme; and The National Bureau of Standards Report BSS-121.

Cemented soil means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

Cohesive soil means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sideslopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

Dry soil means soil that does not exhibit visible signs of moisture content.

Fissured means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular soil means gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

Layered system means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Moist soil means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

Saturated soil means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or sheer vane.

Soil classification system means, for the purpose of this subpart, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the environmental conditions of exposure.

Stable rock means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged soil means soil which is underwater or is free seeping.

Type A means cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if: (i) The soil is fissured; or (ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or (iii) The soil has been previously disturbed; or (iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or (v) The material is subject to other factors that would require it to be classified as a less stable material.

Type B means: (i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or (ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam. (iii) Previously disturbed soils except those which would otherwise be classed as Type C soil. (iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or (v) Dry rock that is not stable; or (vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C means: (i) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48kPa) or less; or (ii) Granular soils including gravel, sand, and loamy sand; or (iii) Submerged soil or soil from which water is freely seeping; or (iv) Submerged rock that is not stable, or (v) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

Unconfined compressive strength means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

Wet soil means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

(c) *Requirements*

(c)(1) *Classification of soil and rock deposits.* Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in paragraph (b) of this appendix.

(c)(2) *Basis of classification.* The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Such analyses shall be conducted by a competent person using tests described in paragraph (d) below, or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.

(c)(3) *Visual and manual analyses.* The visual and manual analyses, such as those noted as being acceptable in paragraph (d) of this appendix, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.

(c)(4) *Layered systems.* In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

(c)(5) *Reclassification.* If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.

(d) *Acceptable visual and manual tests.-*

(d)(1) *Visual tests.* Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

(d)(1)(i) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.

(d)(1)(ii) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.

(d)(1)(iii) Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.

(d)(1)(iv) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

(d)(1)(v) Observed the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.

(d)(1)(vi) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.

(d)(1)(vii) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

(d)(2) *Manual tests.* Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

(d)(2)(i) *Plasticity.* Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.

(d)(2)(ii) *Dry strength.* If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

(d)(2)(iii) *Thumb penetration.* The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard designation D2488 - "Standard Recommended Practice for Description of Soils (Visual - Manual Procedure).") Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.

(d)(2)(iv) *Other strength tests.* Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.

(d)(2)(v) *Drying test.* The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry:

(d)(2)(v)(A) If the sample develops cracks as it dries, significant fissures are indicated.

(d)(2)(v)(B) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as an unfissured cohesive material and the unconfined compressive strength should be determined.

(d)(2)(v)(C) If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

Subpart P Appendix B - Sloping and Benching

(a) *Scope and application.* This appendix contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins. The requirements of this appendix apply when the design of sloping and benching protective systems is to be performed in accordance with the requirements set forth in 1926.652(b)(2).

(b) *Definitions.*

Actual slope means the slope to which an excavation face is excavated.

Distress means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and ravelling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

Maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

Short term exposure means a period of time less than or equal to 24 hours that an excavation is open.

(c) *Requirements -*

(c)(1) *Soil classification.* Soil and rock deposits shall be classified in accordance with appendix A to subpart P of part 1926.

(c)(2) *Maximum allowable slope.* The maximum allowable slope for a soil or rock deposit shall be determined from Table B-1 of this appendix.

(c)(3) *Actual slope.*

(c)(3)(i) The actual slope shall not be steeper than the maximum allowable slope.

(c)(3)(ii) The actual slope shall be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope shall be cut back to an actual slope which is at least 1/2 horizontal to one vertical (1/2H:1V) less steep than the maximum allowable slope.

(c)(3)(iii) When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that such reduction is achieved. Surcharge loads from adjacent structures shall be evaluated in accordance with 1926.651(i).

(c)(4) *Configurations.* Configurations of sloping and benching systems shall be in accordance with Figure B-1.

TABLE B-1.
Maximum Allowable Slopes

SOIL OR ROCK TYPE	MAXIMUM ALLOWABLE SLOPES (H:V) [1] FOR EXCAVATIONS LESS THAN 20 FEET DEEP [3]
STABLE ROCK	VERTICAL (90 Deg.)
TYPE A [2]	3/4:1 (53 Deg.)
TYPE B	1:1 (45 Deg.)
TYPE C	1 1/2:1 (34 Deg.)

[1] Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.

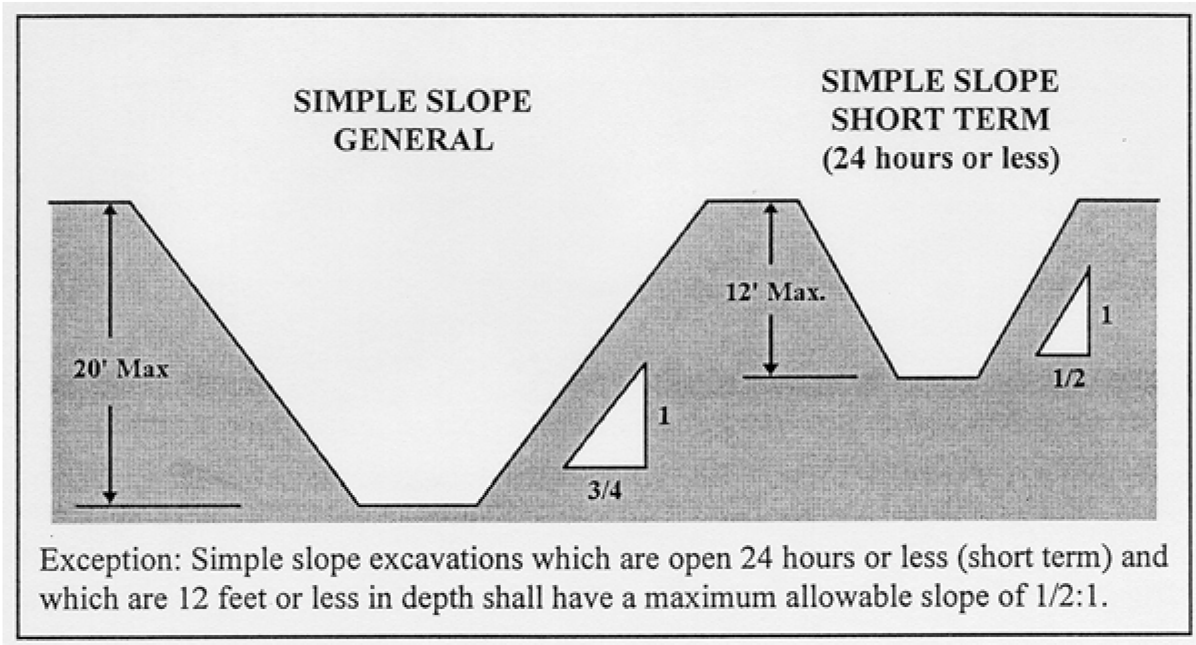
[2] A short-term maximum allowable slope of 1/2H:1V (63 degrees) is allowed in excavations in Type A soil that are 12 feed (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be 3/4H:1V (53 degrees).

[3] Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

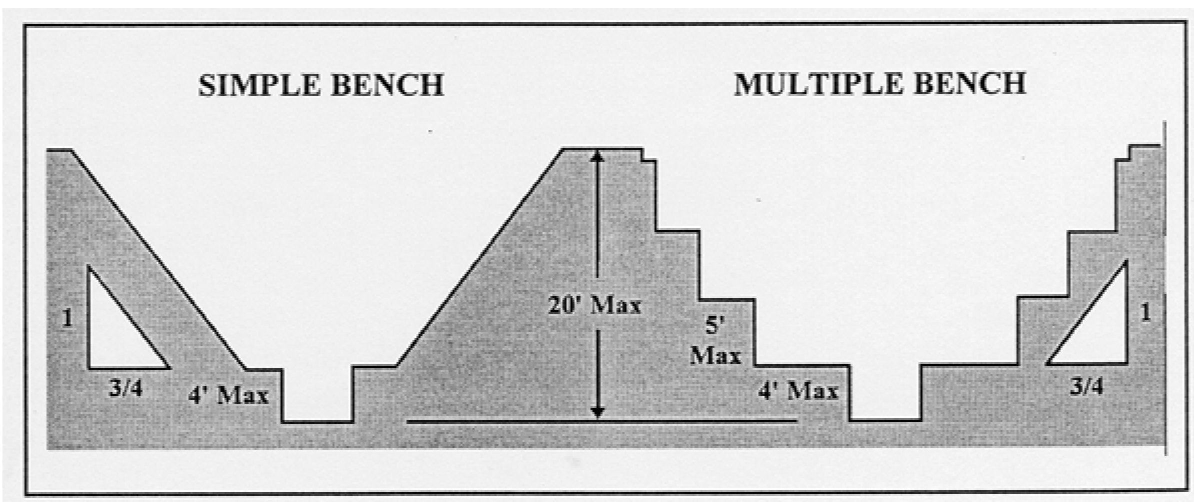
Figure B-1 - Slope Configurations
(All slopes stated below are in the horizontal to vertical ratio)

B-1.1 Excavations made in Type A soil.

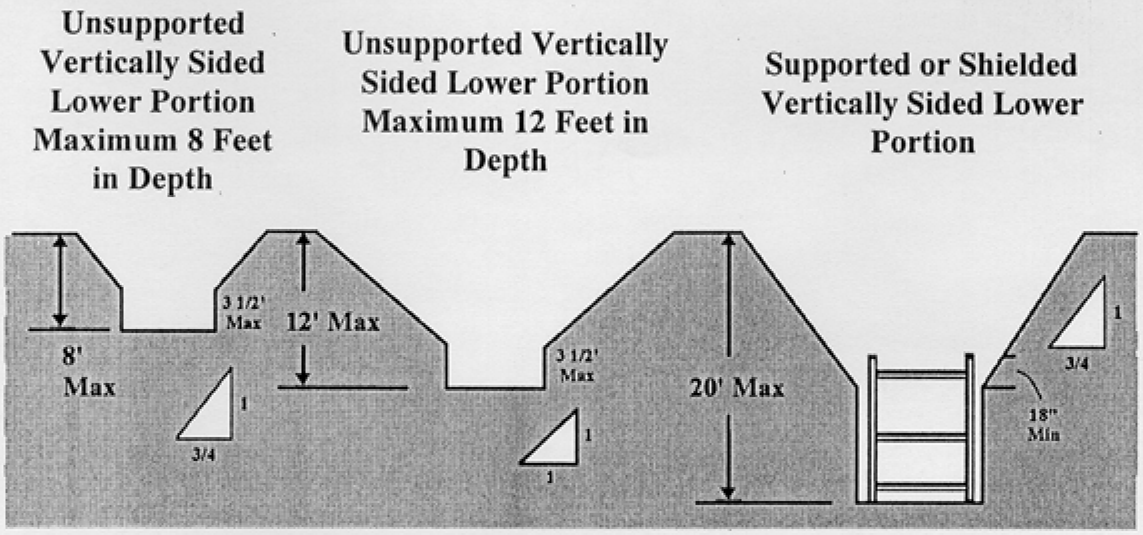
1. All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of 3/4:1.



2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 3/4 to 1 and maximum bench dimensions as follows:



3. All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3 1/2 feet.



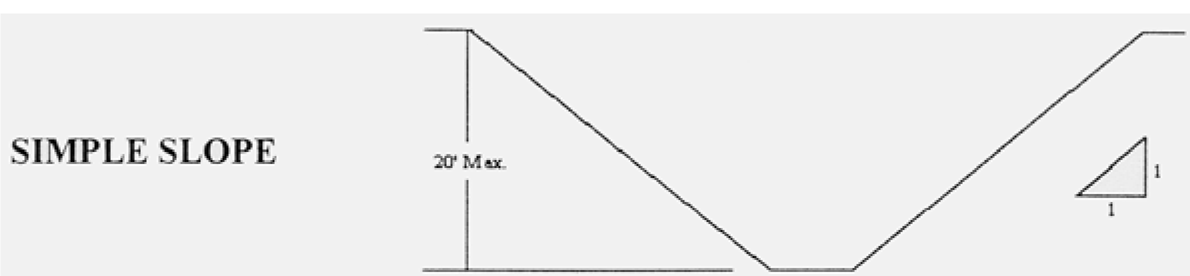
All excavations more than 8 feet but not more than 12 feet in depth with unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of 3 1/2 feet.

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 3/4:1. The support or shield system must extend at least 18 inches above the top of the vertical side.

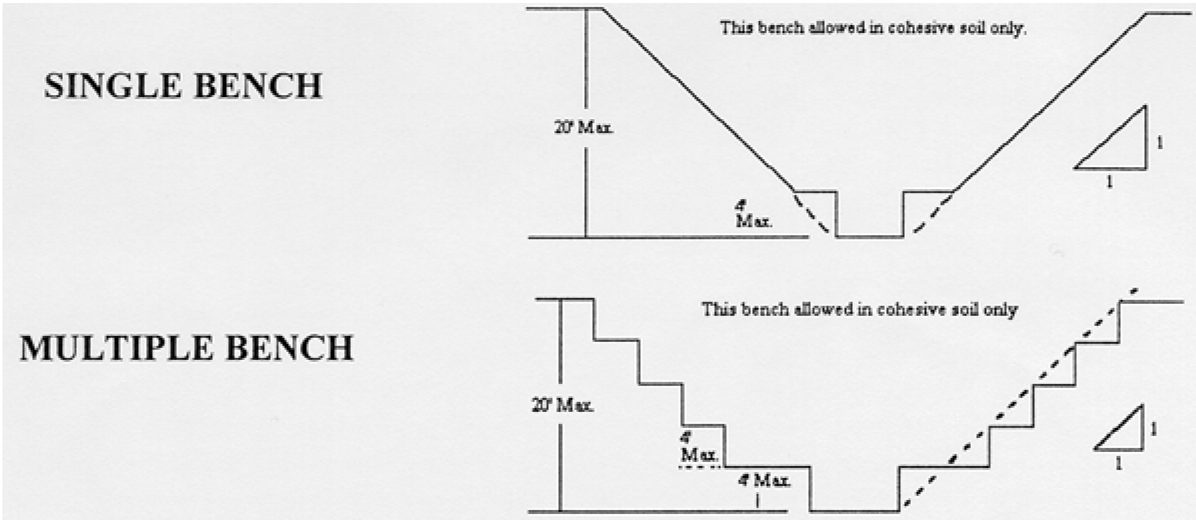
4. All other simple slope, compound slope, and vertically sided lower portion excavations shall be in accordance with the other options permitted under 1926.652(b).

B-1.2 Excavations made in Type B soil.

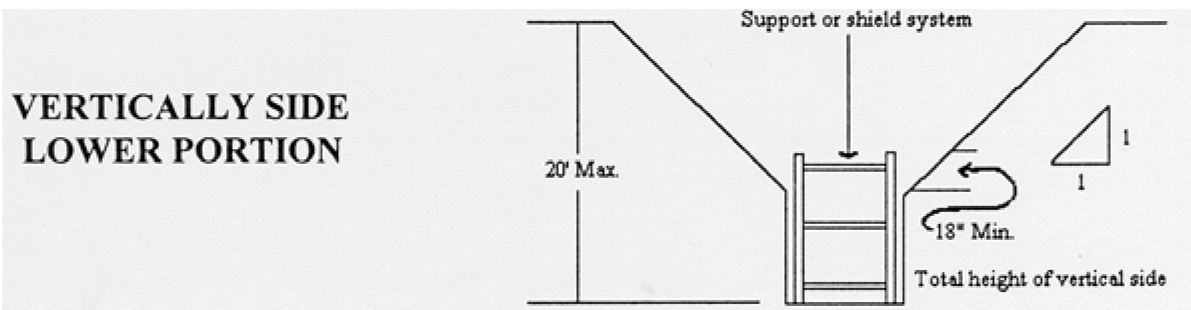
1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.



2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as follows:



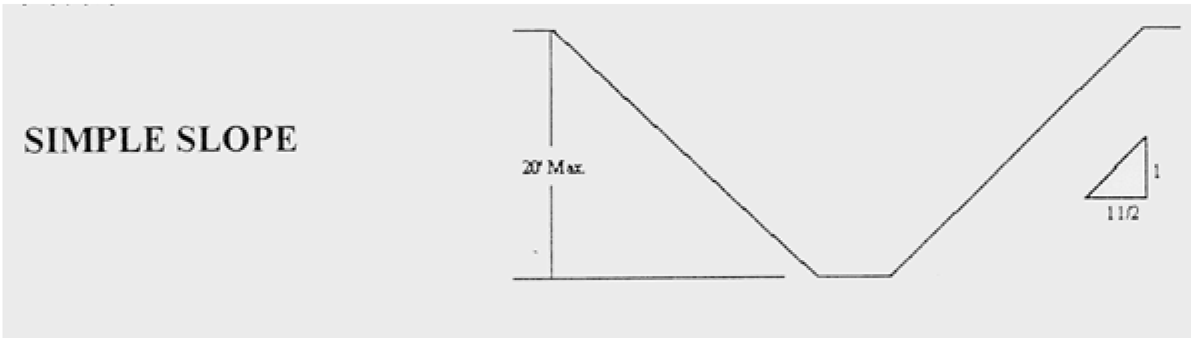
3. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1:1.



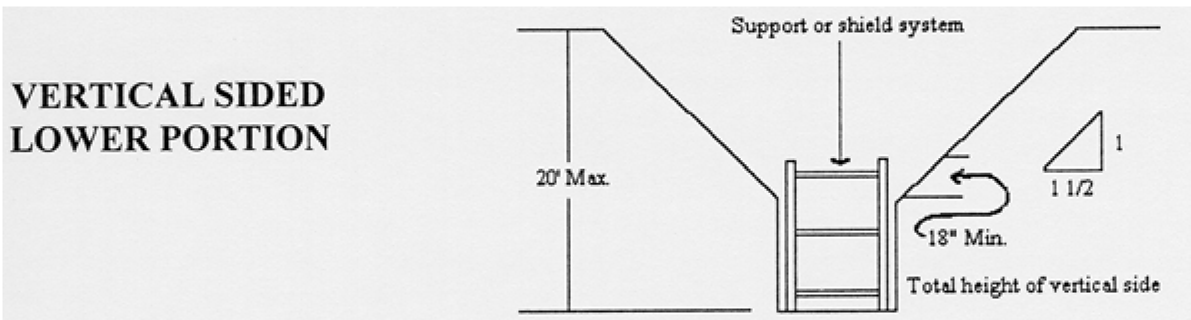
4. All other sloped excavations shall be in accordance with the other options permitted in 1926.652(b).

B-1.3 Excavations made in Type C soil.

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1 1/2:1.



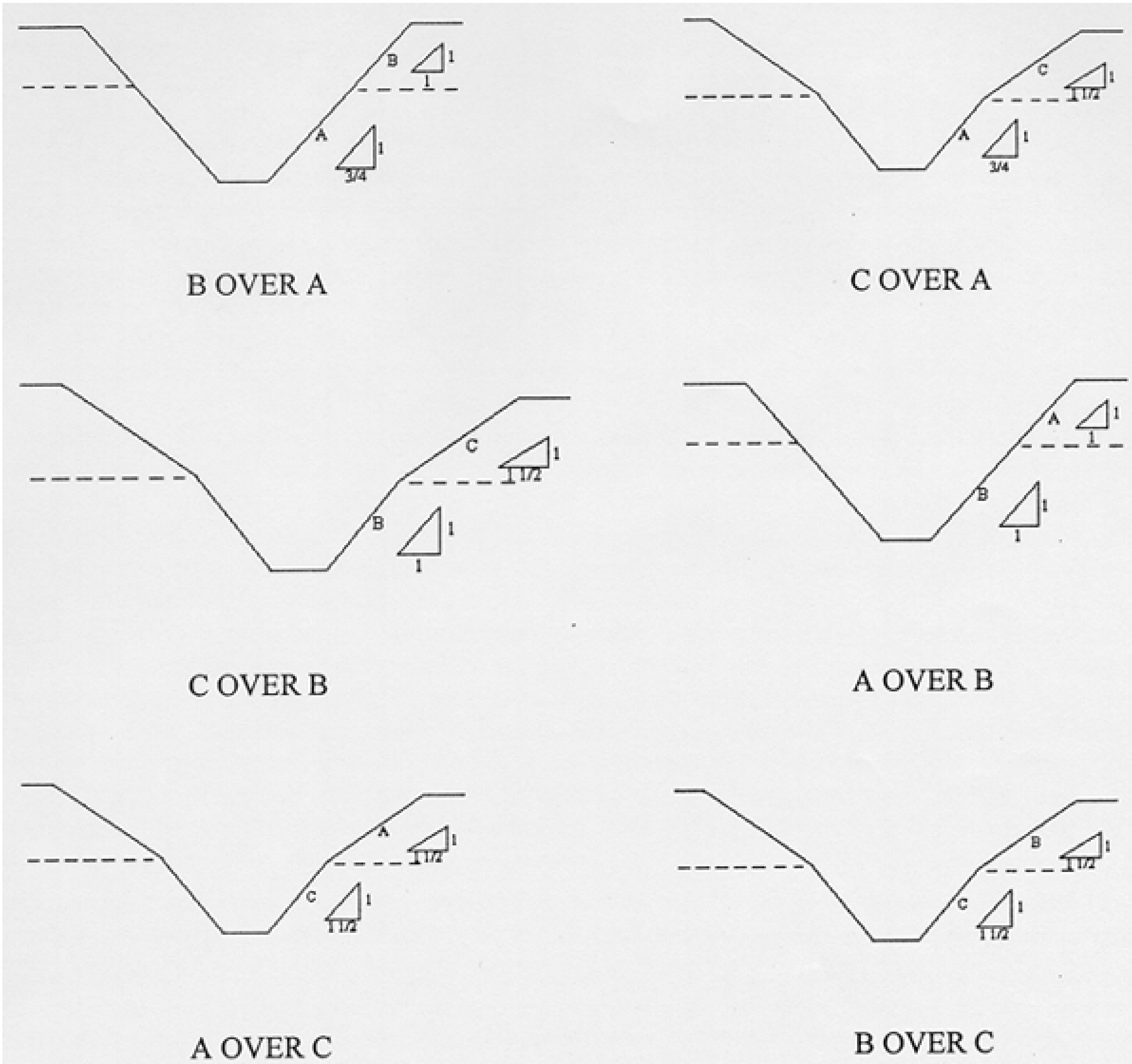
2. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1 1/2:1.



3. All other sloped excavations shall be in accordance with the other options permitted in 1926.652(b).

B-1.4 Excavations made in Layered Soils

1. All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.



2. All other sloped excavations shall be in accordance with the other options permitted in 1926.652(b).

ATTACHMENT XIII

TETRA TECH DECONTAMINATION OF FIELD EQUIPMENT AND WASTE HANDLING STANDARD OPERATING PROCEDURE

TETRA TECH NUS, INC.	STANDARD OPERATING PROCEDURES	Number SA-7.1	Page 1 of 8
		Effective Date 09/03	Revision 3
		Applicability Tetra Tech NUS, Inc.	
		Prepared Earth Sciences Department	
Subject DECONTAMINATION OF FIELD EQUIPMENT		Approved D. Senovich	

TABLE OF CONTENTS

1.0 PURPOSE

Decontamination is the process of removing and/or neutralizing site contaminants that have contacted and/or accumulated on equipment. The objective/purpose of this SOP is intended to protect site personnel, general public, and the sample integrity through the prevention of cross contamination onto unaffected persons or areas. It is further intended through this procedure to provide guidelines regarding the appropriate procedures to be followed when decontaminating drilling equipment, monitoring well materials, chemical sampling equipment and field analytical equipment.

2.0 SCOPE

This procedure applies to all equipment including drilling equipment, heavy equipment, monitoring well materials, as well as chemical sampling and field analytical equipment decontamination that may be used to provide access/acquire environmental samples. Where technologically and economically feasible, single use sealed disposable equipment will be employed to minimize the potential for cross contamination. This procedure also provides general reference information on the control of contaminated materials.

3.0 GLOSSARY

Acid - For decontamination of equipment when sampling for trace levels of inorganics, a 10% solution of nitric acid in deionized water should be used. Due to the leaching ability of nitric acid, it should not be used on stainless steel.

Alconox/Liquinox - A brand of phosphate-free laboratory-grade detergent.

Decontamination Solution - Is a solution selected/identified within the Health and Safety Plan or Project-Specific Quality Assurance Plan. The solution is selected and employed as directed by the project chemist/health and safety professional.

Deionized Water (DI) - Deionized water is tap water that has been treated by passing through a standard deionizing resin column. This water may also pass through additional filtering media to attain various levels of analyte-free status. The DI water should meet CAP and NCCLS specifications for reagent grade, Type I water.

Potable Water - Tap water used from any municipal water treatment system. Use of an untreated potable water supply is not an acceptable substitute for tap water.

Pressure Washing - Employs high pressure pumps and nozzle configuration to create a high pressure spray of potable water. High pressure spray is employed to remove solids.

Solvent - The solvent of choice is pesticide-grade Isopropanol. Use of other solvents (methanol, acetone, pesticide-grade hexane, or petroleum ether) may be required for particular projects or for a particular purpose (e.g. for the removal of concentrated waste) and must be justified in the project planning documents. As an example, it may be necessary to use hexane when analyzing for trace levels of pesticides, PCBs, or fuels. In addition, because many of these solvents are not miscible in water, the equipment should be air dried prior to use. Solvents should not be used on PVC equipment or well construction materials.

Steam Pressure Washing - This method employs a high pressure spray of heated potable water. This method through the application of heat provides for the removal of various organic/inorganic compounds.

4.0 RESPONSIBILITIES

Project Manager - Responsible for ensuring that all field activities are conducted in accordance with approved project plan(s) requirements.

Field Operations Leader (FOL) - Responsible for the onsite verification that all field activities are performed in compliance with approved Standards Operating Procedures or as otherwise dictated by the approved project plan(s).

Site Health and Safety Officer (SHSO) - The SHSO exercises shared responsibility with the FOL concerning decontamination effectiveness. All equipment arriving on-site (as part of the equipment inspection), leaving the site, moving between locations are required to go through a decontamination evaluation. This is accomplished through visual examination and/or instrument screening to determine the effectiveness of the decontamination process. Failure to meet these objectives are sufficient to restrict equipment from entering the site/exiting the site/ or moving to a new location on the site until the objectives are successfully completed.

5.0 PROCEDURES

The process of decontamination is accomplished through the removal of contaminants, neutralization of contaminants, or the isolation of contaminants. In order to accomplish this activity a level of preparation is required. This includes site preparation, equipment selection, and evaluation of the process. Site contaminant types, concentrations, media types, are primary drivers in the selection of the types of decontamination as well as where it will be conducted. For purposes of this SOP discussion will be provided concerning general environmental investigation procedures.

The decontamination processes are typically employed at:

- Temporary Decontamination Pads/Facilities
- Sample Locations
- Centralized Decontamination Pad/Facilities
- Combination of some or all of the above

The following discussion represents recommended site preparation in support of the decontamination process.

5.1 Decontamination Design/Constructions Considerations

5.1.1 Temporary Decontamination Pads

Temporary decontamination pads are constructed at satellite locations in support of temporary work sites. These structures are generally constructed to support the decontamination of heavy equipment such as drill rigs and earth moving equipment but can be employed for smaller articles.

The purpose of the decontamination pad is to contain wash waters and potentially contaminated soils generated during decontamination procedures. Therefore, construction of these pads should take into account the following considerations

- Site Location – The site selected should be within a reasonable distance from the work site but should avoid:

  - Pedestrian/Vehicle thoroughfares
  - Areas where control/custody cannot be maintained
  - Areas where a potential releases may be compounded through access to storm water transport systems, streams or other potentially sensitive areas.
  - Areas potentially contaminated.

- Pad – The pad should be constructed to provide the following characteristics

  - Size – The size of the pad should be sufficient to accept the equipment to be decontaminated as well as permitting free movement around the equipment by the personnel conducting the decontamination.

  - Slope – An adequate slope will be constructed to permit the collection of the water and potentially contaminated soils within a trough or sump constructed at one end. The collection point for wash waters should be of adequate distance that the decontamination workers do not have to walk through the wash waters while completing their tasks.

  - Sidewalls – The sidewalls should be a minimum of 6-inches in height to provide adequate containment for wash waters and soils. If splash represents a potential problem, splash guards should be constructed to control overspray. Sidewalls maybe constructed of wood, inflatables, sand bags, etc. to permit containment.

  - Liner – Depending on the types of equipment and the decontamination method the liner should be of sufficient thickness to provide a puncture resistant barrier between the decontamination operation and the unprotected environment. Care should be taken to examine the surface area prior to placing the liner to remove sharp articles (sticks, stones, debris) that could puncture the liner. Liners are intended to form an impermeable barrier. The thickness may vary from a minimum recommended thickness of 10 mil to 30 mil. Achieving the desired thickness maybe achieved through layering lighter constructed materials. It should be noted that various materials (rubber, polyethylene sheeting) become slippery when wet. To minimize this potential hazard associated with a sloped liner a light coating of sand maybe applied to provide traction as necessary.

  - Wash/drying Racks – Auger flights, drill/drive rods require racks positioned off of the ground to permit these articles to be washed, drained, and dried while secured from falling during this process. A minimum ground clearance of 2-feet is recommended.

  - Maintenance – The work area should be periodically cleared of standing water, soils, and debris. This action will aid in eliminating slip, trip, and fall hazards. In addition, these articles will reduce potential backsplash and cross contamination. Hoses should be gathered when not in use to eliminate potential tripping hazards.

5.1.2 Decontamination Activities at Drill Rigs/DPT Units

During subsurface sampling activities including drilling and direct push activities decontamination of drive rods, Macro Core Samplers, split spoons, etc. are typically conducted at an area adjacent to the operation. Decontamination is generally accomplished using a soap/water wash and rinse utilizing buckets and brushes. This area requires sufficient preparation to accomplish the decontamination objectives.

Buckets shall be placed within mortar tubs or similar secondary containment tubs to prevent splash and spills from reaching unprotected media. Drying racks will be employed as directed for temporary pads to permit parts to dry and be evaluated prior to use/re-use.

5.1.3 Decontamination Activities at Remote Sample Locations

When sampling at remote locations sampling devices such as trowels, pumps/tubing should be evacuated of potentially contaminated media to the extent possible. This equipment should be wrapped in plastic for transport to the temporary/centralized decontamination location for final cleaning and disposition.

5.2 Equipment Decontamination Procedures

The following represents procedures to be employed for the decontamination of equipment that may have contacted and/or accumulated contamination through site investigation activities.

5.2.1 Monitoring Well Sampling Equipment

5.2.1.1 Groundwater sampling pumps – This includes pumps inserted into the monitoring well such as Bladder pumps, Whale pumps, Redi-Flo, reusable bailers, etc.

1) Evacuate to the extent possible, any purge water within the pump.

2) Scrub using soap and water and/or steam clean the outside of the pump and tubing, where applicable.

3) Insert the pump and tubing into a clean container of soapy water. Pump a sufficient amount of soapy water through the pump to flush any residual purge water. Once flushed, circulate soapy water through the pump to ensure the internal components are thoroughly flushed.

4) Remove the pump and tubing from the container, rinse external components using tap water. Insert the pump and tubing into a clean container of tap water. Pump a sufficient amount of tap water through the pump to evacuate all of the soapy water (until clear).

5) Rinse equipment with pesticide grade isopropanol

6) Repeat item #4 using deionized water through the hose to flush out the tap water and solvent residue as applicable*.

7) Drain residual deionized water to the extent possible, allow components to air dry.

8) Wrap pump in aluminum foil or a clear clean plastic bag for storage.

5.2.1.2 Electronic Water Level Indicators/Sounders/Tapes

During water level measurements, rinsing with the extracted tape and probe with deionized water and wiping the surface of the extracted tape is acceptable. However, periodic full decontamination should be conducted as indicated below.

* - The solvent should be employed when samples contain oil, grease, PAHs, PCBs, and other hard to remove materials. If these are not of primary concern, the solvent step may be omitted. In addition, do not rinse PE, PVC, and associated tubing with solvents.

1) Wash with soap and water
2) Rinse with tap water
3) Rinse with deionized water

Note: In situations where oil, grease, free product, other hard to remove materials are encountered probes and exposed tapes should be washed in hot soapy water.

5.2.1.3 Miscellaneous Equipment

Miscellaneous equipment including analytical equipment (water quality testing equipment) should be cleaned per manufacturer's instructions. This generally includes wiping down the sensor housing and rinsing with tap and deionized water.

Coolers/Shipping Containers employed to ship samples are received from the lab in a variety of conditions from marginal to extremely poor. Coolers should be evaluated prior to use for

- Structural integrity – Coolers missing handles or having breaks within the outer housing should be removed and not used. Notify the laboratory that the risk of shipping samples will not be attempted and request a replacement unit.

- Cleanliness – As per protocol only volatile organic samples are accompanied by a trip blank. If a cooler's cleanliness is in question (visibly dirty/stained) or associated with noticeable odors it should be decontaminated prior to use.

  1) Wash with soap and water
  2) Rinse with tap water
  3) Dry

If these measures fail to clean the cooler to an acceptable level, remove the unit from use as a shipping container and notify the laboratory to provide a replacement unit.

5.2.2 Down-Hole Drilling Equipment

This includes any portion of the drill rig that is over the borehole including auger flights, drill stems, rods, and associated tooling that would extend over the borehole. This procedure is to be employed prior to initiating the drilling/sampling activity, then between locations.

1) Remove all soils to the extent possible using shovels, scrapers, etc. to remove loose soils.
2) Through a combination of scrubbing using soap and water and/or steam cleaning remove visible dirt/soils.
3) Rinse with tap water.
4) Rinse equipment with pesticide grade isopropanol
5) To the extent possible allow components to air dry.
6) Wrap or cover equipment in clear plastic until it is time to be used.

5.2.3 Soil/Sediment Sampling Equipment

This consists of soil sampling equipment including but not limited to hand augers, stainless steel trowels/spoons, bowls, dredges, scoops, split spoons, Macro Core samplers, etc.

1) Remove all soils to the extent possible.

2) Through a combination of scrubbing using soap and water and/or steam cleaning remove visible dirt/soils.

3) Rinse with tap water.

4) Rinse equipment with pesticide grade isopropanol

5) Rinse with deionized water

6) To the extent possible allow components to air dry.

7) If the device is to be used immediately, screen with a PID/FID to insure all solvents (if they were used) and trace contaminants have been adequately removed.

8) Once these devices have been dried wrap in aluminum foil for storage until it is time to be used.

5.3 Contact Waste/Materials

During the course of field investigations disposable/single use equipment becomes contaminated. These items include tubing, trowels, PPE (gloves, overboots, splash suits, etc.) broken sample containers.

With the exception of the broken glass, single use articles should be cleaned (washed and rinsed) of visible materials and disposed of as normal refuse. The exception to this rule is that extremely soiled materials that cannot be cleaned should be containerized for disposal in accordance with applicable federal state and local regulations.

5.3.1 Decontamination Solutions

All waste decontamination solutions and rinses must be assumed to contain the hazardous chemicals associated with the site unless there are analytical or other data to the contrary. The waste solution volumes could vary from a few gallons to several hundred gallons in cases where large equipment required cleaning.

Containerized waste rinse solutions are best stored in 55-gallon drums (or equivalent containers) that can be sealed until ultimate disposal at an approved facility. These containers must be appropriately labeled.

5.4 Decontamination Evaluation

Determining the effectiveness of the decontamination process will be accomplished in the following manner

- Visual Evaluation – A visual evaluation will be conducted to insure the removal of particulate matter. This will be done to insure that the washing/rinsing process is working as intended.

- Instrument Screening – A PID and/or an FID should be used to evaluate the presence of the contaminants or solvents used in the cleaning process. The air intake of the instrument should be passed over the article to be evaluated. A positive detection requires a repeat the decontamination process. It should be noted that the instrument scan is only viable if the contaminants are detectable within the instruments capabilities.

- Rinsate Blanks – It is recommended that Rinsate samples be collected to

  - Evaluate the decontamination procedure representing different equipment applications (pumps versus drilling equipment) and different decontamination applications.

  - Single use disposable equipment – The number of samples should represent different types of equipment as well as different Lot Numbers of single use articles.

The collection and the frequency of collection of rinsate samples are as follows:

- Per decontamination method
- Per disposable article/Batch number of disposable articles

It is recommended that an initial rinsate sample be collected early in the project to ensure that the decontamination process is functioning properly and in an effort to avoid using a contaminated batch of single use articles. It is recommended that a follow up sample be collected during the execution of the project to insure those conditions do not change. Lastly, rinsate samples collection may be driven by types of and/or contaminant levels. Hard to remove contaminants, oils/greases, some PAHs/PCBs, etc. may also support the collection of additional rinsates due to the obvious challenges to the decontamination process. This is a field consideration to be determined by the FOL.

ATTACHMENT XIV

DIVE CONTRACTOR HASP

ATTACHMENT XV

OSHA POSTER

U.S. Department of Labor

OSHA®
Occupational Safety and Health Administration

Job Safety and Health
IT'S THE LAW!

All workers have the right to:

- A safe workplace.
- Raise a safety or health concern with your employer or OSHA, or report a work-related injury or illness, without being retaliated against.
- Receive information and training on job hazards, including all hazardous substances in your workplace.
- Request an OSHA inspection of your workplace if you believe there are unsafe or unhealthy conditions. OSHA will keep your name confidential. You have the right to have a representative contact OSHA on your behalf.
- Participate (or have your representative participate) in an OSHA inspection and speak in private to the inspector.
- File a complaint with OSHA within 30 days (by phone, online or by mail) if you have been retaliated against for using your rights.
- See any OSHA citations issued to your employer.
- Request copies of your medical records, tests that measure hazards in the workplace, and the workplace injury and illness log.

This poster is available free from OSHA.

Employers must:

- Provide employees a workplace free from recognized hazards. It is illegal to retaliate against an employee for using any of their rights under the law, including raising a health and safety concern with you or with OSHA, or reporting a work-related injury or illness.
- Comply with all applicable OSHA standards.
- Report to OSHA all work-related fatalities within 8 hours, and all inpatient hospitalizations, amputations and losses of an eye within 24 hours.
- Provide required training to all workers in a language and vocabulary they can understand.
- Prominently display this poster in the workplace.
- Post OSHA citations at or near the place of the alleged violations.

FREE ASSISTANCE to identify and correct hazards is available to small and medium-sized employers, without citation or penalty, through OSHA-supported consultation programs in every state.

Contact OSHA. We can help.

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