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FINAL SITE 17 GEOPHYSICAL INVESTIGATION PLAN NSWC INDIAN HEAD MD
5/1/2009
CH2MHILL

Final
Site 17 Geophysical Investigation Plan

Naval Support Facility Indian Head
Indian Head, Maryland



Prepared for
Department of the Navy
Naval Facilities Engineering Command
Washington

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Site 17 Geophysical Investigation Plan

Naval Support Facility Indian Head Indian Head, Maryland

Contract Task Order 038

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Acronyms and Abbreviations

bgs	below ground surface
DGM	digital geophysical mapping
DQO	data quality objective
FTP	file transfer protocol
GIP	Geophysical Investigation Plan
GSV	geophysical system verification
JATO	jet assisted take-off
MEC	munitions and explosives of concern
MPPEH	material potentially presenting an explosive hazard
MRSIMS	Munitions Response Site Information System
NSF-IH	Naval Support Facility, Indian Head
OSHA	Occupational Safety and Health Administration
PDF	portable document format
QC	quality control
RTK	real-time kinematic
SUXOS	Senior UXO Supervisor
UTM	universal transverse mercator
UXO	unexploded ordnance

1.0 Geophysical Operations Overview

This Geophysical Investigation Plan (GIP) provides details of the equipment, approach, methods, operational procedures, and quality control (QC) methods to be used in performing the geophysical investigation at Site 17, Naval Support Facility Indian Head (NSF-IH), Indian Head, Maryland. NSF-IH is a Navy facility in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, DC. Site 17 is in the southeast portion of the facility and is defined as a 1,000-foot stretch of Mattawoman Creek shoreline where metal parts were discarded. The geophysical investigation discussed in this GIP is for an approximately 9,500-square-foot (0.21-acre) area within Site 17 (Figure 1). The purpose of the geophysical investigation is to identify subsurface anomalies within the focus area. This information will be used by CH2M HILL to evaluate the need for clearing munitions and explosives of concern (MEC) and non-MEC related items before implementing a remedial action (soil mixing) that will address shallow groundwater contamination at Site 17.

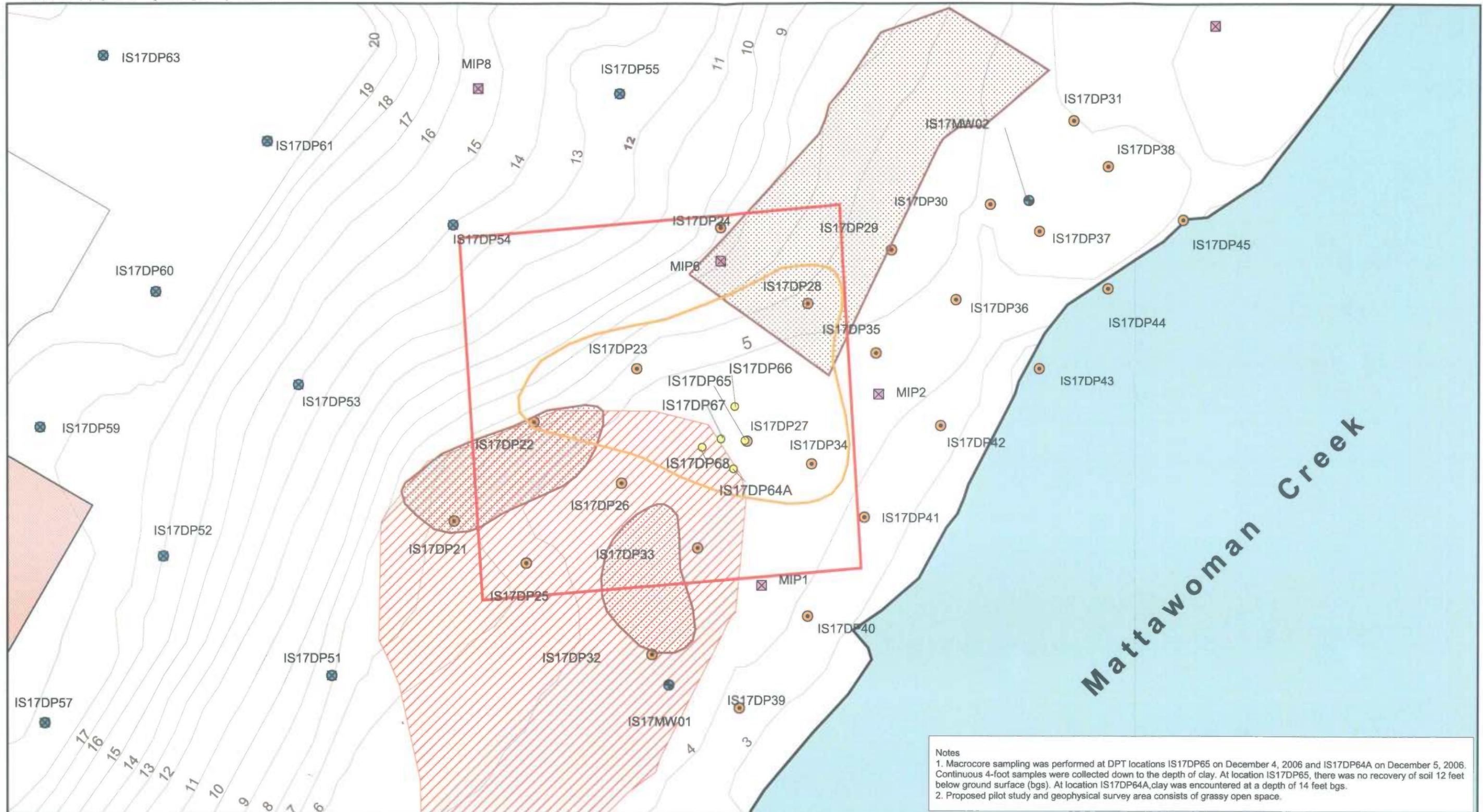
The following topics are covered in the remaining subsections of this GIP: safety issues; geophysical data quality objectives (DQOs); description of the site; anticipated MEC types, quantities, compositions, and depths; site physical conditions (geology and topography); adverse geophysical conditions; site utilities and manmade features that may affect the geophysical operation; data acquisition and reporting; and geophysical program QC requirements.

Geophysical instruments will be used during digital geophysical mapping (DGM) survey operations that record instrument response digitally, allowing for the subsequent download and interpretation of the data. DGM instruments will be operated by the DGM subcontractor.

Geophysical instruments used during operations such as clearance of locations for emplacement of survey stakes will be analog, meaning these instruments will be used to detect metallic items in the subsurface on a real-time basis and the instrument response will not be recorded. Generally analog instruments indicate the presence of metallic anomalies through sound or visual display. Analog instruments will be operated by an unexploded ordnance (UXO) Technician III or II.

2.0 Safety Issues

Personnel are required to adhere to the project Health and Safety Plan. Based on a site visit performed March 10, 2009, there are no MEC or material potentially presenting an explosive hazard (MPPEH) items on the surface within the survey area or along the access routes. Therefore, a surface clearance will not be required. But these items may be present in the general vicinity of the survey area (along the shoreline, for example). MEC avoidance will be practiced during all site visits and during the geophysical survey. MEC avoidance will be provided by one UXO Technician III or CH2M HILL Senior UXO Supervisor (SUXOS). DGM survey personnel will not access areas outside of the survey area or access routes, as directed by the SUXOS or UXO Technician. Personnel are prohibited from



Notes
 1. Macrocore sampling was performed at DPT locations IS17DP65 on December 4, 2006 and IS17DP64A on December 5, 2006. Continuous 4-foot samples were collected down to the depth of clay. At location IS17DP65, there was no recovery of soil 12 feet below ground surface (bgs). At location IS17DP64A, clay was encountered at a depth of 14 feet bgs.
 2. Proposed pilot study and geophysical survey area consists of grassy open space.

- LEGEND**
- Monitoring Wells
 - ⊠ July 2002 Membrane Interface Probe/Direct Push Technique Locations
 - December 2004 MIP/DPT and March 2005 DPT Locations
 - ⊙ August 2005 MIP/DPT Locations
 - December 2006 DPT Locations
 - Buildings
 - ▨ Backfill with 1-foot Layer of clean Soil and 0.5-foot Layer of Gravel, FSSI, 2006

- Demolished Buildings
- ▨ Drum Removal Area (FSSI, 2006)
- ▭ Proposed Geophysical Survey Area (9,531sq. ft.)
- ▭ Proposed Pilot Study Area (3,539 sq. ft.)
- Road
- Topographic Elevation Contours (1 foot Intervals)
- Base Boundary

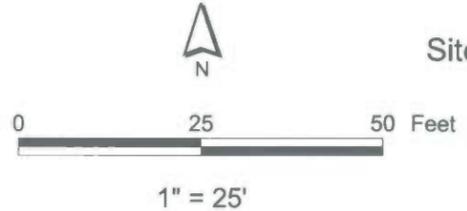


Figure 1
 Site 17 Proposed Geophysical Investigation Area
 Geophysical Investigation Plan
 NSF-IH, Indian Head, Maryland

touching, handling, moving, or investigating any item that resembles MEC or MPPEH. It is noted that some MEC/MPPEH items potentially present at NSF-IH are not typical "inventory items" and therefore may not initially appear to be MEC/MPPEH (e.g., research and development items). Upon encountering a potential MEC/MPPEH item, survey personnel will retreat to the designated rally point and immediately inform the Senior UXO Supervisor (SUXOS). The SUXOS will report the finding to the base contact (Nick Carros, 301-744-2263) and then contact the CH2M HILL Project Manager. The base contact will coordinate any further action related to the item using base resources.

3.0 DGM Personnel Qualifications

DGM operations will be conducted by personnel experienced in MEC geophysical operations and led by a qualified MEC geophysicist. All DGM support personnel onsite will have documentation of completion of the 40-hour Occupational Safety and Health Administration (OSHA) certification, any necessary re-certification (8-hour refresher), and OSHA-compliant medical monitoring physical exams. At least one DGM team member shall be qualified to administer first aid and cardiopulmonary resuscitation. Throughout DGM operations, DGM support personnel will strictly adhere to the general practices given in this GIP and specifically in the project Health and Safety Plan.

4.0 Area to be Investigated

The area to be investigated is shown in Figure 1.

A single grid (100 feet by 95 feet) will be established across the survey area to track progress and data processing. Control points will be placed on the ground using either a real-time kinematic (RTK) global positioning system or conventional survey equipment as required to use the DGM system validated through the geophysical system verification (GSV) process (see Attachment A).

5.0 Past, Current, and Future Site Uses

As noted earlier, Site 17 is a 1,000-foot stretch of shoreline along Mattawoman Creek where metal parts were discarded from the 1960s until the early 1980s. The discarded materials included rocket motor casings, shipping containers, empty drums, and various metal parts.

A removal action was conducted at the site in 2005 to remove drums at the surface and soil to 1 foot below ground surface (bgs); the excavated area was backfilled with 6 inches of gravel covered by 1 foot of clean fill. As shown in Figure 1, there is some overlap between the areas included in the removal action and the area included in this geophysical survey. During the removal action seven jet-assisted take off (JATO) bottles, one missile motor, and four pieces of miscellaneous Munitions Debris (MD) scrap were recovered at the surface.

The site is currently vacant and unused. No change to site use is anticipated. Following the geophysical survey and clearance of MEC and non-MEC metallic items (if needed), a soil mixing remediation project is planned to address shallow groundwater contamination.

6.0 Anticipated MEC Types, Composition, and Quantities

Materials discarded at the site have included rocket motor casings, shipping containers, empty drums, and various metal parts. During the 2005 removal action, seven jet-assisted take off (JATO) bottles, one missile motor, and four pieces of miscellaneous munitions debris-related scrap were recovered at the surface. It is unknown whether other items remain at the site.

7.0 Anticipated Depth of MEC Items

The anticipated depth of potential MEC items is from near-surface to greater than 4 feet bgs (if buried in disposal pits).

8.0 Vegetation and Topography

The area to be surveyed is lightly vegetated and fairly flat. Vegetation will be cut before DGM operations begin.

9.0 Geologic Conditions

Soil underlying the site consists of fill material in the upper 10 to 12 feet of the subsurface. The fill is characterized by greenish clay with silt and wood fragments. The fill layer is underlain by silt at a depth of 10 feet to 18 feet bgs. Underlying the silt is a silty clay layer to a depth of 20 feet bgs. Native soil is present at approximately 6 feet bgs.

10.0 Shallow Groundwater Conditions

Based on previous investigations, the groundwater table is located approximately 2 feet bgs in the area to be investigated.

11.0 Adverse Geophysical Conditions

There are no known adverse geophysical conditions that might affect DGM operations.

12.0 Site Utilities

No site utilities are expected in the areas where DGM will be performed.

13.0 Manmade Features Potentially Affecting Geophysical Operations

No manmade features are expected in the areas where DGM will be performed

14.0 Site-specific Dynamic Events

No site-specific dynamic events (for example, unusually strong winds or harsh weather conditions) that might affect the DGM survey operations at the site are anticipated. Although it is possible that weather conditions may impede operations at some time during the project, no significant delays or effects on geophysical instruments resulting from weather are expected.

15.0 Overall Site Accessibility and Impediments

The survey areas are readily accessible via dirt roads, and access impediments are not anticipated.

16.0 Potential Worker Hazards

No potential worker hazards are apparent at the site other than those associated with conducting project field work. Such hazards are addressed in the project Health and Safety Plan.

17.0 Geophysical System Verification

A site-specific geophysical system verification will be compared to project DQOs (discussed in the attached GSV Work Plan) to validate the geophysical system selected for the DGM surveys.

18.0 GM DQOs

The primary objective of the DGM activities at the site is to identify metallic anomalies that may be MEC, MPPEH or non-MEC metallic items. DQOs specific to the DGM surveys at the site are in the attached GSV Work Plan.

19.0 Geophysical Instrumentation

19.1 Analog Geophysical Instruments

The analog geophysical instruments to be used during non-DGM operations where a geophysical instrument is needed to detect metallic items will be a Schonstedt GA-52/Cx magnetometer.

19.2 GM Instruments

The DGM instruments to be used for the DGM geophysical survey will be the EM61-MK2. The system configuration to be used for DGM operations at the site will be determined through the instrument validation process.

20.0 Data Acquisition, Processing and Reporting

20.1 Field Data Sheets

Field data sheets will be recorded in the Munitions Response Site Information System (MRSIMS) field devices (Trimble GeoXT) and will include:

- Site ID
- Grid ID (or other identifier of surveyed area)
- Field team leader name
- Field team members' names
- Date of data collection
- Instrument used
- Positioning method used
- Instrument serial numbers
- File names in data recorders
- Data collection sampling rate
- Line numbers, survey direction, fiducial locations, start and end points
- Weather conditions
- Grid conditions
- Terrain conditions
- Cultural conditions
- Survey area sketch
- Associated QC data file names
- Field notes (other)

20.2 Data Processing

Instrument-specific software will be used for initial data processing and the output will be imported into Geosoft Oasis Montaj™ for additional processing, graphical display, anomaly selections and QA/QC. The types of processing used will be system-specific, but the general processing steps that may be performed on the data include the following:

- Positional offset correction
- Sensor bias, background leveling and/or standardization adjustment
- Sensor drift removal
- Latency or lag correction
- Geophysical noise identification and removal (spatial, temporal, motional, terrain induced)
- Contour level selection with background shading
- Digital filtering and enhancement (low pass, high pass, band pass, convolution, correlation, non-linear, etc.)

20.3 Interpretation/Anomaly Selection

MEC-experienced data processing geophysicists will use the following criteria, supplemented by site- and system-specific criteria established during instrument validation, for selecting and locating anomalies:

- Maximum amplitude of the response with respect to local background conditions
- Lateral extent (plan size) of the area of response
- Three-dimensional shape of the response
- Decay curve characteristics
- Location of the response with respect to the edge of the grid, unsurveyable areas, land features, cultural features, or utilities within or adjacent to the grid
- Potential distortions in the response from interference of nearby cultural features

20.4 Dig Locations

The target analysis process culminates in the creation of digital dig locations (a shape file imported into the MRSIMS field devices for use by the intrusive investigation team), which contain target information location and amplitude.

20.5 Grid Maps

With each dig sheet, the DGM subcontractor will also provide a grid map containing the following information:

- Client
- Project
- Contractor
- Map creator
- Map approver
- Date map was created
- Map file name (full path and file extension)
- Scale
- Grid identification
- Grid corner locations
- Contoured data
- Anomaly locations with unique identification numbers
- North arrow, legend, title block, etc.

20.6 Records Management

All files will be made available for QC verification during the project to verify that the field and data processing procedures are properly implemented. All raw data files, final processed data files, hard copies, and field notes will be maintained for the duration of the project.

20.7 Final Reports, Maps, and Geophysical Mapping Data

No later than 3 work days after collection, the DGM subcontractor will provide each day's data for QC inspection via the Internet using a File Transfer Protocol (FTP) site, electronic mail (email) attachments for small files under 5 megabytes, or digital compact disk. Such data are considered to be in raw form. These data will be corrected for sensor offsets, diurnal variations, latency, heading error (if magnetometer is used), and drift. The DGM subcontractor also will provide a digital planimetric map, in Geosoft format and coincident with the location of the geophysical survey, so that each day's geophysical data set can be registered within the original mission plan survey map.

All geophysical field data will be provided to CH2M HILL in delineated fields as x, y, z, v1, v2, and so on, where x and y are universal transverse mercator (UTM) grid plane coordinates in easting (meters) and northing (meters) directions and z (elevation is an optional field in feet), v1, v2, v3, and so on are the instrument readings. The last data field will be a time stamp. Each data field will be separated by a comma or tab. No individual file will be more than 100 megabytes in size and no more than 600,000 lines long. Each grid of data will be logically and sequentially named so that the file name can be easily correlated with the grid name used by other project personnel.

Within 45 days of data collection, the processed geophysical field data, all final maps, and supporting geophysical interpretations will be provided to CH2M HILL. All geophysical data will be accompanied by a report (standard report format out of MRSIMS) documenting the field activities associated with the data and the processing performed. Information provided by the MRSIMS report is summarized in Table 1.

TABLE 1
Processing Documentation Requirements

Information Type	"Raw" Data Delivery Report	Final Data Delivery Report	Must be in File Headers
Site ID	X	X	X
Geophysical instrument type used	X	X	
Positioning method used	X	X	
Instrument serial numbers (geophysical and positioning)	X	X	
Coordinate system and unit of measure	X	X	
Grid ID (or other identifier of surveyed area)	X	X	X
Date of data collection	X	X	X
Raw data file names associated with delivery	X	X	
Processed data file names associated with delivery	X	X	
Name of Project Geophysicist	X	X	
Name of Site Geophysicist	X	X	
Name of data processor	X	X	

TABLE 1
Processing Documentation Requirements

Information Type	"Raw" Data Delivery Report	Final Data Delivery Report	Must be in File Headers
Data processing software used	X	X	
Despiking method and details	X	X	
Sensor drift removal and details	X	X	
Latency/lag correction and details	X	X	
Sensor bias, background leveling and/or standardization adjustment method and details		X	
Portable document format (PDF) document showing graphical results of each field quality control test	X	X	
Geophysical noise identification and removal (spatial, temporal, motional, terrain induced) and details		X	
Other filtering/processing performed and details		X	
Gridding method		X	
Anomaly selection and decision criteria details		X	
Geosoft ".xyz" file for unit of survey being delivered (e.g., grid or area agreed upon with Geophysicist)		X	
Geosoft ".grd" file for unit of survey being delivered		X	
Geosoft ".map" file for unit of survey being delivered		X	
PDF of Geosoft map for unit of survey being delivered		X	
Geosoft ".map" mosaic of all processed data to date		X	
PDF mosaic of Geosoft map of all processed data to date		X	
Other processing comments		X	
Date data processing is completed	X	X	
Data delivery date	X	X	
Scanned copy of field notes and field mobile data collection device notes (if applicable)	X		

All sensor data will be correlated with navigational data, based on a local "third order" (1:5,000) monument or survey marker. If a suitable point is not available, a land surveyor will establish a minimum of two new monuments or survey markers with a minimum of third-order accuracy.

21.0 DGM Systems QC

An extensive QC program will be applied to the DGM operations at the site. Figure 2 shows an overall chart of the QC steps, and details for those steps are provided in the following subsections.

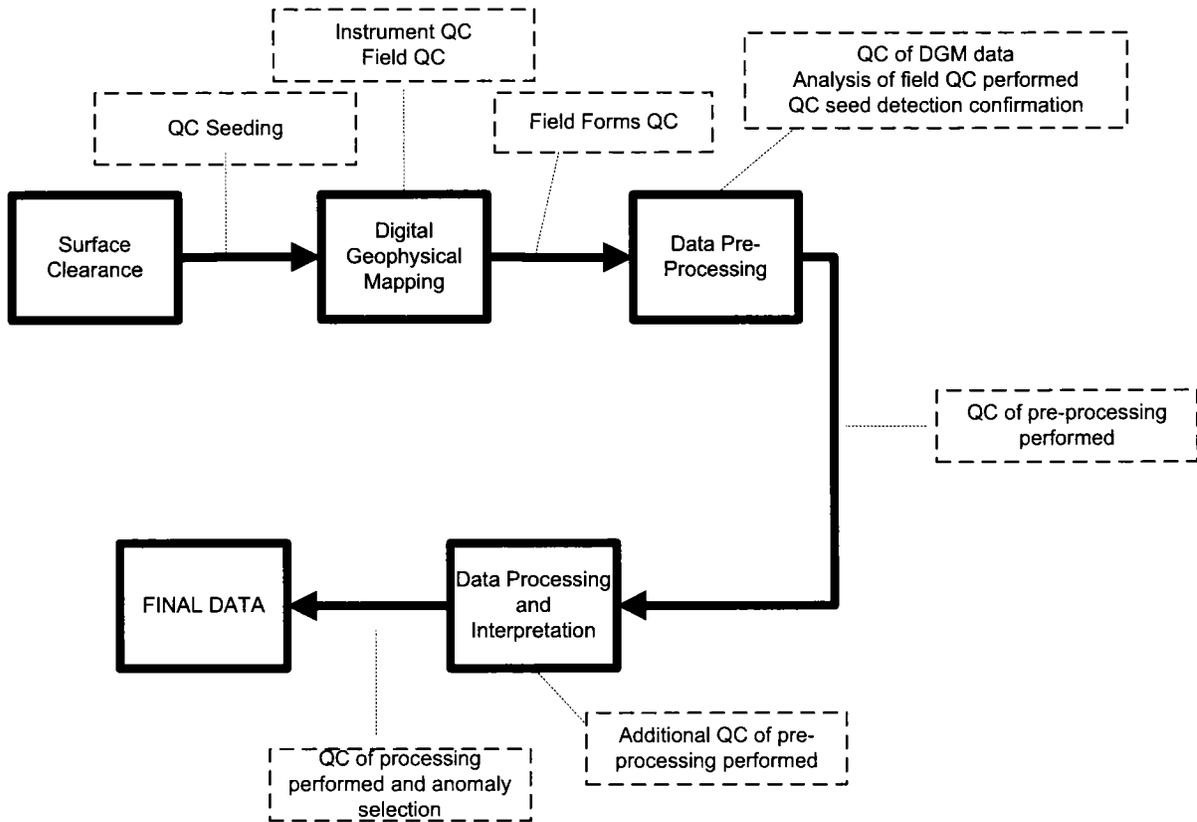


Figure 2 Overview of DGM Process QC

22.0 DGM Instruments Quality Control

Each of the geophysical systems will be field tested to confirm proper operating conditions. Several basic QC tests will be performed in addition to instrument-specific tests. A description of each basic QC test, its acceptance criteria, and its frequency is provided below and summarized in Table 2.

1. **Equipment Warm-up.** This is an instrument-specific activity, although standard warm-up time is 5 minutes. Some geophysical systems require more warm-up time than others. Each system-specific standard operating procedure defines the equipment-specific warm-up time. Equipment warm-up will be performed the first time an instrument is turned on for the day or has been turned off for a sufficient amount of time for the specific instrument to cool down.
2. **Record Sensor Positions.** Positioning accuracy of the final processed data will be demonstrated by operating the equipment over one or more known points. The accuracy of the data positioning will be assessed by calculating the difference between a known location over which a positioning instrument is held and the displayed position. The sensor position test will be conducted at the beginning of the survey operation for each work day.
3. **Personnel Test.** This test checks the response of instruments to personnel and their clothing/proximity to the system. On a daily basis, the instrument coils/sensors for those instruments being used that day will be checked for their response to the personnel operating the system. The response will be observed in the field for immediate corrective action and transmitted back to the processor, and analyzed and checked for spikes in the data that could create false anomalies. The personnel test will be conducted at the beginning of the survey operation for each work day.
4. **Vibration Test (Cable Shake).** This test checks the response of instruments to vibration. On a daily basis, the instrument coils/sensors for those instruments being used that day will be checked for their response to vibrations in the cables. The response will be observed in the field for immediate corrective action and transmitted back to the processor and analyzed and checked for spikes in the data that could create false anomalies. The vibration test will be conducted at the beginning of the survey operation for each work day.
5. **Static Background and Static Spike.** Static tests will be performed by positioning the survey equipment within or near the survey boundaries in an area free of metallic contacts and collecting data for at least 1 minute. During this time, the instrument will be held in a fixed position without a spike (known standard) and then with a spike. The purpose of the static test is to determine whether unusual levels of instrument or ambient noise exist. The static background and static spike test will be conducted at the beginning and end of each survey operation.
6. **Repeat Data.** This test is performed to verify repeatability of the data and will be performed after the initial survey over an area. At least 2 percent of the survey lines will be repeated.

TABLE 2
DGM Instruments Standardization Tests and Acceptance Criteria

Test	Test Description	Acceptance Criteria	Power On	Beginning of Day	Beginning and End of Day	First Time Instr. Used	2% of Total Area Surveyed
1	Equipment Warm-up	Equipment specific (typically 5 min)	X				
2	Record Sensor Positions	± 4 inches (2.54 centimeters)		X			
3	Personnel Test	Based on instrument used. Personnel, clothing, etc. should have no effect on instrument response		X			
4	Vibration Test (Cable Shake)	Data profile does not exhibit data spikes		X			
5	Static Background & Static Spike	± 20% of standard item response, after background correction			X		
6	Repeat Data	Qualitative comparison of data.					X

23.0 QC Seed Items

At least one surrogate item will be seeded per acre. The seed items will be tagged with a non-biodegradable label identifying the items as inert and providing a contract reference, a point of contact address, phone number, and a target identifier. CH2M HILL personnel will perform seeding using hand tools. The seed locations will be checked using a hand-held analog geophysical instrument to confirm that no existing anomalies are present at the seed location. Once placed, the locations of all seeded items will be surveyed using an RTK differential global positioning system or conventional survey equipment. The items will be placed at easily detectable depths in order to have a high enough signal-to-noise ratio to compare to known industry standard target values. Detection of the QC seed items will be monitored by CH2M HILL and if an item is not detected, a root-cause analysis will be performed and corrective actions determined.

24.0 QC of DGM Data and Deliverables

Both the DGM subcontractor and CH2M HILL will perform QC of geophysical data and data deliverables at each step of the processing path. Figure 3 shows the processing path and the QC steps performed. Data will not move to the next stage until they have passed the QC check.

QC checks to be performed on field forms, pre-processed data, and processed data can be found in Table 1.

25.0 Corrective Measures

Specific corrective measures are related to the type of geophysical equipment used; however, the following are the basic corrective measures to be followed in association with DGM surveying:

- Replacement of sensors if they fail to meet instrument check requirements.
- Resurvey of grids if seeded items are not identified (do not show in the DGM data). In a situation in which there is a failure to select a seed item from the data but the item is clearly present in the DGM data, a re-analysis of the DGM data will be performed instead of a resurvey.

26.0 Analog Geophysical Systems QC

QC over the analog geophysical instruments will be accomplished through daily checks that the instruments are functioning before using them for field activities. Each instrument will be operated over a small metallic item buried close to the maximum detection depth determined for that item during instrument validation. If the instrument is not able to detect the item, it will be taken out of use until it is repaired.

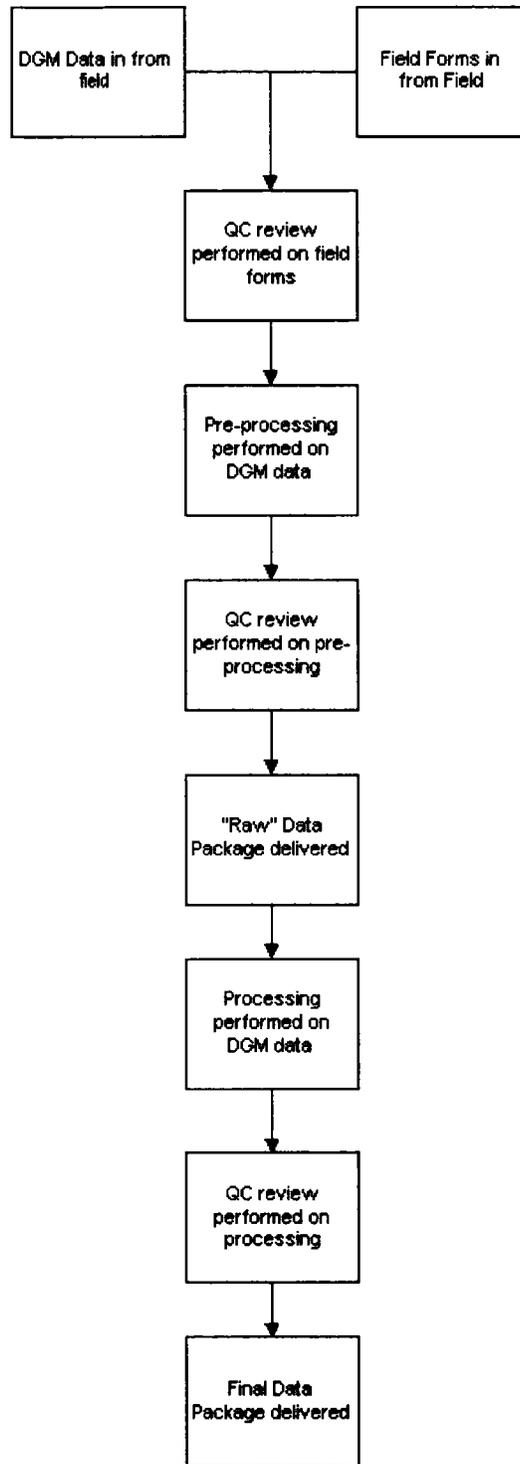


Figure 3 QC of DGM Data – Process Flowpath

Attachment A
GSV Work Plan

Geophysical System Verification Work Plan

Geophysical Investigation of Site 17 Naval Support Facility, Indian Head, MD

**Navy CLEAN Contract # N62470-08-D-1000
Contract Task Order No. 038**

Prepared for
**U.S. Navy Facilities Engineering Command,
Washington**

May 2009

Prepared by
CH2MHILL

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Acronyms and Abbreviations

cm	centimeter(s)
DGM	digital geophysical mapping
DGPS	differential global positioning system
DQO	data quality objective
GSV	geophysical system validation
GPS	global positioning system
IST	industry standard target
MEC	munitions and explosives of concern
mV	millivolts
NRL	Naval Research Laboratory
NAD83	North American Datum 83
QC	quality control
RTK	real-time kinematic
UTM	universal transverse mercator
UXO	unexploded ordnance

Geophysical System Verification

The initial phase of the investigation to locate munitions and explosives of concern (MEC) as well as non-MEC metallic items in the subsurface at Site 17, Naval Support Facility, Indian Head, Maryland, will be verification of the proposed geophysical system using a geophysical system verification (GSV) strip. CH2M HILL will use a physics-based, presumptively selected technology process in which signal strength and sensor performance are initially demonstrated by static and dynamic tests on a test strip prior to production mapping. To verify the translation into the field production data, the signal levels for the seed targets will be compared to expected values for industry standard targets (ISTs). Multiple ISTs will also be distributed as blind seeds throughout the project area for continued quality control (QC) validation.

1.1 Personnel and Qualifications

All personnel involved in performance of the GSV and the production geophysical surveys will meet the following qualifications:

- **Project/ QC Geophysicist:** will have a degree in geophysics, geology, geological engineering, or a closely related field, and have a minimum of 5 years of directly related geophysical experience. This individual will be capable of managing a geophysical data collection and processing project/program, including several task orders/sites and will have at least 1 year of experience in managing geophysical operations on an MEC site.
- **Site Geophysicist:** will have a degree in geophysics, geology, geological engineering, or a closely related field, and have a minimum of 2 years of directly related geophysical experience. This individual will be capable of competently managing personnel, equipment and data on projects requiring multiple (three or more) geophysical field teams and geophysical data processors and will have at least 1 year of experience in performing geophysical operations on an MEC site.
- **Geophysical Data Processor:** will have a degree in geophysics, geology, geological engineering, or a closely related field, and will have at least 6 months of experience in processing geophysical data related to MEC projects.
- **Field Geophysicist:** will have a degree in geophysics, geology, geological engineering, or a closely related field, will have a minimum of 2 years of directly related geophysical experience and will have at least 1 year of experience in performing geophysical operations on an MEC site.
- **Geophysical Technician:** will have at least 6 months of experience in geophysical data collection on MEC-related projects.

The following individuals will be involved in the GSV:

- CH2M HILL Project Geophysicist
- Unexploded Ordnance (UXO) Technician II (or higher)
- Digital geophysical mapping (DGM) subcontractor's Site Geophysicist

- DGM subcontractor's Field Geophysicist or Geophysical Technician
- DGM subcontractor's Data Processor

1.2 DGM System

The DGM system to be validated and used for the production surveys will consist of the Geonics EM61-MK2 time domain electromagnetic metal detector, with positioning provided by either a differential global positioning system (DGPS) or fiducial methods.

1.2.1 EM61-MK2

Time-domain electromagnetic metal detectors are designed to detect shallow ferrous and non-ferrous metallic objects with very good spatial resolution and with minimal interference from adjacent metallic features. An electromagnetic transmitter generates a pulsed primary magnetic field in the earth, which induces eddy currents in nearby metallic objects. The eddy current decay produces a secondary magnetic field measured by the receiver coil of the instrument. By taking the measurement at relatively long times after the start of the decay, the current induced in the ground has fully dissipated and only the current in the metal is still producing a secondary field.

The EM61-MK2 is a high-resolution time-domain electromagnetic instrument designed to detect, with high spatial resolution, shallow ferrous and non-ferrous metallic objects. The standard EM61-MK2 system consists of two air-cored, 1-meter-by-0.5-meter coils, a digital data recorder, batteries, and processing electronics. The EM61-MK2's transmitter generates a pulsed primary magnetic field, which then induces eddy currents in nearby metallic objects. Each of the two spatially separated receiver coils measures these eddy currents. The EM61-MK2 offers the ability to measure the eddy currents at three distinct time intervals in the bottom coil, or at four intervals if no top coil measurements are recorded (as it will be used for the Indian Head surveys.) Earlier time gates provide enhanced detection of smaller metallic objects. Secondary voltages induced in the coils are measured in millivolts (mV). Assuming accurate data positioning, target resolution of approximately 0.5 meter can be expected.

1.2.2 Positioning

Positioning of the EM61-MK2 data will be performed primarily using a DGPS. It is possible that in some areas tall vegetation (for example, trees) will obstruct line-of-sight with the satellites required for global positioning system (GPS) positioning and odometer or fiducial positioning methods will be required.

Global Positioning Systems. GPS satellites orbit the earth transmitting a signal that can be detected with a GPS receiver. The GPS receiver uses the known locations of the satellites and the time of signal transmittal to calculate its position. DGPS increases the accuracy of GPS readings through the use of two receivers: a stationary receiver that acts as a base station and collects data at a known location and a second roving receiver that makes the position measurements. The base stations can be configured to either transmit the correction data to the rover system or to save the data to be used to correct positional data during post-processing. Real-time kinematic (RTK) DGPS instruments are ideal for field-mapping applications when satellite visibility conditions are adequate because they provide the highest GPS accuracy possible (sub-centimeter accuracy). Typical accuracies of geophysical data positioning after

adding errors induced by the DGM system operation are in the range of 20 to 50 centimeters (cm).

Odometer and Fiducial Methods. Odometer methods use a procedure wherein a measuring device (for example, wheel-based, thread-feeding) determines the distance traveled along a linear transect. Using this approach, a series of survey lanes are established over a grid. Flags are placed at the beginning and end of each lane, and an operator walks down the lane while sensor readings are collected when triggered by the odometer system at a pre-defined interval (for example, every 20 cm). As the operator walks past the starting and ending points in the survey lane, the operator stops the data collection. By assuming the operator walked in a straight line, the total distance recorded by the odometer system is compared to the known distance travel, and the down-line position for each of the data points is adjusted accordingly.

Fiducial methods use a time-marking procedure to determine the spatial location of the collected data. As in the odometer approach, a series of survey lanes are established over a grid. Flags are placed at the beginning and end of each lane, and at equal distances along the transect (for example, every 30 meters). An operator walks down the lane while the data logger collects sensor readings at a prescribed sampling. As the operator walks past the starting, fiducial, and end lines in the survey lane, the operator presses a button on the data logger that places a fiducial time mark in the data stream. By assuming the operator walked in a straight line at a constant velocity, the location of each data point can be calculated.

1.3 Location and Length of GSV Strip

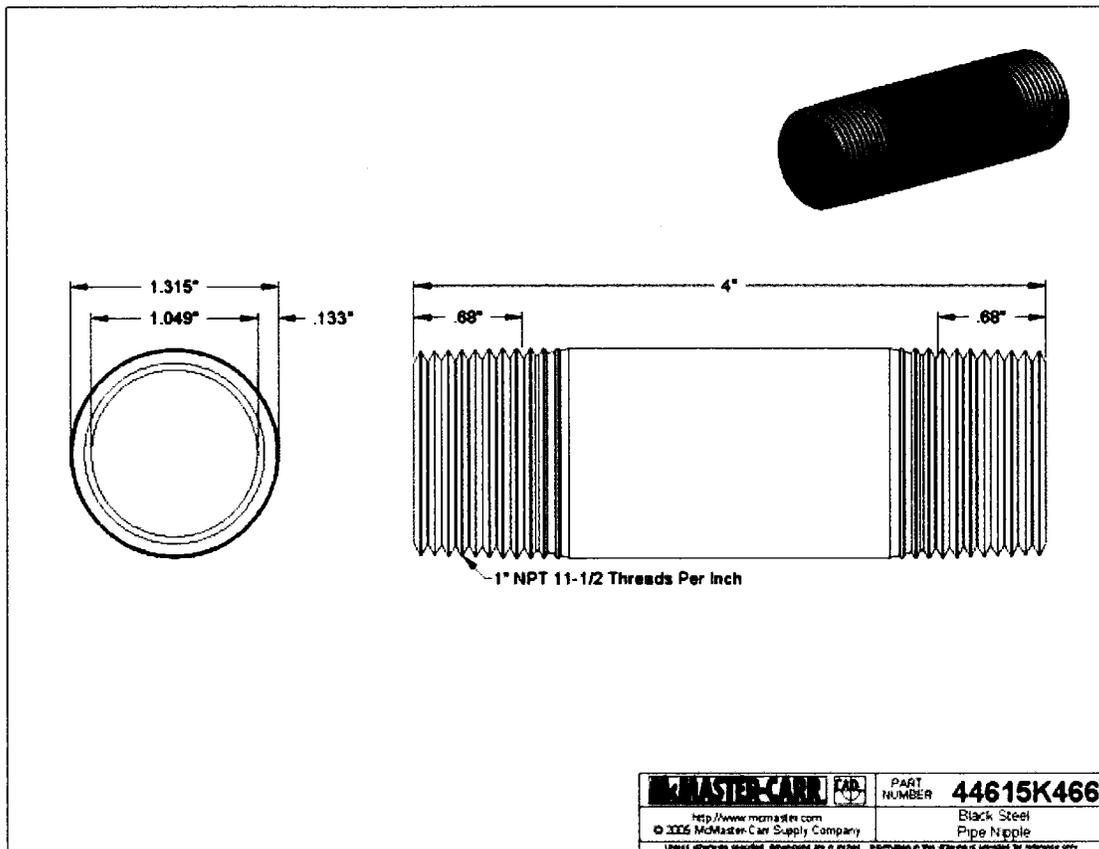
An area near, or within, the site will be selected for the GSV strip location. The exact location of the GSV strip will be finalized during the initial mobilization to the site. The GSV area will be set up as a strip of approximately 15 meters or longer.

1.4 Industry Standard Target Items

The IST items (see Figure 1) to be used in the GSV are 1 inch (2.54 cm) by 4 inches (10.16 cm) steel pipes (part number 44615K466) from the McMaster-Carr on-line catalog (<http://www.mcmaster.com/>):

Shape: Straight nipple, threaded both ends
Schedule: 40
Pipe Size: 1 inch (1.315-inch outer diameter)
Length: 4 inches
Finish: Black welded steel

FIGURE 1
Industry Standard Target

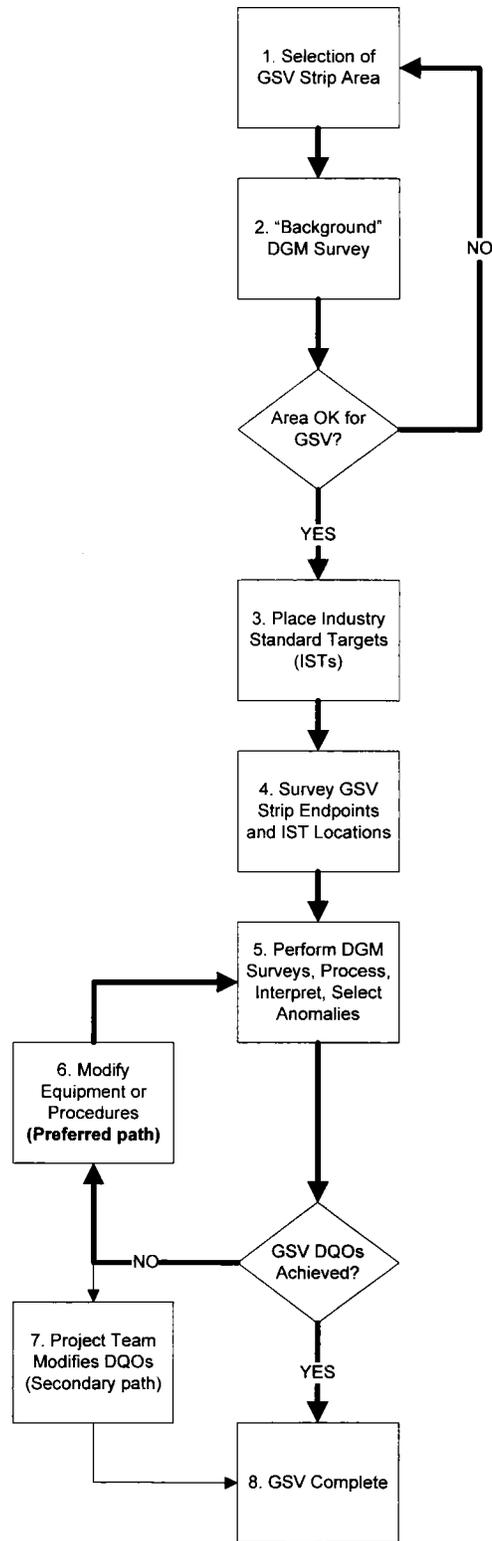


These items have been tested by the Naval Research Laboratory (NRL) for their standard response under their best orientation (perpendicular to the EM61-MK2 instrument plane to cause the highest peak amplitude response) and worst orientation (parallel to the instrument plane to cause the lowest peak amplitude response) at multiple distances from the instrument's bottom transmit/receive coil.

1.5 GSV Procedures

A qualified and experienced MEC DGM operations geophysical team (see Section 1.1) will employ the system to be tested during the GSV. Figure 2 illustrates the GSV process and the procedures to be employed (numbered in accordance with the steps shown on Figure 2) during site work.

FIGURE 2
GSV Process



1. A GSV area will be selected with preference for the following (although none of the conditions are required for GSV success):
 - (a) Terrain, geology and vegetation similar to that of a majority of the project site.
 - (b) Geophysical noise conditions similar to those expected across the survey area.
 - (c) Large enough site to accommodate all necessary GSV tests and equipment and for adequate spacing of the IST items to avoid ambiguities in data evaluation.
 - (d) Readily accessible to project personnel.
 - (e) Close proximity to the actual survey site (if not within the site).

2. A "background" DGM survey will be performed by the DGM subcontractor with the instrument to be validated over the GSV. This step will allow background geophysical conditions to be recorded, will help determine the appropriateness of the location (for example, few existing anomalies), and will verify that ISTs are not seeded near existing anomalies. The data will be post-processed (that is, filtered and positions attached to the geophysical data) and provided to the CH2M HILL Project Geophysicist for evaluation.
3. Following verification that the GSV area is clear of subsurface anomalies (or that existing anomalies can be avoided during seeding), typically three IST items will be buried in their most difficult-to-detect orientation (co-planar with the system's coils) at depths of approximately 3, 7 and 11 times their diameter (3, 7 and 11 inches). Typical maximum industry detection depths for these items are approximately 11 times their diameter (EM 1110-1-4009).

CH2M HILL personnel will bury the ISTs using shovels to dig the holes to the appropriate depths for burial of the seed items. The background survey data and anomaly avoidance techniques will be used to ensure that corner stakes and ISTs are not placed on top of or near existing anomalies. Personnel will emplace ISTs and record the emplacement data (depth, orientation, and azimuth).

4. A registered Land Surveyor will use an RTK DGPS or conventional total station survey equipment to record IST locations to a horizontal accuracy of 3 cm, providing an easting and northing in North American Datum 83 (NAD83) (UTM Zone 18 coordinates, meters, for the center of the targets. The location of the endpoints of the GSV will also be recorded (in UTM meters).
5. A DGM survey will be performed by the DGM subcontractor over the GSV. The data will be processed and interpreted by the DGM subcontractor. "Draft-Final" data packages will be provided to the CH2M HILL Project Geophysicist for evaluation.
6. If the initial data quality objectives (DQOs) have not been met, the CH2M HILL Project Geophysicist will meet with the DGM subcontractor to discuss whether modifications to instrumentation or procedures can be made to the DGM system in order to meet the DQOs.
7. If the DQOs cannot be met by the DGM subcontractor, the CH2M HILL Project Geophysicist will meet with the project team to discuss a modification of a DQO before completing the GSV.

8. Once the surveys have been performed and the system has been found to meet the initial (or modified) DQOs, the GSV will be complete.

1.6 Data Quality Objectives

Testing in the GSV area will demonstrate the ability of the system to achieve the specific DQOs outlined in Table 1. The system will not be used for site surveys until it is able to meet the GSV DQOs or until the project team agrees on reasoning behind a DQO not being met and an appropriate revised DQO is prepared.

Additional DQOs for production surveys will be monitored during through the IST blind-seeding program and other QC tests, as discussed in the Geophysical Investigation Plan. The GSV DQOs, measurement performance criteria, and test method to be used during the GSV are summarized in Table 1 and discussed in detail in the following subsections.

TABLE 1
Project Data Quality Objectives

Data Quality Objective	Measurement Performance Criteria	Test Method During GSV
General System Functioning		
DGM System Positioning. Accurate coordinates are being obtained from DGM positioning systems.	Positional error at known monuments will not exceed ± 10.2 centimeters (4 inches).	Results of Sensor Positions QC Test will be evaluated to ensure compliance.
DGM System Data Repeatability. Repeatabile data are being obtained from DGM system.	Response to standardized item will not vary more than $\pm 20\%$.	Results of Static Background and Static Spike QC Test will be evaluated to ensure compliance.
DGM Surveys		
Munitions Detection. System is capable of detecting munitions items within industry standards.	Maximum amplitude of 660 microsecond time channel (Channel 3) is greater than 0.8X the maximum amplitude from NRL validation test results for that item at the specified depth and orientation.	Results of DGM surveys will be evaluated to ensure compliance.
Downline Data Density. Spacing between points is acceptable for detection of munitions items.	More than 98% of possible sensor readings are captured along a transect at 0.2-meter spacing or less. In addition, any transect containing a data gap of 0.6 meters (2 feet) or greater does not meet the DQO.	Results of DGM surveys will be evaluated to ensure compliance.

TABLE 1
Project Data Quality Objectives

Data Quality Objective	Measurement Performance Criteria	Test Method During GSV
Data Handling		
All data must be delivered in a timely manner and in a useable format.	GSV data package is completed and delivered within 24 hours.	Evaluate based on actual delivery of data

1.6.1 General Geophysical Systems Functioning

DGM System Positioning

The DQO for DGM systems positioning is that the coordinates being obtained from the positioning system are of sufficient accuracy to allow for appropriate relocation of MEC items for intrusive investigation. The measurement performance criterion for this is that the positional error at known monuments will not exceed ± 10.2 cm (4 inches). This will be evaluated during the GSV by ensuring that, on a daily basis, the positioning system in use passes QC Test #2 (Record Sensor Positions), as outlined in Table 2.

DGM System Data Repeatability

The DQO for DGM system data repeatability is that the system responds consistently from the beginning to the end of an operation. The measurement performance criterion is that the response to a standardized item will not vary more than ± 20 percent. This will be evaluated during the GSV by ensuring that, on a daily basis, the geophysical system being used passes QC Test #5 (Static Background and Static Spike), as outlined in Table 2.

1.6.2 DGM Surveys

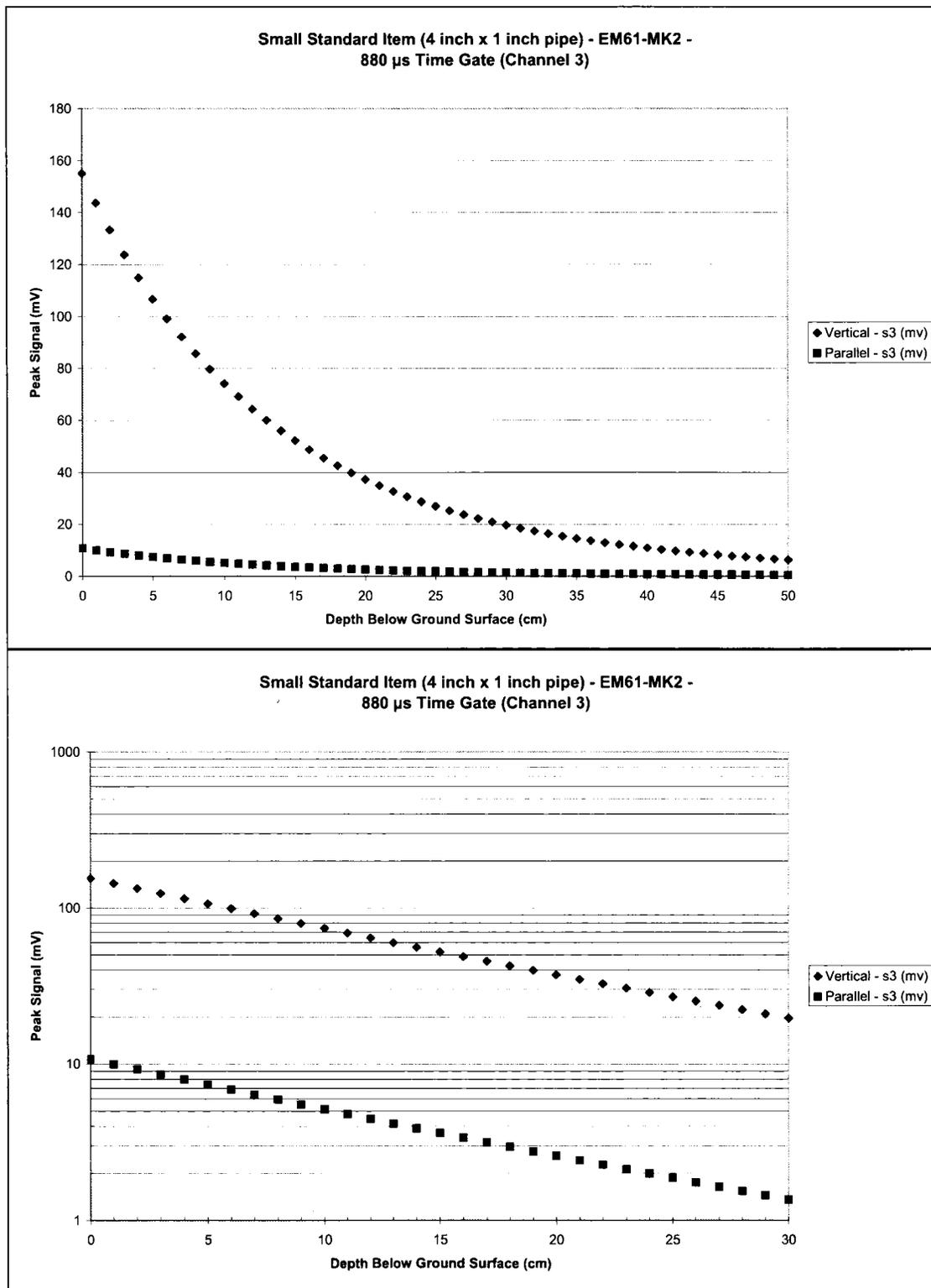
Munitions Detection

The DQO for munitions detection is to demonstrate that the system in use is capable of detecting munitions within industry standards. This is demonstrated through a physics-based, presumptively selected technology process in which signal strength and sensor performance are compared to validated industry values by static and dynamic tests on a test strip prior to production mapping. For the EM61-MK2, this process involves demonstrating that the maximum amplitude response over a standard item is comparable to the maximum response obtained through NRL demonstration tests (see Figure 3) for that exact item at the same depth and orientation (parallel or perpendicular to the plane of the transmit coil.) Once it has been established that the system is responding comparably, a cross-correlation of industry experience with detection of munitions items can be assumed. In other words, the depths and orientations of munitions items which the EM61-MK2 has been shown to be effective at detecting under test scenarios¹ and other projects can be expected.

¹ Final Report for the Evaluation of Unexploded Ordnance (UXO) Detection Technology at the Standardized UXO Test Sites Aberdeen and Yuma Proving Grounds, Standardized UXO Technology Demonstration Site Program, SERDP, November 2007. Demonstrator scoring results: <http://aec.army.mil/usaec/technology/uxo01f.html>

A comparable maximum amplitude will be considered a value no less than 20 percent lower than the maximum amplitude response in the NRL tests for the standard item at the comparable orientation. For example, if the 4-inch x 1-inch IST is placed in the GSV at a depth of 7.6 cm below the ground surface, which results in a distance from the EM61-MK2 transmit coil of 49.6 cm (the coil is typically 42 cm above the ground surface), and at an orientation perpendicular to the transmit coil, the comparable maximum amplitude on channel 3 of the EM61-MK2 would be approximately 5.2 mV. A recorded result in the GSV of at least 4.2 mV would therefore be required over the item to meet the DQO.

FIGURE 3
 NRL Results for 4-inch x 1-inch Standard Pipe Tested under EM61-MK2 Bottom Coil
 (Top graph is to depth of 50 cm and with linear x-axis. Bottom graph is same data but “zoomed” to view to depth of 30cm and using a log scale on the x-axis.)



Downline Data Density

The DQO for downline (along the survey transect) data density is to have sufficient data collected along each transect to detect munitions items. Industry experience has demonstrated that a data density of at least 5 readings per meter is adequate to achieve this purpose. The measurement performance criterion is that at least 98 percent of possible sensor readings are captured along each transect at 0.2 meter or lesser spacing between points. In addition, any transect containing a data gap of 0.6 meter (2 feet) or greater does not meet the DQO. This will be evaluated during the GSV by verifying that all of the DGM data collected meet this standard.

1.6.3 Data Handling

The DQO for data handling is that all data must be delivered in a timely manner and in a useable format. Because of the need for rapid feedback during GSV operations to effectively test potential DGM systems, the measurement performance criterion for data handling during GSV activities will require that data packages of raw data for the GSV be completed and delivered to the CH2M HILL Project Geophysicist within 1 working day of data collection. Final processed data for the GSV shall be delivered to the CH2M HILL Project Geophysicist within 3 working days of data collection. During production surveys, the measurement performance criterion for data handling will require that "draft" (raw) data packages be completed and delivered to the CH2M HILL Project Geophysicist within 3 working days of data collection and the final data packages within 5 working days of data collection. This will be evaluated based on the actual delivery of data during the GSV.

1.7 Quality Control

Achievement of the instrument evaluation DQOs will be verified by the CH2M HILL QC Geophysicist. The selected GSV area, the process of emplacing the GSV items, and the survey locations will be verified through observation during the GSV. Geophysical subcontractor-provided standard operating procedures (to be provided as an addendum to this Work Plan after subcontractor selection) will be checked to ensure that equipment and procedures are being checked following standard procedures for the system employed. The QC tests listed in Table 2 and detailed in the following subsections will be performed on the geophysical system being used.

TABLE 2
Geophysical Instrument Standardization Tests and Acceptance Criteria

Test	Test Description	Acceptance Criteria	Power on	Beginning of day	Beginning and end of day	1st time instrument used	2% of Total Area Surveyed
1	Equipment Warm-up	Equipment specific (typically 5 min)	X				
2	Record Sensor Positions	+/- 4 inches (2.54cm)		X			

TABLE 2
Geophysical Instrument Standardization Tests and Acceptance Criteria

Test	Test Description	Acceptance Criteria	Power on	Beginning of day	Beginning and end of day	1st time instrument used	2% of Total Area Surveyed
3	Personnel Test	Based on instrument used. Personnel, clothing, etc. should have no effect on instrument response.		X			
4	Vibration Test (Cable Shake)	Data profile does not exhibit data spikes		X			
5	Static Background & Static Spike	+/- 20% of standard item response, after background correction			X		
6	Repeat Data	Qualitative repeatability of data.					X

1. **Equipment Warm-up.** All geophysical equipment will be warmed up a minimum of 5 minutes. Equipment warm-up will be performed the first time an instrument is turned on for the day or has been turned off for a sufficient amount of time for the specific instrument to cool down.
2. **Record Sensor Positions.** Positioning accuracy of the final processed data will be demonstrated by operating the equipment over one or more known points. The accuracy of the data positioning will be assessed by calculating the difference between a known location over which a positioning instrument is held and the displayed position. The sensor position test will be conducted at the beginning of the survey operation for each work day.
3. **Personnel Test.** This test checks the response of instruments to personnel and their clothing/proximity to the system. On a daily basis, the instrument coils/sensors for those instruments being used that day will be checked for their response to the personnel operating the system. The response will be observed in the field for immediate corrective action and transmitted back to the processor, and analyzed and checked for spikes in the data that could create false anomalies. The personnel test will be conducted at the beginning of the survey operation for each work day.
4. **Vibration Test (Cable Shake).** This test checks the response of instruments to vibration. On a daily basis, the instrument coils/sensors for those instruments being used that day will be checked for their response to vibrations in the cables. The response will be observed in the field for immediate corrective action and transmitted back to the processor and analyzed and checked for spikes in the data that could create false anomalies. The vibration test will be conducted at the beginning of the survey operation for each work day.

5. **Static Background and Static Spike.** Static tests will be performed by positioning the survey equipment within or near the survey boundaries in an area free of metallic contacts and collecting data for at least 1 minute period. During this time, the instrument will be held in a fixed position without a spike (known standard) and then with a spike. The purpose of the static test is to determine whether unusual levels of instrument or ambient noise exist. The static background and static spike test will be conducted at the beginning and end of each survey operation.
6. **Repeat Data.** This test is performed to verify repeatability of the data and will be performed after the initial survey over an area. At least 2 percent of the survey lines will be repeated.

1.8 Data Analysis and Interpretation

All data collected at the GSV test strip will be post-processed and analyzed. Instrument-specific data processing standard operating procedures will be provided as an addendum to this Work Plan after subcontractor selection. Raw and processed geophysical data and a target selection spreadsheet will be delivered by the geophysical subcontractor to the CH2M HILL QC Geophysicist within 1 business day of data collection.

1.9 Data Evaluation

The CH2M HILL QC Geophysicist will evaluate the data provided by the geophysical subcontractor and validate for the project team whether the selected geophysical system meets the GSV DQOs.

1.10 Reporting

Results of the GSV will be included in a GSV report prepared after the GSV has been performed. The report will include a summary of all of the GSV operations, an as-built map of the GSV plot, and GSV results.

Attachment B
Health and Safety Plan

Final

**Health and Safety Plan
Geophysical Investigation of Site 17**

**Naval Support Facility Indian Head
Indian Head, Maryland**

Contract Task Order No. 038

May 2009

Prepared for

**Department of the Navy
Naval Facilities Engineering Command
Washington**

Under the

**Navy CLEAN 1000 Program
Contract No. N62470-08-D-1000**

Prepared by



CH2MHILL

Chantilly, VA

Prepared By:

Cindy Collins

02/12/2009

Date

Approved By:

Mark Orman

04/15/2009

Responsible Health and Safety Manager

Date

Approved By:

Dan Young

02/17/2009

Munitions Response Health and Safety Manager

Date

Approved By:

Sarah Meyers

04/15/2009

Project Manager (PM)

Date

CH2M HILL HEALTH AND SAFETY PLAN

This Health and Safety Plan (HSP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Enterprise-wide Core Standards (CS) and Standard Operating Procedures (SOPs), as appropriate. In addition, this plan adopts procedures in the project Work Plan (WP). The Safety Coordinator (SC) is to be familiar with the CSs and SOPs and the contents of these instructions. CH2M HILL's personnel and subcontractors must be trained on this plan and sign **Attachment 1**.

Project Information and Background

PROJECT NO: CLEAN 1000 CTO-038

CLIENT: Naval Facilities Engineering Command Washington

PROJECT/SITE NAME: Naval Support Facility Indian Head (NSF-IH) Site 17

SITE ADDRESS: Indian Head, Maryland

CH2M HILL PROJECT MANAGER: Sarah Meyers/WDC

CH2M HILL OFFICE: Chantilly, VA

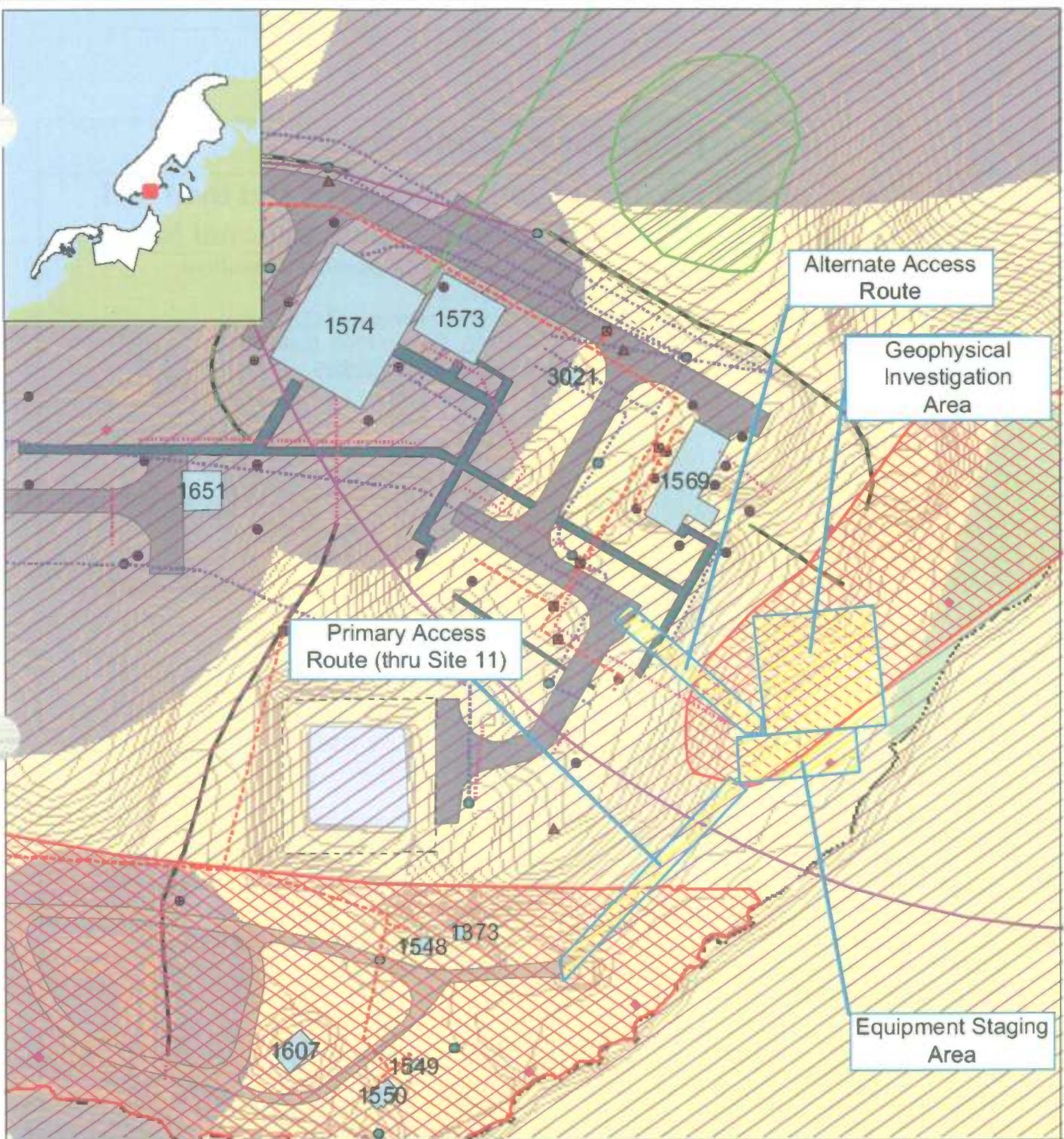
DATE HEALTH AND SAFETY PLAN PREPARED: 02/12/2009

DATE(S) OF SITE WORK: May 2009 through September 2009

SITE BACKGROUND AND SETTING: NSF-IH is a naval facility consisting of the main area (on the Cornwallis Neck Peninsula) and the Stump Neck Annex, near Indian Head, in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington D.C. The mission of NSF-IH is to provide primary technical capability in energetics for all warfare centers through engineering, fleet and operational support, manufacturing technology, limited production, and industrial base support. Secondary technical capability is provided through research, development, test and evaluation for energetic materials, ordnance devices and components, and related ordnance engineering standards including chemicals, propellants and their propulsion systems, explosives, pyrotechnics, warhead, and simulators.

SITE 17: Site 17 is a 1,000-foot stretch of shoreline along the Mattawoman Creek where metal parts were discarded from the 1960s until the early 1980s. The discarded materials included rocket motor casings, shipping containers, empty drums, and various metal parts. A removal action was conducted by Shaw at the site in 2005 to remove drums at the surface and soil to one foot below the ground surface (bgs). During the removal action, seven jet-assisted take off (JATO) bottles, one missile motor, and four pieces of miscellaneous munitions and explosives of concern (MEC) related scrap were recovered at the surface. To address shallow groundwater contamination, further remediation activities will be conducted including soil mixing. The field work for this effort will consist of EM61-MK2 geophysical surveys across approximately 11,000 square feet to identify subsurface anomalies within the focus area. This information will be used by CH2M HILL to evaluate the need for clearance of MEC and non-MEC related items prior to implementation of a remedial action (soil mixing)

that will address shallow groundwater contamination. The area to be surveyed is lightly vegetated and fairly flat.



NSF-IH Work Approval Permit Layout

100 0 100 200 300 Feet

- | | | | | |
|---|--|--|--|--|
| <ul style="list-style-type: none"> Work Area Buildings Trailers Cargo Boxes Railcars Temporary Pet Boxes Sidewalks Playgrounds Wetlands IR Sites Fences | <ul style="list-style-type: none"> Eagle Protection Areas (Active) Eagle Protection Areas (Inactive) Species Protection Areas Cultural Resources Protection Historic Buildings Worker Notification Areas K24 Remote Operations Intra-line (K18) Work Restrictions Inhabited Bldg. Work Restrictions Munitions Response Area Surface Water Bodies | <ul style="list-style-type: none"> Streams Dry Intermittent Permanent Roads, Parking Lots Asphalt Concrete Gravel Dirt | <ul style="list-style-type: none"> Utilities Industrial Steam Potable Water Potable Valve River Water River Water Valve Fire Hydrants Stormwater Sanitary Sewer Compressed Air | <ul style="list-style-type: none"> Utility Poles Light Transformer Wells Potable Water Monitoring Telephone/Fiber Optic Aboveground Underground Submarine Electric Aboveground Underground |
|---|--|--|--|--|

Permit NOT Valid Without Signature

DISCLAIMER: Utilities depicted are believed to be accurate to +/- 15 feet.

NOTE: While performing work, if any underground utilities or item(s) are detected and are not shown on this plan, please detail at approximate location and give description of item(s) to CWAPC coordinator.

Emergency Contacts

**If injured on the job, notify your supervisor and then call
1-866-893-2514 to contact CH2M HILL'S Occupational Nurse**

<p>Medical Emergency Facility Medical Response #: 301-744-4333 (if in restricted area, use red call boxes – no cell phone usage in restricted area!) Off Base# 911</p>	<p>CH2M HILL- Medical Consultant WorkCare Dr. Peter Greaney M.D. 300 S. Harbor Blvd, Suite 600 Anaheim , CA 92805 800-455-6155 714-978-7488</p>
<p>Urgent Care Facility Bryans Road Urgent Care 3059 Marshall Hall Road Bryans Road MD 301/375-8080</p>	<p>CH2M HILL Director Security Operations Thomas Horton/DEN 720/273-3100 (cell) or 720/286-0022 (office)</p>
<p>Fire/Spill Emergency Facility Fire Response #:301-744-4333 Local Fire Dept #: 911</p>	<p>Responsible Health and Safety Manager (RHSM) Name: Mark Orman Phone:(414) 847-0597</p>
<p>Security & Police – 911 Facility Security #:301-744-4333 (if in restricted area, use red call boxes – no cell phone usage in restricted area!) Local Police #:911</p>	<p>Human Resources Department Name: Sherri Huntley Phone:703-376-5000</p>
<p>Utilities Emergency Phone Numbers On base: Seth Berry Phone: 301-744-2273</p>	<p>Worker's Compensation: Contact Business Group HR dept. to have form completed or contact Jennifer Rindahl after hours: (720)891-5382</p>
<p>Safety Coordinator (SC) Name: Keith Schucker/CLK Phone: 703-471-1441</p>	<p>Media Inquiries Corporate Strategic Communications Name: John Corsi Phone: (720) 286-2087</p>
<p>Project Manager Name: Sarah Meyers/WDC Phone: 703-376-5338</p>	<p>Automobile Accidents: Rental: Linda Anderson/COR 720/286-2401 CH2M HILL owned vehicle: Linda George 720-286-2057</p>
<p>Federal Express Dangerous Goods Shipping Phone:800/238-5355</p>	<p>CH2M HILL Dangerous Goods Shipping Phone:800/255-3924</p>

Facility Alarms: Since CH2M HILL personnel will not always be working in close proximity to each other, hand signals, voice commands, air horns, and two-way radios will comprise the mechanisms to alert site personnel of an emergency. All onsite contractors must read and sign the "Hazard Control Briefing for Environmental Division Visitors IHDIVNAVSURFAWARCEN", and attend the "Pre-construction Safety Briefing" from the Safety Department prior to commencing work.

Evacuation Assembly Area(s): In the event that the site must be evacuated, all personnel will immediately stop activities and report to a safe place of refuge at the support zone area. The safe place of refuge may also serve as the telephone communication point, as communication with emergency response agencies may be necessary. A telephone communication point and safe place of refuge will be determined prior to the commencement of site activities at each site.

Facility/Site Evacuation Route(s): To be determined (TBD) for each site before start of work on that site.

Local Hospital

Civista Medical Center
701 East Charles St., LaPlata MD 20646

Hospital Phone#: 301-609-4000

Start at : NSF-IH Site 17, Indian Head, MD

1. Start out going NORTH on W CAFFEE RD toward INCINERATOR PL. (go 1.4 miles)
2. W CAFFEE RD becomes STRAUSS AVE. (go 1.4 miles)
3. STRAUSS AVE. becomes one way in the opposite direction so to exit the facility, turn RIGHT onto S JACKSON RD (go 0.1 miles), then LEFT onto E FARNUM RD (go 0.1 miles), and SLIGHT RIGHT onto STRAUSS AVE to exit through the gate. (go 0.0 miles)
4. STRAUSS AVE becomes INDIAN HEAD HWY/MD-210 N. (go 2.0 miles)
5. Turn RIGHT onto HAWTHORNE RD/MD-225. (go 10.6 miles)
6. Turn RIGHT onto CRAIN HWY/US-301 S/BLUE STAR MEMORIAL HWY. (go 0.7 miles)
7. Turn LEFT onto MD-6/CHARLES ST. (go 0.6 miles)
8. End at 701 Charles St La Plata, MD 20646-5930

ESTIMATED TIME: 31 minutes | DISTANCE: 16.92 miles



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1.0 Tasks to be Performed under this Plan

1.1 Description of Tasks

Refer to project documents (i.e., Work Plan) for detailed task information. A health and safety risk analysis (Table 1) has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin. Refer to Section 7.2 for procedures related to “clean” tasks that do not involve hazardous waste operations and emergency response (Hawwoper).

1.1.1 Hawwoper-Regulated Tasks

- Geophysical surveying of MEC sites
- Land Surveying
- Vegetation reduction/removal

1.1.2 Non-Hawwoper-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state Hawwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hawwoper-trained personnel. **Prior approval from the Responsible Health and Safety Manager (RHSM) is required before these tasks are conducted on regulated hazardous waste sites.**

TASKS

- No non-hawwoper regulated tasks currently expected.

CONTROLS

- Brief on hazards, limits of access, and emergency procedures
- Post contaminant areas as appropriate (refer to Section 7.2 for details)
- Sample and monitor as appropriate (refer to Section 1.0)

1.2 Change Management

PROJECT Health, Safety and Environment (HS&E) Change Management Form			
<i>This evaluation form should be reviewed on a continuous basis to determine if the current site health and safety plan adequately addresses ongoing project work, and should be completed whenever new tasks are contemplated or changed conditions are encountered.</i>			
Project Task: Project Number:	Indian Head geophysical survey of Site 17 381329.XO.SS.DR 17	Project/Task Manager: Sarah Meyers Project Name: Geophysical surveying of Site 17	
Evaluation Checklist		Yes	No
1.	Have the CH2MHILL staff listed in the original HSP changed?		
2.	Has a new subcontractor been added to the project?		
3.	Is any chemical or product to be used that is not listed in Attachment 2 of the plan?		
4.	Have additional tasks been added which were not originally addressed in Section 1.1 of the plan?		
5.	Have new contaminants or higher than anticipated levels of original contaminants been encountered?		
6.	Have other safety, equipment, activity or environmental hazards been encountered that are not addressed in Section 2.1 of the plan?		

If the answer is "YES" to Questions 1-3, an HSP revision is NOT needed. Please take the following actions:

- Confirm that staff's medical and training status is current – check training records at: <http://www.int.ch2m.com/hands> (or contact your regional SPA), and confirm subcontractor qualifications.
- Confirm with the project Contracts Administrator (KA) that subcontractor safety performance has been reviewed and is acceptable
- Confirm with health and safety (H&S) that subcontractor safety procedures have been reviewed and are acceptable.

If the answer is "YES" to Questions 4-6, an HSP revision MAY BE NEEDED.

Table 1 Hazard Analysis
(Refer to Section 2.0 for Hazard Controls)

POTENTIAL HAZARDS	Project Activities								
	Geophysical Surveying	Land Surveying	Vegetation Removal Reduction						
Abrasive Blasting									
Aerial Lifts									
Arsenic									
Asbestos Hazard									
Benzene									
Biological Hazards	X	X	X						
Cadmium									
Chainsaws			X						
Chemical Hazard-Dermal/Inhalation	X	X	X						
Compressed Gas Cylinders									
Concrete & Masonry Work									
Confined Space Entry									
Crane-Suspended Personnel Platforms									
Cranes									
Demolition									
Diving									
Drilling									
Electrical Safety									
Energized Electrical Work									
Excavations									
Fall Protection									
Field Vehicles	X	X	X						
Fire Prevention			X						
Flight Line Hazards									
Forklifts									
Formaldehyde									
Hand & Power Tools	X	X	X						
Haul Truck Operations									
Heavy Equipment									
Hexavalent Chromium									
Highly Hazardous Chemicals, Toxics, Reactives (as defined by 29 CFR 1910.119)									
Hoists									
Lead									
Lockout /Tagout									
Manual Lifting									
MEC/MPPEH	X	X	X						

2.0 Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the RHSM for clarification.

The H&S hazards posed by field activities have been identified for each project activity and are provided in the Hazard Analysis Table (Table 1). Hazard control measures for project-specific and general H&S hazards are provided in 2.1 and 2.2 of this section.

In addition to the controls specified in this section, Project-Activity Self-Assessment Checklists are contained in **Attachment 4**. These checklists are to be used to assess the adequacy of CH2M HILL and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the RHSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records.

Applicable project activity self-assessment checklists (see **Attachment 4**) shall be completed weekly by a CH2M HILL representative during the course of the project depending on the work performed at the time.

2.1 Project-Specific Hazards

2.1.1 MEC

(Reference CH2M HILL Standard Operating Procedure (SOP) HS&E 610, Explosives Usage and Munitions Response [MR])

- MEC avoidance will be practiced during all site visits and during the geophysical survey. MEC avoidance will be provided by one Unexploded Ordnance (UXO) Technician III or CH2M HILL Senior UXO Supervisor (SUXOS).
- No underwater work is authorized.
- All work will be performed in accordance with the approved Work Plan.
- Contact with MEC or Material Potentially Presenting and Explosive Hazard (MPPEH) is prohibited.
- No overwater work authorized.

2.1.2 Vegetation clearing and reduction

Avoidance will be practiced during vegetation clearance. All MPPEH will be marked and reported. All personnel will be under the direct supervision of the UXO Technician.

Vegetation reduction and clearing will be conducted using weed eaters. No machetes or knives permitted on site unless address in this HSP, covered in an Activity Hazard Analysis (AHA) and personnel trained on usage. The following safety equipment shall be readily available while operating a weed eater:

- Equipment operator's manual
- Fully stocked first aid kit.
- Multipurpose fire extinguisher.
- Grounded extension cord approved for outdoor use and ground fault circuit interrupter (GFCI) for electrical-powered equipment.
- Approved safety gasoline container and funnel or flexible nozzle for refueling gasoline or diesel powered equipment

Personal Protective Equipment Requirements

The following personal protective equipment (PPE) shall be worn while operating weed eaters:

- Safety glasses with side shields or face shield to prevent injury from wood chips, sawdust, or other flying objects.
- Steel-toed safety shoes or boots or sturdy leather boots to prevent foot injury from falling objects and accidental contact with the equipment.
- Hearing protection to prevent permanent damage to hearing. Ear muffs or plugs will have a decibel noise reduction rating (NRR) assigned to them. The higher the rating, the greater the protection offered.
- Fabric or leather work gloves to prevent hand injury from abrasions, splinters, and cuts.
- Clothing (long sleeved shirt and long pants (no shorts) shall be well fitted and free of loose edges that could become entangled in equipment.

Safe Operation

The following safe operation guidelines shall be followed when for using a weed eater:

- Inspect the equipment prior to use.
- Equipment shall be held firmly with both hands.
- Overreaching or cutting above waist height shall be avoided.
- Bystanders and helpers shall remain a safe distance from operation.
- Do not operate equipment when fatigued; take frequent breaks.
- Work slowly; don't rush.
- A fire extinguisher shall be present at all times when operating gasoline or diesel powered equipment in forest or brushy areas.

Refueling the Engine

- Fueling gasoline or diesel powered equipment shall be conducted in accordance with the equipment operator's manual.
- Fuel shall be stored and transported in an approved safety container. The engine shall be shut off and allowed to cool before refueling. Never refuel a hot engine.
- A fire extinguisher shall be present during fueling and refueling.
- Smoking around fueling or refueling operations is prohibited.
- A funnel or a flexible nozzle shall be used to avoid spilling fuel on the engine.

2.1.3 Chainsaws

Only chainsaws equipped with a spark arrestor and fully functioning chain brake or “safety chain” shall be used. The following safety equipment shall be readily available while operating a chainsaw:

- Chainsaw operator's manual
- Fully stocked first aid kit.
- Multipurpose fire extinguisher.
- Foreign voltage detector (FVD) when topping utility poles.
- Grounded extension cord approved for outdoor use and ground fault circuit interrupter (GFCI) for electrical-powered chainsaws.
- Approved safety gasoline container and funnel or flexible nozzle for refueling gasoline-powered chainsaws
- Sledge hammer and non-metallic wedges when necessary to prevent pinching of the chain.

PPE Requirements

The following PPE shall be worn while operating chainsaws:

- Safety glasses with side shields or face shield to prevent injury from wood chips, sawdust, or other flying objects.
- Hard hat with properly fitted suspension to prevent head injury from falling debris.
- Steel-toed safety shoes or boots to prevent foot injury from falling objects and accidental contact with the moving chain.
- Hearing protection to prevent permanent damage to hearing. Ear muffs or plugs will have a decibel NRR assigned to them. The higher the rating, the greater the protection offered.
- Non-leather, fabric work gloves to prevent hand injury from abrasions, splinters and cuts.
- Clothing that is well-fitted and free of loose edges that could become entangled in the saw.
- Protective chaps or leggings that cover the area from the groin to about 2 inches above the ankles should be considered. These chaps are made from synthetic fabrics that are designed to prevent the running saw chain from coming in contact with your legs.

Safe Operation

The following safe operation guidelines shall be followed regardless of the purpose for using a chainsaw:

- Inspect the chainsaw prior to use.
- Chainsaws shall be held firmly with both hands, with thumbs and fingers encircling both chain saw handles.
- Stand slightly to the left side of the saw, out of the plane of the cutting chain and guide bar to reduce the risk of injury in the event of a kickback.
- Position saw so that it is between the waist and mid-chest level. Overreaching or cutting above the mid-chest height shall be avoided.
- Maintain a full throttle setting while cutting. Chainsaws are designed to be run at full speed.
- Always be aware of what is in the saw's downward path after the cut.
- Do not attempt to cut material that is larger than the guide bar of the saw.

- Avoid cuts that will cause the chainsaw to jam. Always cut into the compression wood first until the cut starts to close; then cut from the other side toward the compression cut.
- Use a non-metallic wedge to prevent the compression cut jamming on the blade.
- Chainsaws are designed to feed themselves into the wood and require only light pressure to cut efficiently. If extra force is required to keep cutting, the chain requires sharpening. Additional signs of a dull chain include a saw that is cutting crooked, results in fine sawdust instead of chips, or the smell of burnt wood. Do not use a dull chain.
- Bystanders and helpers shall be kept at a safe distance from operation.
- Do not operate a chainsaw when fatigued; take frequent breaks.
- Work slowly; don't rush.
- A fire extinguisher shall be present at all times when operating the chainsaw in forest or brushy areas.

Refueling the Engine

The fuel for gasoline-powered chainsaws shall be mixed in accordance with the manufacturer's recommendations as outlined in the chainsaw operator's manual. Fuel shall be stored and transported in an approved safety container. The following precautions should also be followed:

- The engine shall be shut off and allowed to cool before refueling; never refuel a hot engine.
- A fire extinguisher shall be present during fueling and refueling.
- Smoking around fueling or refueling operations shall be prohibited.
- A funnel or a flexible nozzle shall be used to avoid spilling fuel on the engine.

2.1.4 Field Vehicles

- Field vehicles may be personal vehicles, rental vehicles, fleet vehicles or project vehicles.
- Emergency kits are available in all northeast region (NER) offices for personal and rental vehicles. Fleet vehicles are equipped with emergency supplies. It is a project responsibility to equip all project vehicles with emergency equipment.
- Maintain both a First Aid kit and Fire Extinguisher in the field vehicle at all times.
- Utilize a rotary beacon on vehicle if working adjacent to active roadway.
- Car rental must meet the following requirements:
 - Dual air bags
 - Antilock brakes
 - Be midsize or larger.
 - Familiarize yourself with rental vehicle features.
 - Mirror adjustments
 - Seat adjustments
 - Cruise control features, if offered.
 - Pre-program radio stations.
- Always wear seatbelt while operating vehicle.
- Adjust headrest to proper position.
- Tie down loose items if utilizing a van.
- Pull off the road, put the car in park and turn on flashers before talking on a mobile phone.
- Close car doors slowly and carefully. Fingers can get pinched in doors or the truck.

- Park vehicle in a location where it can be accessed easily in the event of an emergency. If not possible, carry a phone.

2.1.5 Fire Prevention

- Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must:
 - be maintained in a fully charged and operable condition,
 - be visually inspected each month, and
 - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.
- Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations.
- Combustible materials stored outside should be at least 10 feet from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
- Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.

2.1.6 Manual Lifting

(Reference CH2M HILL SOP HSE-112, Manual Lifting)

- Back injuries are the leading cause of disabling work and most back injuries are the result of improper lifting techniques or overexertion. Office or field tasks and activities involving manual lifting are to be identified and a program implemented to assist employees to mitigate the risks associated with manual lifting.
- When possible, the task should be modified to minimize manual lifting hazards.
- Effectiveness of manual handling control measures will be evaluated during assessments (HSE-114, *Office & Warehouse Safety Program*, or HSE-109, *Audits*).
- Manual handling incidents are reviewed as part of the HSE Program reviews, and the results influence program development, training, and education efforts.
- Lifting of loads weighing more than 40 pounds (18 kilograms) should be evaluated by the SC using the Lifting Evaluation Form contained in SOP HSE-112.
- Using mechanical lifting devices is the preferred means of lifting heavy objects such as forklifts; cranes, hoists, and rigging; hand trucks; and trolleys.
- Personnel shall seek assistance when performing manual lifting tasks that appear beyond their physical capabilities.
- Physical differences make it difficult to set up safe lifting limits, unless extensive individual testing is performed. In general, the following steps must be practiced when planning and performing manual lifts: Assess the situation before you lift; ensure good lifting and body positioning practices; ensure good carrying and setting down practices.
- All employees must receive training for the correct procedures to lift safely using the computer-based health and safety training or project-specific training.

2.1.7 Visible Lighting

- While work is in progress outside construction areas shall have at least 33 lux (lx).
- Construction work conducted inside buildings should be provided with at least 55 lx light.
- The means of egress shall be illuminated with emergency and non-emergency lighting to provide a minimum 11 lx measured at the floor. Egress illumination shall be arranged so

that the failure of any single lighting unit, including the burning out of an electric bulb will not leave any area in total darkness.

2.2 General Hazards

2.2.1 General Practices and Housekeeping

- Site work should be performed during daylight hours whenever possible.
- Good housekeeping must be maintained at all times in all project work areas.
- Common paths of travel should be established and kept free from the accumulation of materials.
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions.
- Provide slip-resistant surfaces, ropes, and/or other devices to be used.
- Specific areas should be designated for the proper storage of materials.
- Tools, equipment, materials, and supplies shall be stored in an orderly manner.
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.
- Containers should be provided for collecting trash and other debris and shall be removed at regular intervals.
- All spills shall be quickly cleaned up. Oil and grease shall be cleaned from walking and working surfaces.
- Review the safety requirements of each job you are assigned to with your supervisor. You are not expected to perform a job that may result in injury or illness to yourself or to others.
- Familiarize yourself with, understand, and follow jobsite emergency procedures.
- Do not fight or horseplay while conducting the firm's business.
- Do not use or possess firearms or other weapons while conducting the firm's business.
- Report unsafe conditions or unsafe acts to your supervisor immediately.
- Report occupational illnesses, injuries, and vehicle accidents.
- Do not remove or make ineffective safeguards or safety devices attached to any piece of equipment.
- Report unsafe equipment, defective or frayed electrical cords, and unguarded machinery to your supervisor.
- Shut down and lock out machinery and equipment before cleaning, adjustment, or repair. Do not lubricate or repair moving parts of machinery while the parts are in motion.
- Do not run in the workplace.
- When ascending or descending stairways, use the handrail and take one step at a time.
- Do not apply compressed air to any person or clothing.
- Do not wear steel taps or shoes with metal exposed to the sole at any CH2M HILL project location.
- Do not wear finger rings, loose clothing, wristwatches, and other loose accessories when within arm's reach of moving machinery.
- Remove waste and debris from the workplace and dispose of in accordance with federal, state, and local regulations.
- Note the correct way to lift heavy objects (secure footing, firm grip, straight back, lift with legs), and get help if needed. Use mechanical lifting devices whenever possible.
- Check toe work area to determine what problems or hazards may exist.

2.2.2 Personal Hygiene

- Keep hands away from nose, mouth, and eyes.
- Keep areas of broken skin (chapped, burned, etc.) covered.
- Wash hands with hot water and soap frequently prior to eating and smoking.

2.2.3 Drugs and Alcohol

(Reference CH2MHILL SOP HSE-105, Drug-Free Workplace)

The following situations pertaining to drugs and alcohol are prohibited:

- Use or possession of intoxicating beverages while performing CH2M HILL work
- Abuse of prescription or nonprescription drugs
- Regulations. Use or possession of illegal drugs or drugs obtained illegally
- Sale, purchase, or transfer of illegal or illegally obtained drugs
- Arrival at work under the influence of legal or illegal drugs or alcohol

2.2.4 Driving

- Always be aware of surroundings while operating a vehicle. Avoid intellectual stress & worries, use of a cellular phone, eating, drinking, smoking, reading a map, adjusting controls or looking at a passenger while driving.
- Use prudent speed limits, assure that backup warning devices are working, be aware of blind spots or other hazards associated with low visibility, etc. Use a spotter if necessary.
- Do no drive while drowsy. Drowsiness can occur at any time, but is most likely after 18 hours or more without sleep.

2.2.5 Hazard Communication

(Reference CH2M HILL SOP HSE-107, Hazard Communications)

The Hazard Communication (HAZCOM) Coordinator is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using **Attachment 2**.
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available.
- Request or confirm locations of Material Safety Data Sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed.
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
- Give employees required chemical-specific HAZCOM training using **Attachment 3**.
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

2.2.6 Shipping and Transportation of Chemical Products

(Reference CH2M HILL's Procedures for Shipping and Transporting Dangerous Goods)

Chemicals brought to the site might be defined as hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be

properly identified, labeled, packed, and documented by trained staff. Contact the RHSM or the Warehouse Coordinator for additional information.

2.2.7 Ultraviolet (UV) Radiation (sun exposure)

Health effects regarding UV radiation are confined to the skin and eyes. Overexposure can result in many skin conditions, including erythema (redness or sunburn), photoallergy (skin rash), phototoxicity (extreme sunburn acquired during short exposures to UV radiation while on certain medications), premature skin aging, and numerous types of skin cancer.

Acute overexposure of UV radiation to the eyes may lead to photokeratitis (inflammation of the cornea), also known as snow blindness. Symptoms include redness of the eyes and a gritty feeling, which progresses to pain and an inability to tolerate any kind of light. This condition can also occur when working in or around water and other UV radiation reflectors. In addition, long-term exposure to sunlight is thought to cause cataracts or clouding of the lens of the eye.

Limit Exposure Time

- Rotate staff so the same personnel are not exposed all of the time.
- Limit exposure time when UV radiation is at peak levels (approximately 2 hours before and after the sun is at its highest point in the sky).
- Avoid exposure to the sun, or take extra precautions when the UV index rating is high.

Provide Shade

- Take lunch and breaks in shaded areas.
- Create shade or shelter through the use of umbrellas, tents, and canopies.
- Fabrics such as canvas, sailcloth, awning material and synthetic shade cloth create good UV radiation protection.
- Check the UV protection of the materials before buying them. Seek protection levels of 95 percent or greater, and check the protection levels for different colors.

Clothing

- Reduce UV radiation damage by wearing proper clothing; for example, long sleeved shirts with collars, and long pants. The fabric should be closely woven and should not let light through.
- Head protection should be worn to protect the face, ears, and neck. Wide-brimmed hats with a neck flap or "Foreign Legion" style caps offer added protection.
- Wear UV-protective sunglasses or safety glasses. These should fit closely to the face. Wrap-around style glasses provide the best protection.

Sunscreen

- Apply sunscreen generously to all exposed skin surfaces at least 20 minutes before exposure, allowing time for it to adhere to the skin.
- Re-apply sunscreen at least every 2 hours, and more frequently when sweating or performing activities where sunscreen may be wiped off.
- Choose a sunscreen with a high sun protection factor (SPF). Most dermatologists advocate SPF 30 or higher for significant sun exposure.
- Waterproof sunscreens should be selected for use in or near water, and by those who perspire sufficiently to wash off non-waterproof products.

- Check for expiration dates, because most sunscreens are only good for about 3 years. Store in a cool place out of the sun.
- Remember—no sunscreen provides 100% protection against UV radiation. Other precautions must be taken to avoid overexposure.

2.2.8 Heat Stress

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°F to 60°F should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.
- Acclimate yourself by slowly increasing workloads (e.g., do not begin with extremely demanding activities).
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shelter/shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. Persons who experience signs of heat syncope, heat rash, or heat cramps should report it to their supervisor immediately to avoid progression of heat-related illness.

SYMPTOMS AND TREATMENT OF HEAT STRESS					
	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool—but not cold—water. Call ambulance, and get medical attention immediately!

Monitoring Heat Stress

These procedures should be implemented when the ambient air temperature exceeds 70°F, the relative humidity is high (>50 percent), or when workers exhibit symptoms of heat stress.

The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 100 beats/minute, or 20 beats/minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 100 beats/minute at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 100 beats/minute, or 20 beats/minute above resting pulse.

2.2.9 Cold Stress

- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in cool weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.
- NSC Guidelines for Work and Warm-Up Schedules can be used with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; workers should be monitored for symptoms of cold-related illnesses. If symptoms are not observed, the work duration can be increased.
- Persons who experience initial signs of immersion foot, frostbite, hypothermia should report it immediately to their supervisor/PM to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

SYMPTOMS AND TREATMENT OF COLD STRESS			
	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm—but not hot—water. Have victim drink warm fluids, but not coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but not coffee or alcohol. Get medical attention.



Wind Chill Chart



Wind (mph)	Temperature (°F)																		
	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times 30 minutes 10 minutes 5 minutes

Wind Chill (°F) = $35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$
 Where, T = Air Temperature (°F) V = Wind Speed (mph) Effective 11/01/01

2.3 Biological Hazards and Controls

2.3.1 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

2.3.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention by notifying your supervisor and contacting Health Resources at 1-800-756-1130. See fact sheets on the CH2M HILL Virtual Office (VO) (HSSE page, Safety topics, Poison Oak, Ivy and Sumac.)

2.3.3 Ticks

Every year employees are exposed to tick bites at work and at home putting them at risk of illness. Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size.

In some geographic areas exposure is not easily avoided. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray only outside of clothing with permethrin or permanone and spray skin with only DEET; and check yourself frequently for ticks.

Where site conditions warrant (vegetation above knee height, tick endemic area) or when tasks warrant (e.g., having to sit/kneel in vegetation) that diminish the effectiveness of the other controls mentioned above, bug-out suits (obtained from MKE warehouse)/Tyvek shall be used. Bug-out suits are more breathable than Tyvek.

Take precautions to avoid exposure by including pre-planning measures for biological hazards prior to starting field work. Contact the MKE Warehouse for preventative equipment such as repellants, protective clothing and tick removal kits. Use the buddy system and perform tick inspections prior to entering the field vehicle. If ticks were not planned to be encountered and are observed, do not continue field work until these controls can be implemented.

See Tick Fact Sheet attached to this HSP for further precautions and controls to implement when ticks are present. Information includes the procedure for submitting a removed tick for testing. If bitten by a tick, follow the removal procedures found in the tick fact sheet, call the occupational nurse at 1-866-893-2514 and submit the tick to Clongen laboratory using the form in the fact sheet attachment.

Be aware of the symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both RMSF and Lyme disease, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, again contact the occupational nurse at 1-866-893-2514.

2.3.4 Bees and Other Stinging Insects

Bee and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform your supervisor and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention by notifying your supervisor and contacting Health Resources at 1-800-756-1130 if a reaction develops.

2.3.5 Bloodborne Pathogens

(Reference CH2M HILL SOP HSE-202, Bloodborne Pathogens)

Exposure to bloodborne pathogens may occur when rendering first aid or cardiopulmonary resuscitation (CPR), or when coming into contact with landfill waste or waste streams containing potentially infectious material (PIM).

- Employees trained in first-aid/CPR or those exposed to PIM must complete CH2M HILL's 1-hour bloodborne computer-based training module annually.
- Hepatitis B vaccine (HBV) is offered to employees who may be exposed to PIM when they complete training and within 10 working days of assignment. (Note: Employees

whose exposure stems only from rendering first aid as a collateral duty receives the vaccine after exposure.)

- Employees who decline the HBV vaccine must sign the declination form (contact regional Safety Program Assistant [SPA]) indicating they declined the vaccination. Anyone who declines the vaccination and chooses to receive the vaccination at a later time may still receive the vaccination by contacting the SPA.
- Hepatitis B and tetanus vaccinations can be requested by completing the medical portion of the enrollment form, located under Tools & Forms at the HS&E web page, or by contacting the regional SPA.

2.3.6 Feral Dogs

Avoid all dogs – both leashed and stray. Do not disturb a dog while it is sleeping, eating, or caring for puppies. If a dog approaches to sniff you, stay still. An aggressive dog has a tight mouth, flattened ears and a direct stare. If you are threatened by a dog, remain calm, do not scream and avoid eye contact. If you say anything, speak calmly and firmly. Do not turn and run, try to stay still until the dog leaves, or back away slowly until the dog is out of sight or you have reached safety (e.g., vehicle). If attacked, retreat to vehicle or attempt to place something between you and the dog. If you fall or are knocked to the ground, curl into a ball with your hands over your head and neck and protect your face. If bitten, immediately scrub the bite site vigorously with soap and water. Report the incident to the local authorities. Seek medical attention as soon as possible.

2.3.7 Mosquito Bites

Due to the recent detection of the West Nile Virus in the Southwestern United States it is recommended that **preventative measures** be taken to reduce the probability of being bitten by mosquitoes whenever possible. Mosquito's are believed to be the primary source for exposure to the West Nile Virus as well as several other types of encephalitis. The following guidelines should be followed to reduce the risk of these concerns for working in areas where mosquitoes are prevalent.

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or N,N-diethyl-meta-toluamide (DEET) since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET. DEET in high concentrations (greater than 35%) provides no additional protection.
- Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.
- Note: Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

Symptoms of Exposure to the West Nile Virus

Most infections are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death.

The West Nile Virus incubation period is from 3-15 days.

Contact the project RHSM with questions, and immediately report any suspicious symptoms to your supervisor/PM.

2.4 Radiological Hazards and Controls

Refer to CH2M HILL's Core Standard, Radiological Control and Radiological Controls Manual for additional requirements.

Hazards	Controls
None Known	None Required

2.5 Contaminants of Concern

There are no known surface contaminants present in the area of work covered by this HSP. Contaminants of concern (COCs) include trichloroethene (TCE), Cis-1,2-DCE and Vinyl Chloride at a depth of 8 to 18 feet bgs. No intrusive work will be conducted to complete the planned tasks. If intrusive work is necessary to complete the tasks covered in this HSP, contact the RHSM before proceeding

Contaminants of Concern					
Contaminant	Location and Maximum^a Concentration parts per million (ppm)	Exposure Limit^b	IDLH^c	Symptoms and Effects of Exposure	PIP^d (eV)
Composition A, B, & C -- Reference RDX and TNT	UK				
Cordite	UK	NL	NL	NL	NL
Dynamite - Nitroglycerine	UK	0.1 mg/m ³	75 mg/m ³	Throbbing headache; dizziness; nausea, vomiting	NL
Diphenylamine	UK	10 mg/m ³	NL	Irritation eyes, skin, mucous membrane; eczema; tachycardia, hypertension	7.40
Nitrocellulose	UK	NL	NL	NL	NL
Perchlorate	UK	NL	NL	NL	NL
RDX	UK	1.5 mg/m ³	NL	Irritation eyes, skin; headache, irritability, lassitude	NL
TNT	UK	0.5 mg/m ³	500 mg/m ³	Irritation skin, mucous membrane; liver damage, jaundice	10.59
Torpex -- Reference RDX / TNT	UK				
PETN	UK	5	NL	Irritation eyes, respiratory system	NL
Footnotes: ^a Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water). ^b Appropriate value of PEL, REL, or TLV listed. ^c IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen. ^d PIP = photoionization potential; NA = Not applicable; NL = No limit found in reference materials; UK = Unknown.					
Potential Routes of Exposure					
Dermal: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 4.		Inhalation: Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 4 and 5, respectively.		Other: Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).	

3.0 Project Organization and Personnel

3.1 CH2M HILL Employee Medical Surveillance and Training

(Reference CH2M HILL- SOPs HSE-113, Medical Surveillance, and HSE-110, Training)

The employees listed meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated safety coordinator (SC) have completed a 12-hour site safety coordinator course, and have documented requisite field experience. An SC with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones. Employees designated First Aid (FA)-CPR are currently certified by the American Red Cross, or equivalent, in FA and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL-SOP HSE-120, *Reproductive Health*, including obtaining a physician's statement of the employee's ability to perform hazardous activities before being assigned fieldwork.

Employee Name	Office	Responsibility	SC/FA-CPR
Sarah Meyers	WDC	Project Manager	
Keith Schucker	CLK	Senior UXO Supervisor/FTL/SC	Level B SC-HW, FA-CPR
Tamir Klaff	WDC	Geophysicist	SC-Hazardous Waste (HW)

3.2 Field Team Chain of Command and Communication Procedures

3.2.1 Client

Contact Name: Mr. Joe Rail, Remedial Project Manager
Phone: 202-685-3105

3.2.2 CH2M HILL

Program Manager: Ray Tyler/VBO
Project Manager (PM): Sarah Meyers/WDC

Responsible Health and Safety Manager (RHSM): Mark Orman/MKE

Field Team Leader: Keith Schucker/CLK

Safety Coordinator (SC): Keith Schucker/CLK; Tamir Klaff/WDC

The PM is responsible for providing adequate resources (budget and staff) for project-specific implementation of the HS&E management process. The PM has overall management responsibility for the tasks listed below. The PM may explicitly delegate specific tasks to other staff, as described in sections that follow, but retains ultimate responsibility for completion of the following in accordance with this SOP:

- Include standard terms and conditions, and contract-specific HS&E roles and responsibilities in contract and subcontract agreements (including flow-down requirements to lower-tier subcontractors)
- Select safe and competent subcontractors by:
 - obtaining, reviewing and accepting or rejecting subcontractor pre-qualification questionnaires
 - ensuring that acceptable certificates of insurance, including CH2M HILL as named additional insured, are secured as a condition of subcontract award
 - including HS&E submittals checklist in subcontract agreements, and ensuring that appropriate site-specific safety procedures, training and medical monitoring records are reviewed and accepted prior to the start of subcontractor's field operations
- Maintain copies of subcontracts and subcontractor certificates of insurance (including CH2M HILL as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures in the project file accessible to site personnel
- Provide oversight of subcontractor HS&E practices per the site-specific safety plan
- Manage the site and interfacing with 3rd parties in a manner consistent with our contract and subcontract agreements and the applicable standard of reasonable care
- Ensure that the overall, job-specific, HS&E goals are fully and continuously implemented

The CH2M HILL RHSM is responsible for:

- Review and accept or reject subcontractor pre-qualification questionnaires that fall outside the performance range delegated to the KA.
- Review and accept or reject subcontractor training records and site-specific safety procedures prior to start of subcontractor's field operations
- Support the oversight of subcontractor (and lower-tier subcontractors) HS&E practices and interfaces with on-site 3rd parties per the site-specific safety plan
- Approving revision to PPE levels

The SC is responsible for verifying that the project is conducted in a safe manner including the following specific obligations:

- Verify this HSP is current and amended when project activities or conditions change.
- Verify CH2M HILL site personnel and subcontractor personnel read the HSP and sign **Attachment 1**, Employee Sign-Off Form prior to commencing field activities.
- Verify CH2M HILL site personnel and subcontractor personnel have completed any required specialty training (e.g., fall protection, confined space entry) and medical surveillance as identified in Section 3.0.

- Verify compliance with the requirements of this HSP and applicable subcontractor health and safety plan(s)
- Act as the project “HAZCOM Coordinator” and perform the responsibilities outlined in Section 2.2.5
- Act as the project “Emergency Response Coordinator” and perform the responsibilities outlined in Section 8.0.
- Post Occupational Safety and Health Administration (OSHA) job-site poster; the poster is required at sites where project field offices, trailers, or equipment-storage boxes are established.
- Verify that safety meetings are conducted and documented in the project file initially and as needed throughout the course of the project (e.g., as tasks or hazards change)
- Verify that project H&S forms and permits, found in **Attachment 4 and 5**, are being used as outlined in Section 1.0
- Perform oversight and/or assessments of subcontractor HS&E practices per the site-specific safety plan and verify that project activity self-assessment checklists, found in **Attachment 4**, are being used as outlined in Section 1.0
- Verify that project files available to site personnel include copies of executed subcontracts and subcontractor certificates of insurance (including CH2M HILL as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures prior to start of subcontractor’s field operations
- Manage the site and interfacing with 3rd parties in a manner consistent with our contract/subcontract agreements and the applicable standard of reasonable care
- Coordinate with the RHSM regarding CH2M HILL and subcontractor operational performance, and 3rd party interfaces
- Ensure that the overall, job-specific, HS&E goals are fully and continuously implemented

The training required for the SC/HW is as follows:

- SC-Initial, SC_HW
- FA and CPR

The SC is responsible for contacting the Field Team Leader and PM. In general, the PM will contact the client. The RHSM should be contacted as appropriate.

3.2.3 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HSE-215, Contracts, Subcontracts and HSE Management Practices)

Subcontractor: USA Environmental (Vegetation Reduction)
 Subcontractor Contact Name: Don Shaw
 Telephone: 813-343-6406 (office); 813-846-9138 (cell)

Subcontractor: Naeva (Geophysical Subcontractor)
 Subcontractor Contact Name: Karen Lemley
 Telephone: 434-978-3187

The subcontractors listed above are required to submit their own Accident Prevention Plan, specific to this project. Other plans, such as Lead or Asbestos Abatement Compliance plans, may be required as well. Subcontractors are responsible for the health and safety

procedures specific to their work, and are required to submit their plans to CH2M HILL for review before the start of field work.

Subcontractors are also required to prepare an Activity Hazard Analysis (AHA) before beginning each activity posing H&S hazards to their personnel using the AHA form provided in **Attachment 5** as a guide. The AHA shall identify the principle steps of the activity, potential H&S hazards for each step and recommended control measures for each identified hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

CH2M HILL should continuously endeavor to observe subcontractors' safety performance and adherence to their Accident Prevention Plan and AHAs. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. Self-assessment checklists contained in **Attachment 4** are to be used by CH2M HILL personnel to review subcontractor performance. CH2M HILL oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

H&S related communications with CH2M HILL subcontractors should be conducted as follows:

- Brief subcontractors on the provisions of this plan, and require them to sign the Employee Signoff Form included in **Attachment 1**.
- Request subcontractor(s) to brief project team on the hazards and precautions related to their work.
- When apparent non-compliance/unsafe conditions or practices are observed, notify the subcontractor safety representative and require corrective action – the subcontractor is responsible for determining and implementing necessary controls and corrective actions.
- When repeat non-compliance/unsafe conditions are observed, notify the subcontractor safety representative and stop affected work until adequate corrective measures are implemented.
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, and stop affected work until adequate corrective measures are implemented. Notify the PM and RHSM as appropriate.
- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

4.0 Personal Protective Equipment (PPE)

(Reference CH2M HILL- SOP HSE-117, Personal Protective Equipment)

- PPE must be worn by employees when actual or potential hazards exist and engineering controls or administrative practices cannot adequately control those hazards.
- A PPE assessment has been conducted by the RHSM based on project tasks (see PPE specifications below). Verification and certification of assigned PPE by task is completed by the RHSM or designee.
- The PPE initially identified for tasks may be changed based on field reconnaissance, results of site monitoring, or additional hazard analysis. These changes must be reviewed by the RHSM prior to implementation.
- Employees must be trained to properly wear and maintain the PPE.
- In work areas where actual or potential hazards are present at any time, PPE must be worn by employees working or walking through the area.
- Areas requiring PPE should be posted or employees must be informed of the requirements in an equivalent manner.
- PPE must be inspected prior to use and after any occurrence to identify any deterioration or damage.
- PPE must be maintained in a clean and reliable condition.
- Damaged PPE shall not be used and must either be repaired or discarded.
- PPE shall not be modified, tampered with, or repaired beyond routine maintenance.

The table below outlines PPE to be used according to task based on project-specific hazard assessment. If a task other than the tasks described in this table needs to be performed, contact the RHSM so this table can be updated.

Project-Specific PPE Requirements^a

Task	Level	Body	Head	Respirator ^b
General site entry Geophysical surveying Vegetation clearance	D	Work clothes; sturdy leather work boots and gloves Chaps for chainsaw use	Hardhat ^c Safety glasses with side shields Faceshield for weed eater and chainsaw, as needed Ear protection ^d	None required
No tasks on this job	Modified D	Work clothes or cotton coveralls Boots: Safety-toe, chemical-resistant boots OR Safety -toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Safety glasses with side shields Ear protection ^d	None required
No tasks on this job	Modified D	Coveralls: Uncoated Tyvek® Boots: Safety -toe, chemical-resistant boots OR Safety -toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Splash shield ^c Safety glasses with side shields Ear protection ^d	None required.
No tasks on this job	C	Coveralls: Polycoated Tyvek® Boots: Safety -toe, chemical-resistant boots OR Safety -toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Splash shield ^c Ear protection ^d Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H cartridges or equivalent ^e

Reasons for Upgrading or Downgrading Level of Protection with approval of the Health and Safety Manager (HSM)

Upgrade ^f	Downgrade
<ul style="list-style-type: none"> • Request from individual performing tasks. • Change in work tasks that will increase contact or potential contact with hazardous materials. • Occurrence or likely occurrence of gas or vapor emission. • Known or suspected presence of dermal hazards. • Instrument action levels (Section 5) exceeded. 	<ul style="list-style-type: none"> • New information indicating that situation is less hazardous than originally thought. • Change in site conditions that decrease the hazard. • Change in work task that will reduce contact with hazardous materials.

^a Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

^b No facial hair that would interfere with respirator fit is permitted.

^c Hardhat and splash-shield areas are to be determined by the SC.

^d Ear protection should be worn when conversations cannot be held at distances of 3 feet or less without shouting.

^f Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the RHSM, and an SC qualified at that level is present.

PPE Certification

I certify that the PPE requirements listed in the table above for the associated tasks are based upon the project-specific hazard assessment I performed.

Mark Orman	02/13/09	02/13/09
Name	Date of Certification	Date(s) of Project Hazard Assessment

5.0 Air Monitoring/Sampling

(Reference CH2M HILL SOP HSE-207, Exposure Assessment for Airborne Chemical Hazards)

5.1 Air Monitoring Specifications

Not needed for geophysical surveying, land surveying, or vegetation clearance.

Instrument	Tasks	Action Levels ^a	Action to be Taken when Action Level reached	Frequency ^b	Calibration
Dust Monitor: Miniram model PDM-3 or equivalent	N/A unless intrusive operations are conducted.	1.5 mg/m ³ >1.5 mg/m ³	Level D Level C	Initially and periodically during tasks	Zero Daily
Noise-Level Monitor^d	Vegetation clearing - as required for gasoline or diesel powered equipment.	<85 dB(A) 85-120 dB(A) 120 dB(A)	No action required Hearing protection required Stop; re-evaluate	Initially and periodically during task	Daily

^a Action levels apply to sustained breathing-zone measurements above background.

^b The exact frequency of monitoring depends on field conditions and is to be determined by the SC; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3", "at surface/SB-2", etc.).

^c If the measured percent of O₂ is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O₂ action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O₂ action levels are required for confined-space entry (refer to Section 2).

^d Noise monitoring and audiometric testing also required.

5.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Instrument	Gas	Span	Reading	Method
PID: OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
PID: TVA 1000	100 ppm isobutylene	CF = 1.0	100 ppm	1.5 lpm reg T-tubing
FID: OVA	100 ppm methane	3.0 ± 1.5	100 ppm	1.5 lpm reg T-tubing
FID: TVA 1000	100 ppm methane	NA	100 ppm	2.5 lpm reg T-tubing
Dust Monitor: Miniram-PDM3	Dust-free air	Not applicable	0.00 mg/m ³ in "Measure" mode	Dust-free area OR Z- bag with HEPA filter
CGI: MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL ± 5% LEL	1.5 lpm reg direct tubing

5.3 Air Sampling

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

Method Description

NA for this scope of work

Personnel and Areas

Results must be sent immediately to the RHSM. Regulations may require reporting to monitored personnel. Results reported to:

HSM: NA
Other: NA

6.0 Spill Containment Procedures

Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and disposed of properly.

Spill clean up materials (absorbent pads, vermiculite, etc) will be available on site for fuel spills from gasoline or diesel powered equipment operations and refueling.

7.0 Site-Control Plan

7.1 Site-Control Procedures

(Reference CH2M HILL SOP HSE-218, Hazardous Waste Operations)

- The SC will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of HSP, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- The SC records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location in accordance with CH2M HILL- Core Standard, *OSHA Postings*.
- Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
 - Line-of-sight and hand signals
 - Air horn
 - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the “buddy system.”
- Initial air monitoring is conducted by the SC in appropriate level of protection.
- The SC is to conduct periodic inspections of work practices to determine the effectiveness of this plan – refer to Sections 1.0 and 3.0. Deficiencies are to be noted, reported to the HSM, and corrected.

7.2 Hazwoper Compliance Plan

(Reference CH2M HILL CS HSE-220, Written Plans and HSE-218 Hazardous Waste Operations)

Certain parts of the site work are covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated Hazwoper tasks (Section 1.1.1) might occur consecutively or concurrently with respect to non-Hazwoper tasks. This section outlines procedures to be followed when approved activities specified in Section 1.1.2 do not require 24- or 40-hour training. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements.

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff is working in proximity to Hazwoper activities. Other data (e.g., soil) also must document that there is no potential for exposure. The RHSM must approve the interpretation of these data. Refer to Sections 1.0 and 1.0 for contaminant data and air sampling requirements, respectively.

- When non-Hazwoper-trained personnel are at risk of exposure, the SC must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
 - nature of the existing contamination and its locations
 - limitations of their access
 - emergency action plan for the site
- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.

8.0 Emergency Response Plan

(Reference CH2M HILL SOP HSE-106, Emergency Planning)

8.1 Pre-Emergency Planning

- The Emergency Response Coordinator (ERC) performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate.
- Review the facility emergency and contingency plans where applicable.
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital. Drills should take place periodically but no less than once a year.
- Brief new workers on the emergency response plan.
- The ERC will evaluate emergency response actions and initiate appropriate follow-up actions.

8.2 Emergency Equipment and Supplies

The ERC should mark the locations of emergency equipment on the site map and post the map.

Emergency Equipment and Supplies	Location
20 (or two 10) class A,B,C fire extinguisher	Site Vehicle
First aid kit	Site Vehicle
Eye Wash	Site Vehicle
Potable water	Site Vehicle
Bloodborne-pathogen kit	Site Vehicle
Additional equipment (specify): Cell Phone	FTL / SC

8.3 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Notify appropriate response personnel.
- Shut down CH2M HILL operations and evacuate the immediate work area.
- Account for personnel at the designated assembly area(s).
- Assess the need for site evacuation, and evacuate the site as warranted.
- Implement HSE-111, *Incident Notification, Reporting and Investigation*.
- Notify and submit reports to clients as required in contract.

Small fires or spills posing minimal safety or health hazards may be controlled with onsite spill kits or fire extinguishers without evacuating the site. When in doubt evacuate. Follow the incident reporting procedures in Section 8.7.

8.4 Emergency Medical Treatment

Emergency medical treatment is needed when there is a life-threatening injury (such as severe bleeding, loss of consciousness, breathing/heart has stopped). When in doubt if an injury is life-threatening or not, treat it as needing emergency medical treatment.

- Notify 911 or other appropriate emergency response authorities as listed in Emergency Contacts at the front of this HSP.
- The ERC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury, perform decontamination (if applicable) where feasible; lifesaving and first aid or medical treatment takes priority.
- Initiate first aid and CPR where feasible.
- Notify supervisor and if the injured person is a CH2M HILL employee. The supervisor will call the occupational nurse at 1-800-756-1130 and make other notifications as required by HSE SOP-111, *Incident Notification, Reporting and Investigation*.
- Make certain that the injured person is accompanied to the emergency room.
- Follow the Serious Incident Reporting process in HSE SOP-111, *Incident Notification, Reporting and Investigation*, and complete incident report forms in **Attachment 5**.
- Notify and submit reports to client as required in contract

8.5 Evacuation

- Evacuation routes, assembly areas, and severe weather shelters (and alternative routes and assembly areas) are to be specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the ERC or designee before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The ERC and a "buddy" will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
- The ERC will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- The ERC will follow the incident reporting procedures in Section 8.7.

8.6 Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

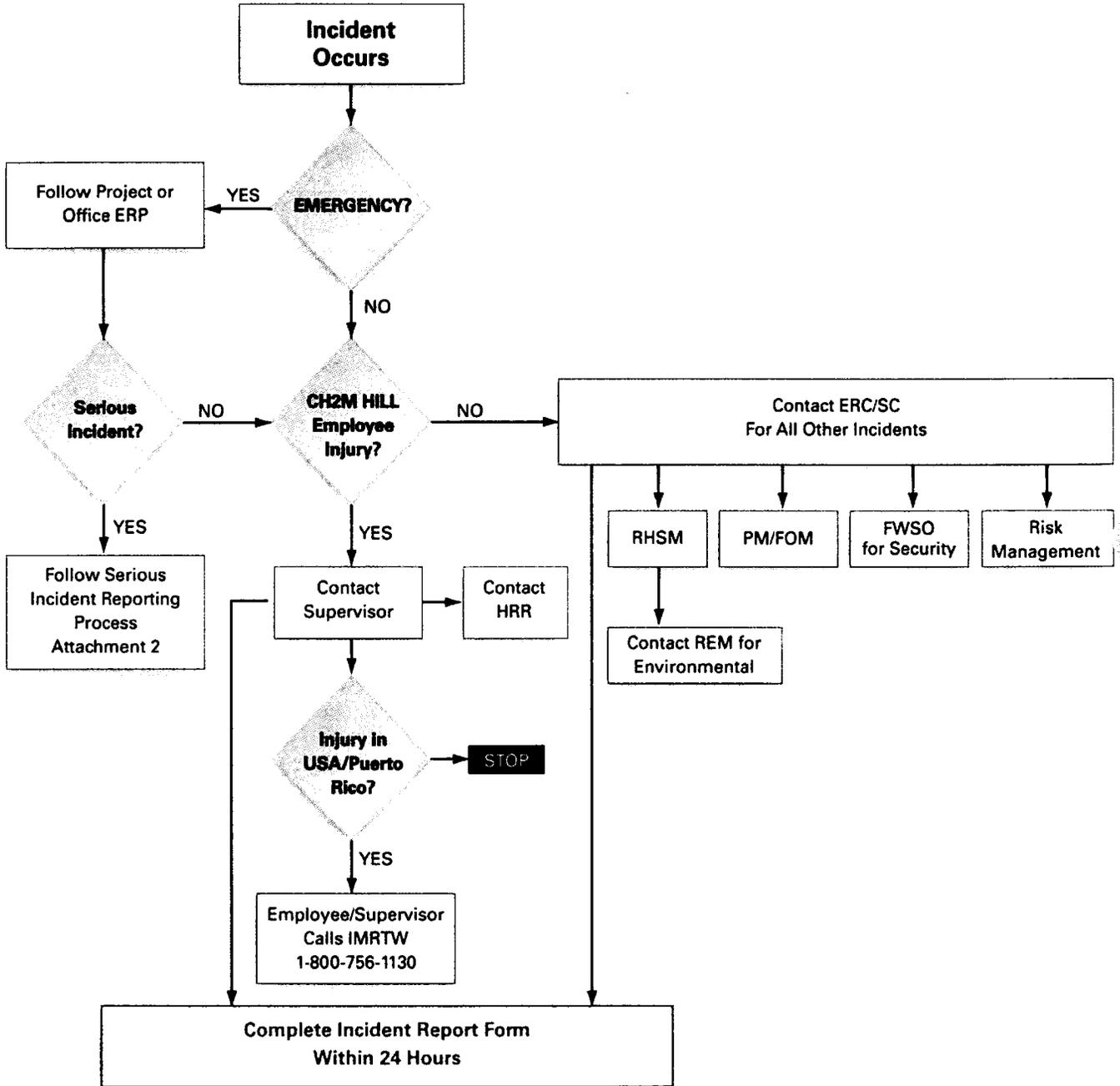
8.7 Incident Notification and Reporting

(Reference CH2M HILL SOP HSE-111, Incident Notification, Reporting and Investigation)

- If you are injured at work, notify your supervisor immediately and contact the Injury Management/Return-to-Work toll free number (for US and Puerto Rico) 1-800-756-1130. All supervisors must contact their Human Resources (HR) representative and complete the employee injury/illness in the Incident Report Form (IRF) in the Hours & Incident Tracking System (HITS) database within 24 hours of the incident
- Immediately notify the PM, ERC, and/or RHSM for any project incident (fire, spill/release, injury/illness, near miss, property damage, or security-related)
- Report any **serious incidents** (life-threatening injury/illness, death, kidnap/missing person, terrorism, property damage greater than \$500K, significant environmental release) **immediately** to your ERC, PM, or RHSM. The Serious Incident Reporting number is 720-286-4911.
- For serious incidents, the Corporate Legal Department will determine who completes the IRF.
- For CH2M HILL subcontractor incidents, immediately notify the ERC and HSM to complete and submit an IRF.
- The RHSM will inform the Responsible Environmental Manager (REM) of any environmental incidents.
- Evaluation and follow-up of the IRF will be completed by the type of incident by the RHSM, REM, or Firm Wide Security Operations (FWSO). The Business Group (BG) HSE Lead will review all BG incidents and modify as required.
- Incident Investigations must be initiated and completed as soon as possible but no later than 72 hours after the incident.
- See the following flowcharts for Immediate Incident Reporting and Serious Incident Reporting.



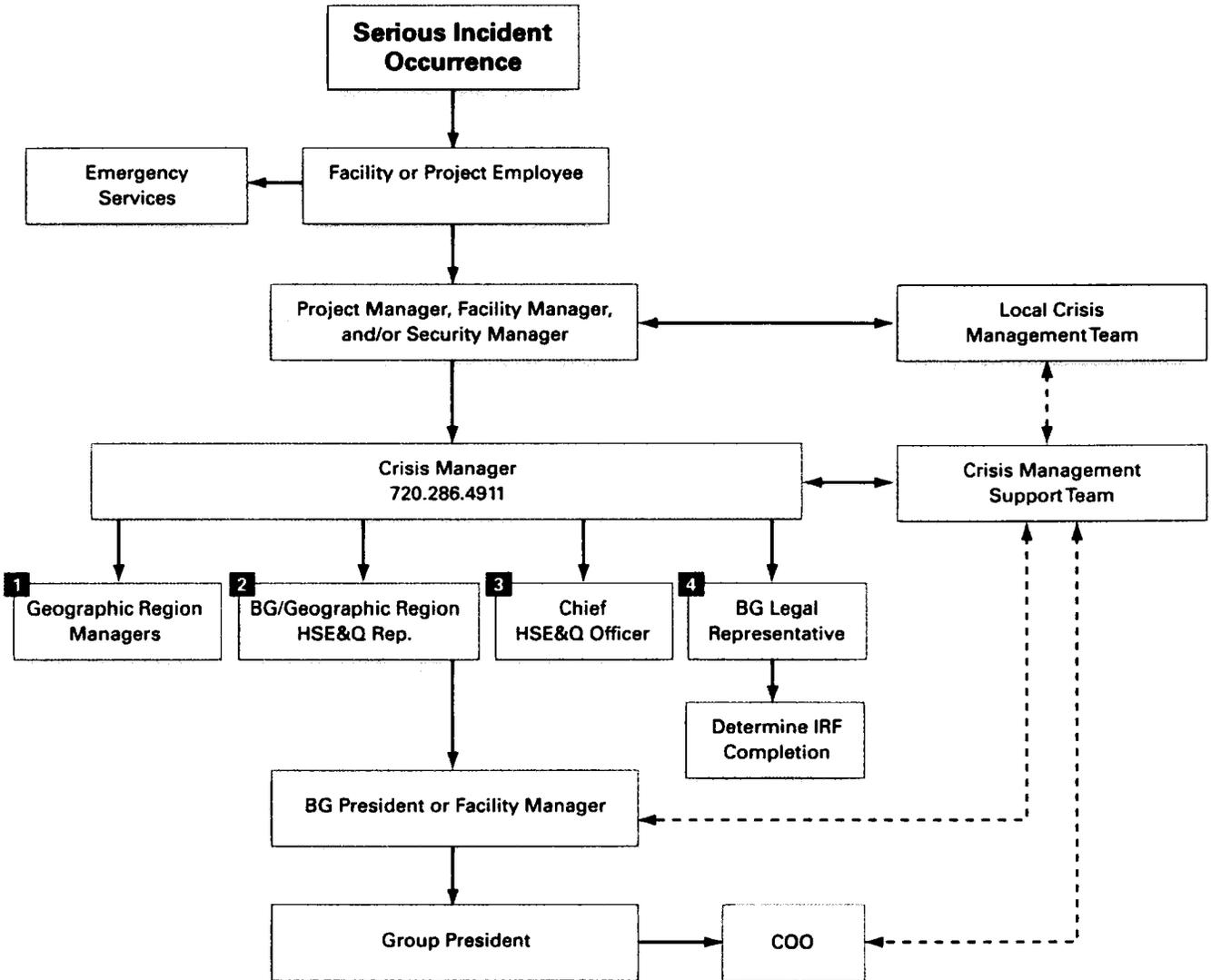
Flowchart 1 CH2M HILL Immediate Incident Notification



ERC = Emergency Response Coordinator
(designated in Emergency Response Plan)
ERP = Emergency Response Plan
FOM = Facility Office Manager
FWSO = Firm Wide Security Operations
HRR = Human Resources Representative

IMRTW = Injury Management/Return-to-Work
PM = Project Manager
REM = Responsible Environmental Manager
RHSM = Responsible Health & Safety Manager
SC = Safety Coordinator

Flowchart 2 CH2M HILL Serious Incident Notification


LEGEND:

————> Direct line of communication

← - - - -> Indirect line of communication

DEFINITIONS:

Local Crisis Management Team: Team comprised of key facility, project and/or business group personnel. Team is assembled as necessary and as appropriate to effectively manage and respond to a crisis situation (serious incident) at/on scene.

Crisis Management Support Team: Team comprised of key corporate personnel. Team is assembled as necessary and as appropriate to effectively support, direct, and/or supplement a Local Crisis Management Team.

Crisis Manager: Corporate based Crisis Manager, contactable by pager 24/7.

9.0 Behavior Based Loss Prevention System

(Reference CH2M HILL SOP HSE-103, Behavior Based Loss Prevention System)

A Behavior Based Loss Prevention System (BBLPS) is a system to prevent or reduce losses using behavior-based tools and proven management techniques to focus on behaviors or acts that could lead to losses.

The four basic Loss Prevention tools that will be used CH2M HILL projects to implement the BBLPS include:

- Activity Hazard Analysis (AHA)
- Pre-Task Safety Plans (PTSP)
- Loss Prevention Observations (LPO)
- Loss and Near Loss Investigations (NLI)

The SC or designated CH2M HILL representative onsite is responsible for implementing the BBLPS on the project site. The Project Manager remains accountable for its implementation. The SC or designee shall only oversee the subcontractor's implementation of their AHAs and PTSPs processes on the project.

9.1 Activity Hazard Analysis

An AHA defines the activity being performed, the hazards posed and control measures required to perform the work safely. Workers are briefed on the AHA before doing the work and their input is solicited prior, during and after the performance of work to further identify the hazards posed and control measures required.

AHAs will be prepared before beginning each project activity posing H&S hazards to project personnel using the AHA form provided in **Attachment 5**. The AHA shall identify the work tasks required to perform each activity, along with potential H&S hazards and recommended control measures for each work task. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

An AHA shall be prepared for all field activities performed by CH2M HILL and subcontractor activities during the course of the project. Hazard Controls (found in Sections 1.0 and its subsections of the HSP), the Hazard Analysis Table (Table 1), and applicable CH2M HILL CSs and SOPs should be used as a basis for preparing AHAs.

CH2M HILL subcontractors are required to provide AHAs specific to their scope of work on the project for acceptance by CH2M HILL. Each subcontractor shall submit AHAs for their field activities, as defined in their work plan/scope of work, along with their project-specific safety plan/accident prevention plan. Additions or changes in CH2M HILL or subcontractor field activities, equipment, tools or material to perform work or additional/different hazard encountered that require additional/different hazard control measures requires either a new AHA to be prepared or an existing AHA to be revised.

9.2 Pre-Task Safety Plans

Daily safety meetings are held with all project personnel in attendance to review the hazards posed and required H&S procedures/AHAs that apply for each day's project activities. The PTSPs serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisor and their work crews to focus on those hazards posed to individual work crews. At the start of each day's activities, the crew supervisor completes the PTSP, provided in **Attachment 5**, with input from the work crew, during their daily safety meeting. The day's tasks, personnel, tools and equipment that will be used to perform these tasks are listed, along with the hazards posed and required H&S procedures, as identified in the AHA. The use of PTSPs better promotes worker participation in the hazard recognition and control process, while reinforcing the task-specific hazard and required H&S procedures with the crew each day. The use of PTSPs is a common safety practice in the construction industry.

9.3 Loss Prevention Observations

Loss Prevention Observations (LPO's) shall be conducted by SC or designee for specific work tasks or operations comparing the actual work process against established safe work procedures identified in the project-specific HSP and AHAs. LPO's are a tool to be used by supervisors to provide positive reinforcement for work practices performed correctly, while also identifying and eliminating deviations from safe work procedures that could result in a loss. The SC or designee shall perform at least one LPO each week for tasks/operations addressed in the project-specific HSP or AHA and forward to Margaret Dombrowski/MKE weekly. The SC or designee shall complete the LPO form in **Attachment 5** for the task/operation being observed.

9.4 Loss/Near Loss Investigations

Loss/Near Loss Investigations shall be performed for CH2M HILL and subcontractor incidents involving:

- Person injuries/illnesses and near miss injuries
- Equipment/property damage
- Spills, leaks, regulatory violations
- Motor vehicle accidents

The cause of loss and near loss incidents are similar, so by identifying and correcting the causes of near loss causes, future loss incidents may be prevented. The following is the Loss/Near Loss Investigation Process:

- Gather all relevant facts, focusing on fact-finding, not fault-finding, while answering the who, what, when, where and how questions.
- Draw conclusions, pitting facts together into a probable scenario.
- Determine incident root cause(s), which are basic causes on why an unsafe act/condition existed.
- Develop and implement solutions, matching all identified root causes with solutions.
- Communicate incident as a Lesson Learned to all project personnel.

- Filed follow-up on implemented corrective active action to confirm solution is appropriate.

The SC or designee shall perform an incident investigation, as soon as practical after incident occurrence during the day of the incident, for all Loss and Near Loss Incidents that occur on the project. Loss and Near Loss incident investigations shall be performed using the following incident investigation forms provided in **Attachment 5**

- IRF
- Root Cause Analysis Form

All Loss and Near Loss incident involving personal injury, property damage in excess of \$1,000 or near loss incidents that could have resulted in serious consequences shall be investigated by completing the incident investigation forms and submitting them to the PM and RHSM within 24 hours of incident occurrence. A preliminary Incident Investigation and Root Cause Analysis shall be submitted to the Project Manager and RHSM within 24 hours of incident occurs. The final Incident Investigation and Root Cause Analysis shall be submitted after completing a comprehensive investigation of the incident.

10.0 Approval

This site-specific HSP has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

Original Plan

Written By: Cindy Collins

Date: 13 February 2009

Approved By: Mark Orman

Date: 15 April 2009

Revisions

Revisions Made By:

Date:

Revisions to Plan:

Revisions Approved By:

Date:

11.0 Attachments

Attachment 1:	Employee Signoff Form – Health and Safety Plan
Attachment 2:	Chemical Inventory/Register Form
Attachment 3:	Chemical-Specific Training Form
Attachment 4:	Project Activity Self-Assessment Checklists/Permits
Attachment 5:	Behavior Based Loss Prevention Forms
Attachment 6:	Material Safety Data Sheets

CH2M HILL Health and Safety Plan

Attachment 1 Health and Safety Plan Employee Sign-off Form

CH2M HILL Health and Safety Plan

Attachment 2 Chemical Inventory/Register Form

CH2M HILL Health and Safety Plan

Attachment 3 Chemical-Specific Training Form



CH2MHILL

CHEMICAL-SPECIFIC TRAINING FORM

Refer to SOP HSE-107 Attachment 1 for instructions on completing this form.

Location:	Project # :
HCC:	Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The Hazard Communication Coordinator (HCC) shall use the product MSDS to provide the following information concerning each of the products listed above.

- Physical and health hazards
- Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)
- Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

CH2M HILL Health and Safety Plan

Attachment 4 Project Activity Self-Assessment Checklists/Permits/Forms

Ordnance Explosives

Chainsaw Operations

HS&E Self-Assessment Checklist - ORDANCE EXPLOSIVES (OE)

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI. The SC position must be filled by a qualified UXO technician to provide field assessment of OE activities.

This checklist is to be used at locations where: 1) CH2M HILL employees are involved with OE activities (complete entire checklist). 2) CH2M HILL oversight of an OE subcontractor is required (complete entire checklist).

UXO/SO's may consult with OE subcontractors when completing this checklist, but shall not direct the means and methods of OE operations nor direct the details of corrective actions. OE subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the H&S manager for review.

Project Name: _____	Project No.: _____	
Location: _____	PM: _____	
Auditor: _____	Title: _____	Date: _____
This specific checklist has been completed to:		
<input type="checkbox"/> Evaluate CH2M HILL employee exposures to OE hazards		
<input type="checkbox"/> Evaluate a CH2M HILL subcontractor's compliance with OE HS&E requirements		
Subcontractor Name: _____		

- Check "Yes" if an assessment item is complete/correct.
 - Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the OE subcontractor. Section 3 must be completed for all items checked "No."
 - Check "N/A" if an item is not applicable.
 - Check "N/O" if an item is applicable but was not observed during the assessment.
- Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-91.

<u>SECTION 1</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
PROJECT PLANNING (2.0)				
1. CH2MHILL employees and sub contractors have completed the training requirements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. All UXO personnel are qualified as UXO.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. CH2MHILL employees and sub contractors have met the requirement for medical surveillance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. CH2MHILL employees and sub contractors have participated in the drug screening program..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. A qualified OE/UXO competent person is assigned to oversee OE operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Site personnel are wearing appropriate PPE, per HSP/FSI	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Project plans address the required support needed for OE operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

HS&E Self-Assessment Checklist - ORDANCE EXPLOSIVES (OE)

<u>SECTION 2</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
GENERAL SAFETY CONCERNS and PROCEDURES (4.2.1)				
6. OE operations are being conducted with approved plans.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Only qualified UXO technicians or Explosive Ordnance Disposal (EOD) personnel will locate, identify, handle, remove, transport, store or dispose of OE/UXO items	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Proper PPE is being worn as required in the HSP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OE SAFETY PRECAUTIONS (4.2.2)				
9. Ordnance items are being properly identified, classified and safely handled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. OE/UXO items are not taken off site as souvenirs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Personnel know and understand the procedures if chemical warfare materiel (CWM) is encountered.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Approach routes of OE/UXO items are being properly observed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. OE/UXO safety precautions are being observed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OE STORAGE/TRANSPORTATION (4.2.3-4.2.4)				
14. OE Storage is in compliance with plans and directives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. OE Storage meets minimum physical security standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. OEW is properly identified, classified and stowed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. OE is properly transported in appropriate containers and vehicles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OE EXCLUSION ZONES (4.2.5)				
17. OE Exclusion Zones (EZ) established	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Multiple UXO teams working onsite have safe separation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Only essential personnel are allowed in the exclusion zone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. When non-essential personnel enter the EZ, OE activities are stopped and an escort provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OE EXCAVATION OPERATIONS (4.2.6)				
21. Hand excavation methods are used to excavate from 12 inches to OE item	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Earth Moving Machinery (EMM) is used to excavate overburden (greater than 12 inches)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. EMM excavations are supervised by a qualified UXO Technician	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. All OE excavations employ a step down off set method.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OE DISPOSAL OPERATIONS (4.2.7)				
25. Proper demolition procedures are being observed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. OE sub contractor conducting disposal, has proper explosive license/permits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Protective measures are taken to reduce shock, blast over pressure and fragmentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Minimum safe separation distances are established	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. OE accountability is tracked "Cradle to Grave" as required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OEW DISPOSAL (4.2.8)				
30. OEW is properly characterized	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. OEW is properly stored treated and disposed of	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. OEW accountability is tracked "Cradle to Grave" as required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

HS&E Self-Assessment Checklist - CHAINSAW OPERATIONS

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/Field Safety Instructions (FSI).

This checklist is to be used at locations where: 1) CH2M HILL employees are operating chainsaws, and/or 2) CH2M HILL is providing oversight of a subcontractor operating a chainsaw.

Safety Coordinators may consult with chainsaw subcontractors when completing this checklist, but shall not direct the means and methods of chainsaw operations nor direct the details of corrective actions. Chainsaw subcontractors shall determine how to correct deficiencies, and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Project Name: _____ Project No.: _____
 Location: _____ PM: _____
 Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

- Evaluate CH2M HILL employee exposures to chainsaw hazards
- Evaluate a CH2M HILL subcontractor's compliance with chainsaw HS&E requirements

Subcontractor Name: _____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the excavation subcontractor. Section 2 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-49.

SECTION 1

	Yes	No	N/A	N/O
SAFETY EQUIPMENT (2.3)				
1. Chainsaw equipped with spark arrestor and fully functioning chain brake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Chainsaw operator's manual readily available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Fully stocked first aid kit and multipurpose fire extinguisher available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Appropriate personal protective equipment available and worn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Clothing free of loose edges that could become entangled in the saw	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PLANNING ACTIVITIES (2.5)				
6. Operators have read the chainsaw operator's manual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. If aerial lifts to be used, aerial lift training completed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Daily safety briefing/meeting conducted with project personnel to discuss planned work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Immediate area surrounding operation cleared of obstructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Companion maintained within calling distance of the chainsaw operator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INSPECTION (3.1.1)				
11. Chain tension, sharpness, condition, and guide gap checked	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Chainsaw components checked for physical damage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Chain does not rotate at idle with chain brake off	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Chain brake and stop switch operating correctly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Throttle trigger can not be engaged until throttle trigger lock out pressed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

HS&E Self-Assessment Checklist - CHAINSAW OPERATIONS

<u>SECTION 1 (Continued)</u>				
	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
STARTING THE ENGINE (3.1.2)				
16. Chainsaw operator's manual consulted for proper starting procedures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Saw placed on level ground with guide bar and chain off the ground	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Saw is not drop-started	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SAFE OPERATION (3.1.3)				
19. Chainsaw handles kept dry, clean, and free of oil or fuel mixture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Chainsaws held firmly with both hands and used right-handed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Operator standing to the left of the saw out of the plane of the chain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Saw used between the waist and mid-chest level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Full throttle maintained while cutting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Operator aware of position of guide bar tip, does not contact tip with anything being cut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Bumper spikes maintained as close to the object as possible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Operator aware of what is in the saw's downward path after the cut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. No attempt to made to cut material that is larger than the guide bar of the saw	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Cuts avoided that will cause chain to jam	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Non-metallic wedges used to prevent compression cuts from jamming the blade	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Bystanders and helpers kept at a safe distance from operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Chainsaw not operated when fatigued	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Fire extinguisher present when operating the chainsaw in forest or brushy areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ELECTRICAL CHAINSAW PRECAUTIONS (3.1.3)				
33. Extension cords approved for outdoor use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Electrical cords equipped with third-wire grounding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. GFCI used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Electrical cord positioned carefully to avoiding cutting with saw or trip hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Saw switched to the off position before completing electrical connections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Saw unplugged before making adjustments and when not in use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REFUELING THE ENGINE (3.1.4)				
39. Fuel mixed in accordance with the manufacturer's recommendations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Fuel stored and transported in an approved safety container	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Engine shut off and allowed to cool before refueling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Fire extinguisher present during fueling and refueling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Area around refueling site free from combustible materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Smoking around fueling or refueling operations prohibited	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Funnel/flexible nozzle used to avoid spilling fuel on the engine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TRANSPORT AND STORAGE (3.1.5)				
46. Chainsaws carried with engine off and guide bar pointing to rear	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Chain guard attached or placed in carrying case prior to transporting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Fuel tank drained and spark plug disconnected for long-term storage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Chainsaw placed in scabbard or secured to platform prior to transporting in aerial lift	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TOPPING UTILITY POLES (3.2.1)				
50. CH2M HILL only topping utility poles from an aerial lift platform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Aerial lifts operated safely (use aerial lift checklist in HS-41)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Maximum length of pole section cut at one time does not exceed 2'	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Pole tested for stray voltage with foreign voltage detector prior to cutting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. Wiring, staples, nails, and other hardware removed within 4" of cut path	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Saw handled between chest and waist level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. Personnel below pole safe distance from the fall area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 1 (Continued)				
	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
57. Cutting stopped leaving approximately one half inch of pole uncut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Pole section removed manually by pulling cut section towards body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Cut pole sections lowered by rope or placed in aerial lift platform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60. Rough edges hammered over after last cut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TREE FELLING (3.2.2)				
61. CH2M HILL not felling trees beyond scope of SOP HS-49	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62. Power company contacted prior to felling trees within two tree lengths of power lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63. Underground services checked that could be damaged when tree strikes the ground	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64. Danger zone created two tree lengths from public areas, public removed from danger zone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
65. Personnel maintain a distance equal to two tree lengths of the tree being felled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66. Intended direction of fall determined	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
67. Suitable escape path determined and maintained clear	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68. Equipment needed to prevent tree from sitting back on the saw determined and readily available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
69. Undercut notch cut on side of the tree in the direction of the fall line	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
70. Back cut started 1-2" inches above the undercut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
71. As tree starts to fall, saw shut off and operator steps into the escape path	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LIMBING STANDING TREES (3.2.3)				
72. CH2M HILL not operating chainsaws where overhead electrical power lines may be contacted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
73. Only subcontractors with special training permitted to work around electrical power lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
74. Branches/limbs not cut above shoulder height	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
75. If limbing from a ladder, ladder secured in position and operator independently secured	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
76. Chainsaws not used from rope and harness unless operator has received specific training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LIMBING FALLEN TREES (3.2.4)				
77. No dead branches/other debris hanging above work that may fall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
78. Personnel do not attempt to manually pull over elevated trees, mechanical equipment used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
79. Springpoles cut safely, avoiding springback	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
80. Small-size brush and saplings cut with hand saws or other cutting tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
81. Operator standing uphill of tree unless secured to prevent rolling/sliding downhill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
82. Cuts made with operator standing on the opposite side of the tree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
83. Operator keeping sight of saw tip, avoiding kickback	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
84. Debris removed periodically to maintain clear vision and movement around tree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BUCKING TREES (3.2.5)				
85. Operator standing uphill of tree unless secured to prevent rolling/sliding downhill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
86. Working from small end to larger to improve stability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
87. If tree on level ground, cutting from upper side and avoiding running chain into ground	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
88. If tree supported at one end, cutting from lower side one-third, then upper side	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
89. If tree supported at both ends, cutting from upper side one-third, then lower side	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CH2M HILL Health and Safety Plan

Attachment 5 Behavior Based Loss Prevention System Forms

Activity Hazard Analysis

Pre-Task Safety Plans

Loss Prevention Observation

Incident Report and Investigation

JH2MHILL
ACTIVITY HAZARD ANALYSIS

Activity:	Date:
	Project:
Description of the work:	Site Supervisor:
	Site Safety Officer:
	Review for latest use: Before the job is performed.

Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	Potential Health and Safety Hazards (Analyze each principal step for potential hazards)	Hazard Controls (Develop specific controls for each potential hazard)

Equipment to be used (List equipment to be used in the work activity)	Inspection Requirements (List inspection requirements for the work activity)	Training Requirements (List training requirements including hazard communication)





PRINT NAME

SIGNATURE

Supervisor Name: _____

Date/Time: _____

Safety Officer Name: _____

Date/Time: _____

Employee Name(s): _____

Date/Time: _____

Pre-Task Safety Plan (PTSP)

Project: _____ Location: _____ Date: _____		
Supervisor: _____ Job Activity: _____		
Task Personnel: _____ _____ _____		
List Tasks: _____ _____ _____		
Tools/Equipment Required for Tasks (ladders, scaffolds, fall protection, cranes/rigging, heavy equipment, power tools): _____ _____ _____		
Potential H&S Hazards, including chemical, physical, safety, biological and environmental (check all that apply):		
<input type="checkbox"/> Chemical burns/contact	<input type="checkbox"/> Trench, excavations, cave-ins	<input type="checkbox"/> Ergonomics
<input type="checkbox"/> Pressurized lines/equipment	<input type="checkbox"/> Overexertion	<input type="checkbox"/> Chemical splash
<input type="checkbox"/> Thermal burns	<input type="checkbox"/> Pinch points	<input type="checkbox"/> Poisonous plants/insects
<input type="checkbox"/> Electrical	<input type="checkbox"/> Cuts/abrasions	<input type="checkbox"/> Eye hazards/flying projectile
<input type="checkbox"/> Weather conditions	<input type="checkbox"/> Spills	<input type="checkbox"/> Inhalation hazard
<input type="checkbox"/> Heights/fall > 6 feet	<input type="checkbox"/> Overhead Electrical hazards	<input type="checkbox"/> Heat/cold stress
<input type="checkbox"/> Noise	<input type="checkbox"/> Elevated loads	<input type="checkbox"/> Water/drowning hazard
<input type="checkbox"/> Explosion/fire	<input type="checkbox"/> Slips, trip and falls	<input type="checkbox"/> Heavy equipment
<input type="checkbox"/> Radiation	<input type="checkbox"/> Manual lifting	<input type="checkbox"/> Aerial lifts/platforms
<input type="checkbox"/> Confined space entry	<input type="checkbox"/> Welding/cutting	<input type="checkbox"/> Demolition
Other Potential Hazards (Describe): _____ _____ _____		

CH2MHILL

Hazard Control Measures (Check All That Apply):			
PPE <input type="checkbox"/> Thermal/lined <input type="checkbox"/> Eye <input type="checkbox"/> Dermal/hand <input type="checkbox"/> Hearing <input type="checkbox"/> Respiratory <input type="checkbox"/> Reflective vests <input type="checkbox"/> Flotation device	Protective Systems <input type="checkbox"/> Sloping <input type="checkbox"/> Shoring <input type="checkbox"/> Trench box <input type="checkbox"/> Barricades <input type="checkbox"/> Competent person <input type="checkbox"/> Locate buried utilities <input type="checkbox"/> Daily inspections	Fire Protection <input type="checkbox"/> Fire extinguishers <input type="checkbox"/> Fire watch <input type="checkbox"/> Non-spark tools <input type="checkbox"/> Grounding/bonding <input type="checkbox"/> Intrinsically safe equipment	Electrical <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Grounded <input type="checkbox"/> Panels covered <input type="checkbox"/> GFCI/extension cords <input type="checkbox"/> Power tools/cord inspected
Fall Protection <input type="checkbox"/> Harness/lanyards <input type="checkbox"/> Adequate anchorage <input type="checkbox"/> Guardrail system <input type="checkbox"/> Covered opening <input type="checkbox"/> Fixed barricades <input type="checkbox"/> Warning system	Air Monitoring <input type="checkbox"/> PID/FID <input type="checkbox"/> Detector tubes <input type="checkbox"/> Radiation <input type="checkbox"/> Personnel sampling <input type="checkbox"/> LEL/O2 <input type="checkbox"/> Other	Proper Equipment <input type="checkbox"/> Aerial lift/ladders/scaffolds <input type="checkbox"/> Forklift/heavy equipment <input type="checkbox"/> Backup alarms <input type="checkbox"/> Hand/power tools <input type="checkbox"/> Crane with current inspection <input type="checkbox"/> Proper rigging <input type="checkbox"/> Operator qualified	Welding & Cutting <input type="checkbox"/> Cylinders secured/capped <input type="checkbox"/> Cylinders separated/upright <input type="checkbox"/> Flash-back arrestors <input type="checkbox"/> No cylinders in CSE <input type="checkbox"/> Flame retardant clothing <input type="checkbox"/> Appropriate goggles
Confined Space Entry <input type="checkbox"/> Isolation <input type="checkbox"/> Air monitoring <input type="checkbox"/> Trained personnel <input type="checkbox"/> Permit completed <input type="checkbox"/> Rescue	Medical/ER <input type="checkbox"/> First-aid kit <input type="checkbox"/> Eye wash <input type="checkbox"/> FA-CPR trained personnel <input type="checkbox"/> Route to hospital	Heat/Cold Stress <input type="checkbox"/> Work/rest regime <input type="checkbox"/> Rest area <input type="checkbox"/> Liquids available <input type="checkbox"/> Monitoring <input type="checkbox"/> Training	Vehicle/Traffic <input type="checkbox"/> Traffic control <input type="checkbox"/> Barricades <input type="checkbox"/> Flags <input type="checkbox"/> Signs
Permits <input type="checkbox"/> Hot work <input type="checkbox"/> Confined space <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Excavation <input type="checkbox"/> Demolition <input type="checkbox"/> Energized work	Demolition <input type="checkbox"/> Pre-demolition survey <input type="checkbox"/> Structure condition <input type="checkbox"/> Isolate area/utilities <input type="checkbox"/> Competent person <input type="checkbox"/> Hazmat present	Inspections: <input type="checkbox"/> Ladders/aerial lifts <input type="checkbox"/> Lanyards/harness <input type="checkbox"/> Scaffolds <input type="checkbox"/> Heavy equipment <input type="checkbox"/> Cranes and rigging	Training: <input type="checkbox"/> Hazwaste <input type="checkbox"/> Construction <input type="checkbox"/> Competent person <input type="checkbox"/> Task-specific (THA) <input type="checkbox"/> Hazcom
Field Notes: _____ _____ _____			

Name (Print): _____

Signature: _____

Date: _____

Safe Work Observation Form			
Project:		Observer:	
		Date:	
Position/Title of worker observed:		Background Information/ comments:	
Task/Observation Observed:			
<ul style="list-style-type: none"> ❖ Identify and reinforce safe work practices/behaviors ❖ Identify and improve on at-risk practices/acts ❖ Identify and improve on practices, conditions, controls, and compliance that eliminate or reduce hazards ❖ Proactive PM support facilitates eliminating/reducing hazards (do you have what you need?) ❖ Positive, corrective, cooperative, collaborative feedback/recommendations 			
Actions & Behaviors	Safe	At-Risk	Observations/Comments
Current & accurate Pre-Task Planning/Briefing (Project safety plan, STAC, AHA, PTSP, tailgate briefing, etc., as needed)			Positive Observations/Safe Work Practices:
Properly trained/qualified/experienced			
Tools/equipment available and adequate			
Proper use of tools			Questionable Activity/Unsafe Condition Observed:
Barricades/work zone control			
Housekeeping			
Communication			
Work Approach/Habits			
Attitude			Observer's Corrective Actions/Comments:
Focus/attentiveness			
Pace			
Uncomfortable/unsafe position			
Inconvenient/unsafe location			
Position/Line of fire			
Apparel (hair, loose clothing, jewelry)			Observed Worker's Corrective Actions/Comments:
Repetitive motion			
Other...			

HITS Incident Report Hardcopy (Phase 1 – Initial Entry)
Rev. 1, 12/03/2007

Phase 1 – Initial Entry

Type of Incident (May select more than one)

- Injury/Illness
- Property Damage
- Spill/Release
- Environment/Permit
- Near Miss
- Other

CH2MHILL

General Information Section

Preparer's Name: _____ Preparer's Phone Number: _____

Date of Incident: _____ Time of Incident: _____ AM / PM

What Business Group is accountable for this incident: _____

What Business Group SubGroup is accountable for this incident: _____

What CH2M HILL Company is accountable for this incident: _____

Where did the Incident occur?

- United States, Geographic Region: _____
- Canada, Province/Territory: _____
- International, Country: _____

Location of Incident?

Company Premises, CH2M HILL Office (use 3 letter office code if available): _____

Project, Project name: _____

In Transit

Traveling from: _____

Traveling to: _____

At Home

Other, Specify: _____

Describe the incident: _____

Describe how this event could have been prevented: _____

Provide Witness Information:

Name: _____ Phone: _____

Name: _____ Phone: _____

Name: _____ Phone: _____

Personnel Notified of Incident (Provide name, date and time):

CH2M HILL Personnel: _____

Client Personnel: _____

Additional Comments: _____

Injury/Illness Section [Complete only if Injury/Illness Incident type selected]

Who was injured?

- CH2M HILL Employee or CH2M HILL Temp Employee
- Subcontractor to CH2M HILL (Non-LLC Joint Venture Project)
- LLC Joint Venture Partner Employee
- LLC Joint Venture Project Subcontractor/Contractor
- Other

Name of Injured: _____ Job Title: _____

Employer Name: _____ Supervisor of Employee: _____

Complete for CH2M HILL Employee Injuries

Business Group of Injured Employee: _____

Has the employee called the Injury Management Administrator (1-800-756-1130)?

Yes No Not Sure

Has the injured employee's supervisor been notified of this incident?

Yes No Not Sure

Complete for Non-CH2M HILL Employee Injuries

Has the project safety coordinator been notified of this incident?

Yes No Not Sure

Project Safety Coordinator: _____

Body Part Affected: _____

Injury/Illness (Result): _____

Describe treatment provided (if medication provided, identify whether over-the-counter or prescription): _____

Describe any work restriction prescribed (include dates and number of days): _____

Physician/Health Care Provider Information

Name: _____ Phone: _____

Was treatment provided away from the worksite?

No Yes

Facility Name: _____

Address: _____

City: _____ Phone Number: _____

Was injured treated in an emergency room?

No Yes

Was injured hospitalized overnight as an in-patient?

No Yes

General Information Environmental Section [Complete only if Environment/Permit or Spill/Release Incident type selected]

Who had control of the area during the incident?

CH2M HILL, Company: _____

Subcontractor, Company: _____

Joint Venture Partner/Contractor/Subcontractor, Company: _____

Other, Company: _____

Relationship to CH2M HILL: _____

Property Damage Section [Complete only if Property Damage Incident type selected]

Property Damaged: _____

Property Owner: _____

Damage Description: _____

Estimated US Dollar Amount: _____

Spill or Release Section [Complete only if Spill/Release Incident type selected]

Substance: _____

Estimated Quantity: _____

Did the spill/release move off the property?: _____

Spill/Release From: _____

Spill/Release To: _____

Environment/Permit Section [Complete only if Environment/Permit Incident type selected]

Describe Environmental or Permit Issue: _____

Permit Type: _____

Permitted Level or Criteria (e.g., discharge limit): _____

Permit Name and Number (e.g., NPDES No. ST1234): _____

Substance and Estimated Quantity: _____

Duration of Permit Exceedence: _____

CH2M HILL Health and Safety Plan

Attachment 6 Material Safety Data Sheets

CHEVRON U S A -- CHEVRON 2-CYCLE OIL - OIL,2-CYCLE
MATERIAL SAFETY DATA SHEET
NSN: 915000F005683
Manufacturer's CAGE: 81230
Part No. Indicator: A
Part Number/Trade Name: CHEVRON 2-CYCLE OIL

=====
General Information
=====

Item Name: OIL,2-CYCLE
Company's Name: CHEVRON U S A INC
Company's Street: 575 MARKET ST
Company's P. O. Box: 7643
Company's City: SAN FRANCISCO
Company's State: CA
Company's Country: US
Company's Zip Code: 94120-2856
Company's Emerg Ph #: 800-231-0623 800-424-9300(CHEMTREC)
Company's Info Ph #: 800-582-3835 800-582-3835
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 002
Status: SE
Date MSDS Prepared: 14APR93
Safety Data Review Date: 16JUN94
Supply Item Manager: CX
MSDS Preparer's Name: UNKNOWN
MSDS Serial Number: BTJYT
Specification Number: NONE
Spec Type, Grade, Class: NONE
Hazard Characteristic Code: N1
Unit Of Issue: NK
Unit Of Issue Container Qty: UNKNOWN
Type Of Container: UNKNOWN
Net Unit Weight: UNKNOWN

=====
Ingredients/Identity Information
=====

Proprietary: NO
Ingredient: SOLVENT,DEWAXED RESIDUAL OIL (PETROLEUM)
Ingredient Sequence Number: 01
Percent: UNKNOWN
NIOSH (RTECS) Number: 1004315SD
CAS Number: 64742-62-7
OSHA PEL: 5 MG/M3 (OIL MIST)
ACGIH TLV: 5 MG/M3 (OIL MIST)
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: RESIDUAL OILS, HYDROTREATED
Ingredient Sequence Number: 02
Percent: UNKNOWN
NIOSH (RTECS) Number: 1003242SR
CAS Number: 64742-57-0
OSHA PEL: 5 MG/M3 (OIL MIST)
ACGIH TLV: 5 MG/M3 (OIL MIST)
Proprietary: NO
Ingredient: DISTILLATES, HYDROTREATED HEAVY PARAFFINIC
Ingredient Sequence Number: 03
Percent: UNKNOWN
NIOSH (RTECS) Number: PY8035500
CAS Number: 64742-54-7
OSHA PEL: 5 MG/M3 (OIL MIST)
ACGIH TLV: 5 MG/M3 (OIL MIST)
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: MINERAL OIL, PETROLEUM DISTILLATES, SOLVENT-DEWAXED HEAVY PARAFFINIC
Ingredient Sequence Number: 04
Percent: UNKNOWN
NIOSH (RTECS) Number: PY8038500
CAS Number: 64742-65-0
OSHA PEL: 5 MG/M3 (OIL MIST)
ACGIH TLV: 5 MG/M3 (OIL MIST)
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: HYDROTREATED LIGHT PETROLEUM DISTILLATE
Ingredient Sequence Number: 05
Percent: 1
Specific Gravity: 0.891
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: UNKNOWN
Solubility In Water: NEGLIGIBLE
Percent Volatiles By Volume: NIL
Corrosion Rate (IPY): UNKNOWN

=====
Fire and Explosion Hazard Data
=====

Flash Point: NONE
Lower Explosive Limit: UNKNOWN
Upper Explosive Limit: UNKNOWN
Extinguishing Media: USE WATER FOG, CARBON DIOXIDE, FOAM, OR DRY CHEMICAL.

WATER OR FOAM MAY CAUSE FROTHING.

Special Fire Fighting Proc: WEAR FIRE FIGHTING PROTECTIVE EQUIPMENT AND A FULL FACED SELF CONTAINED BREATHING APPARATUS. COOL FIRE EXPOSED CONTAINERS

WITH WATER SPRAY.

Unusual Fire And Expl Hazrds: COMBUSTION OR HEAT OF FIRE MAY PRODUCE HAZARDOUS DECOMPOSITION PRODUCTS AND VAPORS.

=====
Reactivity Data
=====

Stability: YES

Cond To Avoid (Stability): HIGH HEAT, OPEN FLAMES AND OTHER SOURCES OF IGNITION

Materials To Avoid: STRONG OXIDIZING AGENTS

Hazardous Decomp Products: AIRBORNE SOLID AND LIQUID PARTICULATES, CARBON

MONOXIDE, OTHER UNIDENTIFIED HYDROCARBON PRODUCTS.

Hazardous Poly Occur: NO

Conditions To Avoid (Poly): NOT APPLICABLE
=====

Health Hazard Data
=====

==LD50-LC50 Mixture: LD 50 ORAL RAT IS UNKNOWN

Route Of Entry - Inhalation: NO

Route Of Entry - Skin: NO

Route Of Entry - Ingestion: NO

Health Haz Acute And Chronic: EYES:MAY CAUSE IRRITATION.SKIN:MAY CAUSE IRRITATION.INGEST:MAY CAUSE GI TRACT IRRITATION.INHAL:MAY CAUSE RESPIRATORY

IRRITATION,CNS EFFETS.

Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: NONE OF THE INGREDIENTS IN THIS PRODUCT IS LISTED BY NTP, IARC OR OSHA AS A CARCINOGEN.

Signs/Symptoms Of Overexp: EYES: PAIN,TEARING,SWELLING,REDNESS,BLURRED VISION.

Med Cond Aggravated By Exp: BECAUSE OF ITS DEFATTING PROPERTIES, PROLONGED

AND REPEATED SKIN CONTACT MAY AGGRAVATE AN EXISTING DERMATITIS.

Emergency/First Aid Proc: EYES: FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. IF IRRITATION PERSISTS, SEE DOCTOR. SKIN: WASH WITH SOAP. IF IRRITATION PERSISTS, SEE DOCTOR. INHALATION: REMOVE VICTIM TO FRESH AIR. GIVE OXYGEN/CPR IF NEEDED. SEE DOCTOR. INGESTION: DO NOT INDUCE VOMITING.

SEE DOCTOR. INJECTION: THIS IS A MEDICAL EMERGENCY. SEE DOCTOR IMMEDIATELY.

=====
Precautions for Safe Handling and Use
=====

Steps If Matl Released/Spill: REMOVE PERSONNEL. ELIMINATE IGNITION SOURCES. VENTILATE AREA. WEAR PROTECTIVE CLOTHING AND EQUIPMENT. DIKE AND CONTAIN. ABSORB IN INERT MATERIAL AND PLACE IN APPROPRIATE DISPOSAL CONTAINER AND COVER. WASH AREA WITH SOAP AND WATER.
Neutralizing Agent: NONE
Waste Disposal Method: CONTACT YOUR LOCAL ENVIRONMENTAL OFFICER. DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS.
Precautions-Handling/Storing: STORE IN A COOL, DRY PLACE WITH ADEQUATE VENTILATION. KEEP AWAY FROM HEAT, OPEN FLAMES AND STRONG OXIDANTS. KEEP CONTAINERS TIGHTLY CLOSED.
Other Precautions: AVOID EYE AND SKIN CONTACT. DO NOT BREATHE VAPORS.

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Control Measures
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Respiratory Protection: NONE NORMALLY REQUIRED. NIOSH/MSHA-APPROVED RESPIRATOR OR SCBA AS APPROPRIATE FOR EXPOSURE OF CONCERN.
Ventilation: MECHANICAL (GENERAL) VENTILATION.
Protective Gloves: NITRILE GLOVES.
Eye Protection: SPLASH GOGGLES IF MISTING.
Other Protective Equipment: PROTECTIVE CLOTHING AS REQUIRED TO MINIMIZE EXPOSURE FROM PROLONGED OR REPEATED CONTACT. EYE BATH AND SAFETY SHOWER.
Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING AND BEFORE EATING.
LAUNDER CONTAMINATED CLOTHING BEFORE REUSE. DISCARD CONTAMINATED SHOES
Suppl. Safety & Health Data: NONE

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Transportation Data
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Trans Data Review Date: 94167
DOT PSN Code: ZZZ
DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
IMO PSN Code: ZZZ
IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IATA PSN Code: ZZZ
IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
AFI PSN Code: ZZZ
AFI Prop. Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
MMAC Code: NR

Additional Trans Data: NONE

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Disposal Data
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Label Data
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Label Required: YES
Technical Review Date: 16JUN94
MFR Label Number: UNKNOWN
Label Status: F
Common Name: CHEVRON 2-CYCLE OIL
Signal Word: CAUTION!
Acute Health Hazard-Slight: X
Contact Hazard-Slight: X
Fire Hazard-Slight: X
Reactivity Hazard-None: X
Special Hazard Precautions: EYES:MAY CAUSE IRRITATION.SKIN:MAY CAUSE IRRITATION.INGEST:MAY CAUSE GI TRACT IRRITATION.INHAL:MAY CAUSE RESPIRATORY IRRITATION,CNS EFFETS. STORE IN A COOL, DRY PLACE WITH ADEQUATE VENTILATION. KEEP AWAY FROM HEAT, OPEN FLAMES AND STRONG OXIDANTS. KEEP CONTAINERS TIGHTLY CLOSED. FIRST AID: EYES: FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. IF IRRITATION PERSISTS, SEE DOCTOR. SKIN: WASH WITH SOAP. IF IRRITATION PERSISTS, SEE DOCTOR. INHALATION: REMOVE VICTIM TO FRESH AIR. GIVE OXYGEN/CPR IF NEEDED. SEE DOCTOR. INGESTION: DO NOT INDUCE VOMITING. SEE DOCTOR. INJECTION: THIS IS A MEDICAL EMERGENCY. SEE DOCTOR IMMEDIATELY.
Protect Skin: Y
Label Name: CHEVRON U S A INC
Label Street: 575 MARKET ST
Label P.O. Box: 7643
Label City: SAN FRANCISCO
Label State: CA
Label Zip Code: 94120-2856
Label Country: US
Label Emergency Number: 800-231-0623 800-424-9300(CHEMTREC)

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URL for this msds <http://siri.org>. If you wish to change, add to, or delete information in this archive please sent updates to dan@siri.org.

SINCLAIR OIL -- GASOLINE - GASOLINE,UNLEADED
MATERIAL SAFETY DATA SHEET
NSN: 9130012720983
Manufacturer's CAGE: 2X948
Part No. Indicator: A
Part Number/Trade Name: GASOLINE

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General Information
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Item Name: GASOLINE,UNLEADED
Company's Name: SINCLAIR OIL CORP
Company's Street: 550 E SOUTH TEMPLE
Company's P. O. Box: 30825
Company's City: SALT LAKE CITY
Company's State: UT
Company's Country: US
Company's Zip Code: 84130-0825
Company's Emerg Ph #: 801-524-2700/800-424-9300(CHEMTREC)
Company's Info Ph #: 801-524-2853/307-324-3404 MEDICAL
Record No. For Safety Entry: 037
Tot Safety Entries This Stk#: 072
Status: SE
Date MSDS Prepared: 01JAN92
Safety Data Review Date: 04DEC92
Supply Item Manager: KY
MSDS Serial Number: BPKZJ
Hazard Characteristic Code: F2
Unit Of Issue: GL

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Ingredients/Identity Information
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Proprietary: NO
Ingredient: CYCLOHEXANE (SARA III)
Ingredient Sequence Number: 01
Percent: 0.9-1.8
NIOSH (RTECS) Number: GU6300000
CAS Number: 110-82-7
OSHA PEL: 300 PPM
ACGIH TLV: 300 PPM, 9293
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: BENZENE (SARA III)
Ingredient Sequence Number: 02
Percent: 0.8-4.8
NIOSH (RTECS) Number: CY1400000
CAS Number: 71-43-2

OSHA PEL: 1PPM/5STEL;1910.1028
ACGIH TLV: 10 PPM; A2; 9293
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: TOLUENE (SARA III)
Ingredient Sequence Number: 03
Percent: 6.6-7.8
NIOSH (RTECS) Number: XS5250000
CAS Number: 108-88-3
OSHA PEL: 200 PPM/150 STEL
ACGIH TLV: 50 PPM; 9293
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: XYLENES (O-,M-,P- ISOMERS) (SARA III)
Ingredient Sequence Number: 04
Percent: 6- 10.4
NIOSH (RTECS) Number: ZE2100000
CAS Number: 1330-20-7
OSHA PEL: 100 PPM/150 STEL
ACGIH TLV: 100 PPM/150STEL;9293
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: NAPHTHALENE (SARA III)
Ingredient Sequence Number: 05
Percent: 0.1-1.2
NIOSH (RTECS) Number: QJ0525000
CAS Number: 91-20-3
OSHA PEL: 10 PPM/15 STEL
ACGIH TLV: 10 PPM/15 STEL; 9293
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: METHYL TERT-BUTYL ETHER (SARA III)
Ingredient Sequence Number: 06
Percent: 0 - 15
NIOSH (RTECS) Number: KN5250000
CAS Number: 1634-04-4
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: ETHYL ALCOHOL (ETHANOL)
Ingredient Sequence Number: 07

Percent: 0 - 10
NIOSH (RTECS) Number: KQ6300000
CAS Number: 64-17-5
OSHA PEL: 1000 PPM
ACGIH TLV: 1000 PPM; 9293
Other Recommended Limit: NONE RECOMMENDED

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Physical/Chemical Characteristics

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Appearance And Odor: CLEAR, BRONZE, RED OR PURPLE COLOR LIQUID - STRONG HYDROCARBON ODOR
Boiling Point: UNKNOWN
Melting Point: <-76F,<-60C
Vapor Pressure (MM Hg/70 F): 466 - 776
Specific Gravity: 0.7
Decomposition Temperature: UNKNOWN
Solubility In Water: NEGLIGIBLE
Corrosion Rate (IPY): UNKNOWN
Autoignition Temperature: >500F

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Fire and Explosion Hazard Data

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Flash Point: -45F,-43C
Lower Explosive Limit: 1.4%
Upper Explosive Limit: 7.6%
Extinguishing Media: USE WATER FOG, CARBON DIOXIDE, FOAM, DRY CHEMICAL OR HALON. WATER MAY BE INEFFECTIVE.
Special Fire Fighting Proc: WEAR FIRE FIGHTING PROTECTIVE EQUIPMENT & A FULL FACED SELF CONTAINED BREATHING APPARATUS/SUPPLIED-AIR RESPIRATOR.COOL FIRE EXPOSED CONTAINERS WITH WATER SPRAY.
Unusual Fire And Expl Hazrds: EXTREMELY FLAMMABLE LIQUID. VAPOR ACCUMULATION COULD FLASH AND/OR EXPLODE IF IT COMES IN CONTACT WITH OPEN FLAME.

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Reactivity Data

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Stability: YES
Cond To Avoid (Stability): HEAT, SPARKS, OPEN FLAMES, STATIC ELECTRICITY AND OTHER SOURCES OF IGNITION
Materials To Avoid: STRONG OXIDIZING AGENTS, HALOGENS, STRONG ACIDS, ALKALIES
Hazardous Decomp Products: CARBON MONOXIDE, CARBON DIOXIDE
Hazardous Poly Occur: NO

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Health Hazard Data
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LD50-LC50 Mixture: ORAL LD50 (RAT) IS UNKNOWN
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: ACUTE/CHRONIC-HIGH VAPOR CONCENTRATIONS ARE IRRITATING TO THE EYES & THE RESPIRATORY TRACT.MAY CAUSE DIZZINESS, HEADACHE,ARE ANESTHETIC,MAY CAUSE UNCONSCIOUSNESS.PROLONGED/REPEATED LIQUID CONTACT WITH SKIN WILL DRY & DEFAT SKIN,LEADING TO IRRITATION & DERMATITIS.
CONTAINS BENZENE WHICH CAUSES BLOOD DISEASE,LEUKEMIA.
Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: YES
Explanation Carcinogenicity: CONTAINS BENZENE.MAY CAUSE BLOOD DISEASES INCLUDING LEUKEMIA.VAPORS MAY CAUSE KIDNEY CANCER IN MALE RATS.
Signs/Symptoms Of Overexp: HIGH VAPOR CONCENTRATIONS ARE IRRITATING TO THE EYES & THE RESPIRATORY TRACT. MAY CAUSE DIZZINESS, HEADACHE, ARE ANESTHETIC, MAY CAUSE UNCONSCIOUSNESS & EVEN DEATH.
PROLONGED/REPEATED LIQUID CONTACT WITH SKIN WILL DRY & DEFAT SKIN, LEADING TO IRRITATION & DERMATITIS. CONTAINS BENZENE WHICH CAUSES BLOOD DISEASE,LEUKEMIA
Med Cond Aggravated By Exp: BENZENE-INDIVIDUALS WITH LIVER DISEASE MAY BE MORE SUSCEPTIBLE TO TOXIC EFFECTS.HEXANE-INDIVIDUALS WITH NEUROLOGICAL DISEASE SHOULD AVOID EXPOSURE.PETROLEUM SOLVENT-THOSE WITH EXISTING DERMATITIS.
Emergency/First Aid Proc: CALL A PHYSICIAN IN ALL CASES.EYES: IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES,HOLDING EYELIDS OPEN.SKIN:WASH WITH SOAP & WATER.INHALED:REMOVE TO FRESH AIR & PROVIDE CPR/OXYGEN IF NECESSARY.ORAL:DO NOT INDUCE VOMITING.CALL A PHYSICIAN IMMEDIATELY.

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Precautions for Safe Handling and Use
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Steps If Matl Released/Spill: WEAR PROTECTIVE EQUIPMENTS.ELIMINATE ALL SOURCES OF IGNITION.USE EXPLOSION-PROOF TOOLS.SHUT OFF FUEL SOURCE.DIKE SPILL.PREVENT LIQUID FROM ENTERING SEWERS/WATERWAYS.RECOVER FREE LIQUID.ADD SAND,EARTH OR OTHER ABSORBENT MATERIAL.TRANSFER TO CONTAINER.

Neutralizing Agent: NOT APPLICABLE

Waste Disposal Method: TREATMENT, STORAGE, TRANSPORTATION AND DISPOSAL MUST BE IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL LAWS AND REGULATIONS.

Precautions-Handling/Storing: STORAGE-STORE IN ACCORDANCE WITH NATIONAL FIRE PROTECTION ASSOCIATION REGULATIONS.KEEP CONTAINERS CLOSED.

Other Precautions: "EMPTY" CONTAINERS RETAIN RESIDUE AND CAN BE DANGEROUS.

DO NOT PRESSURIZE,CUT,WELD,BRAZE,SOLDER,DRILL,GRIND OR EXPOSE SUCH CONTAINERS TO HEAT,FLAME,SPARKS.THEY MAY EXPLODE AND CAUSE INJURY/DEATH.

AVOID REPEATED OR PROLONGED CONTACT WITH SKIN.

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Control Measures
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Respiratory Protection: NIOSH-APPROVED SELF-CONTAINED BREATHING APPARATUS OR ORGANIC VAPOR RESPIRATOR OR SUPPLIED-AIR RESPIRATOR, IF NEEDED.

Ventilation: LOCAL/MECHANICAL (GENERAL) VENTILATION - EXPLOSION PROOF, WELL GROUNDED EQUIPMENTS

Protective Gloves: RUBBER

Eye Protection: CHEMICAL SPLASH GOGGLES & FACE SHIELD

Other Protective Equipment: IMPERVIOUS CLOTHING TO AVOID SKIN AND EYE CONTACT. EYE WASH STATION & SAFETY SHOWER.

Work Hygienic Practices: AVOID CONTACT WITH EYES, SKIN OR CLOTHING. WASH HANDS AFTER USING PRODUCT. AVOID BREATHING VAPORS OR MISTS.

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Transportation Data
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Trans Data Review Date: 92339

DOT PSN Code: GTN

DOT Proper Shipping Name: GASOLINE

DOT Class: 3

DOT ID Number: UN1203

DOT Pack Group: II

DOT Label: FLAMMABLE LIQUID

IMO PSN Code: HRV

IMO Proper Shipping Name: GASOLINE

IMO Regulations Page Number: 3141

IMO UN Number: 1203

IMO UN Class: 3.1

IMO Subsidiary Risk Label: -

IATA PSN Code: RMF

IATA UN ID Number: 1203

IATA Proper Shipping Name: MOTOR SPIRIT

IATA UN Class: 3

IATA Label: FLAMMABLE LIQUID

AFI PSN Code: MUC
AFI Prop. Shipping Name: GASOLINE
AFI Class: 3
AFI ID Number: UN1203
AFI Pack Group: II
AFI Label: FLAMMABLE LIQUID
AFI Basic Pac Ref: 7-7

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Disposal Data
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Label Data
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Label Required: YES
Technical Review Date: 04DEC92
MFR Label Number: UNKNOWN
Label Status: F
Common Name: GASOLINE
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-Severe: X
Fire Hazard-Severe: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE/CHRONIC-HIGH VAPOR CONCENTRATIONS ARE IRRITATING TO THE EYES & THE RESPIRATORY TRACT.MAY CAUSE DIZZINESS, HEADACHE,ARE ANESTHETIC,MAY CAUSE UNCONSCIOUSNESS
PROLONGED/REPEATED LIQUID CONTACT WITH SKIN WILL DRY & DEFAT SKIN,LEADING TO IRRITATION & DERMATITIS.
CONTAINS BENZENE WHICH CAUSES BLOOD DISEASE,LEUKEMIA.STORAGE-STORE IN ACCORDANCE WITH NATIONAL FIRE PROTECTION ASSOCIATION REGULATIONS.FIRST AID-CALL A PHYSICIAN IN ALL CASES.EYES:IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES,HOLDING EYELIDS OPEN.SKIN:WASH WITH SOAP & WATER.INHALED:REMOVE TO FRESH AIR & PROVIDE CPR/OXYGEN IF NEEDED.ORAL:DO NOT INDUCE VOMITING.CALL A PHYSICIAN IMMEDIATELY
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: SINCLAIR OIL CORP
Label Street: 550 E SOUTH TEMPLE
Label P.O. Box: 30825
Label City: SALT LAKE CITY
Label State: UT
Label Zip Code: 84130-0825
Label Country: US
Label Emergency Number: 801-524-2700/800-424-9300(CHEMTREC)

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Response to Comments on the Draft Site 17 Geophysical Investigation Plan

PREPARED FOR: Joe Rail/NAVFAC Washington
Dennis Orenshaw/EPA
Curtis Detore/MDE
Margaret Kasim/CH2M HILL

PREPARED BY: Sarah Meyers/CH2M HILL

DATE: April 30, 2009

Comments on the Draft Site 17 Geophysical Investigation Plan were received from Joe Rail. Dennis Orenshaw, EPA, and Curtis Detore, MDE, reviewed the document and did not have any comments.

Comment responses are provided below.

Comments from Joe Rail (NAVFAC Washington; received on March 17, 2008)

1. Page 1, section 1- Can it be assumed that surface items will be removed prior to this work?

Response: A site visit was performed on March 10, 2009. UXO personnel determined that there are no surface items in the proposed survey area or along the access routes. It was determined during the site visit that the proposed survey area extended into the shoreline/beach area. As this was not the intention, the survey area has been revised so that it does not include the shoreline area.

2. Page 1, section 2- It's mentioned that DGM survey personnel will inform SUXOS or UXO technician if items are encountered and in the last sentence of section 1, it's stated that a UXO technician III or II will operate analog instruments. Isn't this a contradiction of who is using the instruments?

Response: The text is correct. DGM survey personnel will be using digital instruments (EM61-MK2) to perform the survey. The UXO personnel will use analog instruments during support activities such as clearance of locations for survey stakes. To improve clarity on this issue, the last paragraph of section 1.0 has been split into two paragraphs:

"Geophysical instruments will be used during digital geophysical mapping (DGM) survey operations that record instrument response digitally, allowing for the subsequent download and interpretation of the data. DGM instruments will be operated by the DGM subcontractor.

Geophysical instruments used during operations such as clearance of locations for emplacement of survey stakes will be analog, meaning these instruments will be

used to detect metallic items in the subsurface on a real-time basis and the instrument response will not be recorded. Generally analog instruments indicate the presence of metallic anomalies through sound or visual display. Analog instruments will be operated by an unexploded ordnance (UXO) Technician III or II."

3. Page 1, section 2, first paragraph, last sentence- Caution should be taken when marking and securing a perimeter around an item; "retreat and notify" may be a preferred action. Also note that Indian Head has a wide array of items that are not inventory items. For example, R&D items may not look like MEC but actually are. Also in this paragraph, if no UXO personnel are present, how will they know of the discovery of an item?

Response: To address this comment, the paragraph has been revised to read as follows:

"Personnel are required to adhere to the project Health and Safety Plan. Based on a site visit performed March 10, 2009, there are no MEC or material potentially presenting an explosive hazard (MPPEH) items on the surface within the survey area or along the access routes. Therefore, a surface clearance will not be required. But these items may be present in the general vicinity of the survey area (along the shoreline, for example). MEC avoidance will be practiced during all site visits and during the geophysical survey. MEC avoidance will be provided by one UXO Technician III or CH2M HILL Senior UXO Supervisor (SUXOS). DGM survey personnel will not access areas outside of the survey area or access routes, as directed by the SUXOS or UXO Technician. Personnel are prohibited from touching, handling, moving, or investigating any item that resembles MEC or MPPEH. It is noted that some MEC/MPPEH items potentially present at NSF-IH are not typical "inventory items" and therefore may not initially appear to be MEC/MPPEH (e.g., research and development items). Upon encountering a potential MEC/MPPEH item, survey personnel will retreat to the designated rally point and immediately inform the Senior UXO Supervisor (SUXOS). The SUXOS will report the finding to the base contact (Nick Carros, 301-744-2263) and then contact the CH2M HILL Project Manager. The base contact will coordinate any further action related to the item using base resources."

4. Page 7, section 16, last sentence- Ticks can be present in April and do pose a health hazard so I would recommend they be addressed in the H&S plan.

Response: Deleted the last sentence. The H&S plan addresses ticks.

5. Page 9, section 20.6- Typo in the title; fix to read "Records Management."

Response: Typo corrected.

6. Page 14, section 23, first sentence- It's preferred that only surrogates (no inert MEC items) are used.

Response: Surrogate items will be used. Sentence revised:

"At least one ~~inert MEC~~ surrogate item (~~or surrogate if necessary~~) will be seeded per acre."

No Comment from Dennis Orenshaw (EPA; received on March 27, 2009)

"Thank you for providing me with a copy of the following document: Site 17 Geophysical Investigation Plan for the Naval Support Facility at Indian Head, Maryland. Insofar as this investigation deals exclusively with the identification of sub-surface anomalies related to clearing munitions and explosives of concern, I will not be providing comments."

No Comment from Curtis Detore (MDE; received on April 30, 2009)

"The Federal Facilities Division of the Maryland Department of the Environment's Hazardous Waste Program has no comment on the above referenced document."