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Chevron Environmental Management Company

Final Pre-Design Investigation Work Plan

Golden Road Disposal Site
Site No. 8-28-021
Chili, New York

December 2007

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Acronyms

ARCADIS BBL	ARCADIS of New York, Inc.
bgs	below ground surface
CAMP	*Community Air Monitoring Plan*
CEMC	Chevron Environmental Management Company
DER-10 guidance	*Draft DER-10 Technical Guidance for Investigation and Remediation*
FSP	*Field Sampling Plan*
HASP	*Health and Safety Plan*
NYSDEC	New York State Department of Environmental Conservation
PCB	polychlorinated biphenyl
PDI	pre-design investigation
PID	photoionization detector
QAPP	*Quality Assurance Project Plan*
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RI	remedial investigation
ROD	Record of Decision
RSCO	Recommended Soil Cleanup Objective
SVOC	semivolatile organic compound

TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TCL	Target Compound List
TCLP	toxicity characteristics leaching procedure
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1. Introduction

1.1 Site Description and History

This *Pre-Design Investigation Work Plan* (PDI Work Plan) describes field procedures, sample locations and frequencies and analytical testing to be used during the PDI at the Golden Road Disposal located on Golden Road in the Town of Chili, New York (site). The PDI will be performed by ARCADIS of New York, Inc. (ARCADIS BBL) for Chevron Environmental Management Company (CEMC). A site location map is included as Figure 1. The site occupies approximately 7 acres of land adjacent to NYS Route 490, and it is currently an undeveloped former disposal site with no existing structures. It is bounded to the north by a railway system owned by CSX Transportation, Inc., to the south by NYS Route 490, to the east by a residential property and to the west by undeveloped land. The layout of the site is shown on Figure 2.

The site was privately run by Howard Fitzsimmons, Jr. from 1955 through 1976. During this time period, the site received a wide variety of wastes, including household refuse, metal slag, fly ash, foundry sand, scrap metal, empty artillery shell casings, drums, used aboveground storage tanks and junked vehicles. The site was reported to the New York State Department of Environmental Conservation (NYSDEC) on August 7, 1980. The NYSDEC and the Monroe County Health Department investigated the site as a result of complaints. The site was placed on the NYSDEC Inactive Hazardous Waste Registry on August 12, 1980. In 1985, the NYSDEC removed approximately 562 drums and containers and 75 cubic yards of contaminated soil and debris from the site as part of an emergency drum removal action. A remedial investigation (RI) (July to September 1999) and a feasibility study (December 2001) were completed by URS Corporation on behalf of the NYSDEC. The RI identified soil, sediment and groundwater impacts at the site. A Record of Decision (ROD) was prepared for the site by the NYSDEC in October 2002, which presents the selected remedy for the site. In October 2006, CEMC executed an Order on Consent with the NYSDEC to implement the ROD remedy for the site. Since that time, CEMC has completed several activities at the site in preparation for implementing the ROD remedy, including gaining formal access to the site and an adjacent property, delineating wetlands, investigating suspected asbestos-containing materials not identified in the RI, conducting surveying activities and planning out physical access to the site.

1.2 General

A PDI is proposed for the site (Figure 1) to supplement the existing historical analytical data in order to facilitate development of a Remedial Design/Remedial Action Work Plan (RD/RA Work Plan) for the site. The RD/RA Work Plan is a required component of the executed NYSDEC Order on Consent and Settlement Agreement (Index # B8-0449-03-07) for the site (Site # 8-28-021), and will present the RD/RAs to be implemented at the site to satisfy the ROD (NYSDEC, 2002a) remedy. This PDI Work Plan describes field procedures, sample locations and frequencies and analytical testing to be used during the proposed PDI, and follows applicable guidance presented in the *Draft DER-10 Technical Guidance for Site Investigation and Remediation* (DER-10 guidance) (NYSDEC, 2002b). Related documents to be used in conjunction with this PDI Work Plan include the *Field Sampling Plan* (FSP), *Quality Assurance Project Plan* (QAPP), site-specific *Health and Safety Plan* (HASP) and *Community Air Monitoring Plan* (CAMP), which are included as Appendices A, B, C and D, respectively.

The PDI involves the completion of numerous test pits within the areas targeted for remediation by the ROD remedy, as well as sediment sampling from the intermittent pond area and waste sampling from a drum located at the site. A site plan is included as Figure 2 showing the general layout of the site, and Figure 3 shows the proposed location of the test pits.

1.3 Objective and Data Collection

The overall objectives of the investigation detailed in this PDI Work Plan are as follows:

- Delineation of the horizontal and vertical extents of soils impacted with volatile organic compounds (VOCs) within the East Bank Area (Figure 2) and pentachlorophenol contamination in the SS-2 Area (Figure 2) that exceed applicable Recommended Soil Cleanup Objectives (RSCOs) established in the Technical and Administrative Guidance Memorandum #4046 (TAGM #4046) (NYSDEC, 1994).

- Delineation of the horizontal and vertical extents of waste materials buried within the East Bank Area.

- Collection and analysis of soil samples prior to excavation activities, which are required to confirm that the elements of the ROD remedy requiring soil

excavation have been satisfied. The intent of these pre-excavation, confirmatory soil samples and analyses is to eliminate, to the extent practicable, the need for post-excavation, confirmatory sampling. Post-excavation soil sampling and analysis may be conducted in the event that field conditions encountered during soil excavation activities necessitate it (i.e., observed, discreet, soil conditions at the proposed excavation limits have the appearance of being dissimilar to soils within the surrounding excavation limits, as established by the pre-excavation, confirmatory soil sampling). The limits of the proposed excavations (East Bank Area and the SS-2 Area) will be presented in the RD/RA Work Plan and will be based on the pre-excavation confirmatory soil analyses, such that at the proposed limits of the excavations will extend up to those sample points where the ROD remedy objectives have been met. The quantity and spacing of these sample points will be consistent with the DER-10 guidance (NYSDEC, 2002b).

- Characterization of soils proposed to be excavated and the contents of a partially filled drum that will be disposed off site during implementation of the ROD remedy.

- Collection and analysis of sediment samples within the intermittent pond area (Figure 2) to provide data for the evaluation of the current ROD remedy element requiring that the intermittent pond area be filled in. The intermittent pond area is within a wetland area (*Wetland Delineation Report*, ARCADIS BBL, 2007).

This PDI Work Plan is organized into the following sections:

- Introduction
- Mobilization
- Delineation and Pre-Excavation Confirmatory Soil Sampling and Analysis
- Intermittent Pond Sediment Sampling and Analysis
- Waste Characterization Sampling and Analysis
- Sample Identification Procedure

- Sample Handling and Documentation
- Quality Assurance/Quality Control Procedures
- Demobilization
- References

This PDI Work Plan and associated field sampling activities are supported by the FSP, which is presented in Appendix A of this PDI Work Plan. Quality assurance sampling will be conducted during the collection of all soil and sediment samples in accordance with the QAPP, located in Appendix B of this PDI Work Plan. The results of all soil, sediment and waste analyses will be reported in the RD/RA Work Plan.

2. Mobilization

Adequate and appropriate personnel and equipment will be mobilized to the site to conduct the PDI. All site personnel will review and understand the requirements of the site-specific HASP (Appendix C) prior to commencing site work. Air monitoring equipment will be calibrated and deployed in accordance with the site-specific HASP (Appendix C) and the CAMP (Appendix D) prior to conducting excavation activities. Test pits will be excavated using a hydraulic-powered excavator. Sediment sampling will be conducted using manual coring equipment. Safety fencing will be installed, where needed, to restrict access to the site during the PDI. This includes, but is not limited to, fencing around each test pit that remains open prior to demobilization from the site and fencing at the entrance to the site.

A decontamination pad, consisting of a bermed area lined with three layers of 6-mil thickness polyethylene sheeting will be constructed to allow for the decontamination of the excavator bucket. Decontamination activities will be able to be conducted without placing any equipment on the lined area, thus eliminating the possibility for equipment to puncture the liner system. The excavator bucket will be decontaminated within the decontamination pad area between each test pit and prior to demobilization from the site. Decontamination procedures for the excavator bucket will follow the decontamination procedures outlined in Section 5.2 of the FSP (Appendix A). Clean, new 55-gallon drums will be brought to the site for use in containerizing investigation-derived waste (e.g., used personal protective equipment, sampling equipment, decontamination water). Historical sampling points of interest will be surveyed and located to provide guidance for the test pits and sampling activities.

3. Delineation and Pre-Excavation Confirmatory Soil Sampling and Analysis

This section presents the procedures to be followed to complete the test pits and conduct soil sampling and analyses to delineate soil contamination and to obtain pre-excavation confirmatory soil samples in preparation for implementing the ROD remedy. Test pits will be completed within two areas of the site (East Bank Area and SS-2 Area, see Figure 3) that are discussed in this section, with soil samples obtained from each completed test pit location. All soil sample locations will be documented, as well as photoionization detector (PID) readings and observations of soil conditions for each excavated test pit. Soils excavated during implementation of the PDI Work Plan that experience soil headspace PID readings ranging from 25 to 100 parts per million will be targeted for sampling. Photographs will also be taken throughout the PDI. Sediment samples will be obtained from the intermittent pond area. Sediment and soil samples will be collected and handled in accordance with the FSP located in Appendix A of this PDI Work Plan. After all samples are collected, the exact location and depth of all samples will be documented. An expedited turnaround time for the analytical results of all soil samples will be requested to provide adequate time to review analytical results and conduct additional test pitting and soil sampling, as needed, to achieve the objectives of this PDI Work Plan without demobilizing from the site.

3.1 East Bank Area

3.1.1 Purpose

The delineation and pre-excavation confirmatory soil sampling and analysis activities for the East Bank Area are being proposed to provide soil data that will delineate the horizontal and vertical limits of soil excavation within the East Bank Area, and to satisfy all confirmatory soil analytical requirements necessary to document that the objective of the ROD remedy has been achieved within each proposed excavation area prior to conducting the excavation activities. The pre-excavation confirmatory soil sampling will be used to establish the limits of the proposed excavation that will be presented in the RD/RA Work Plan.

3.1.2 Soil Sampling Activities

The ROD-established soil cleanup objectives for the proposed East Bank Area excavation is to meet NYSDEC TAGM #4046 RSCOs for VOCs and the removal of all waste material (e.g., cans, liquid waste, visibly contaminated soil). Delineation, pre-excavation confirmatory and waste characterization soil samples will be collected from

test pits during the PDI that are spatially located outward from historical sample locations where VOCs were indicated to exceed RSCOs. Soil samples will be collected during this PDI from locations within the test pits to satisfy confirmatory bottom and sidewall soil sampling and waste characterization sampling requirements.

Using the four historical test pits that showed evidence of waste material present and soil VOC contamination exceeding RSCOs (TP-3, TP-3N, TP-3N1 and TP-3NW) as starting points, new test pits will be excavated in an outward direction at the approximate locations shown on Figure 3. These proposed test pits have been given a unique identification based on each test pit's proximity to an adjacent historical test pit, or based on its purpose (e.g., CSW – confirmatory sidewall, TP-3-E – located east of historical test pit TP-3) and include TP-CSW-1, TP-CSW-2, TP-CSW-3, TP-CSW-4, TP-CSW-5, TP-CSW-6, TP-CSW-7, TP-3-SW, TP-3NW-S, TP-3NW-W, TP-3NW-N, TP-3N1-W, TP-3N1-N, TP-3N1-S, TP-3N1-E, TP-3N-E and TP-3-E.

3.1.2.1 Test Pits TP-3-SW, TP-3NW-S, TP-3NW-W, TP-3NW-N, TP-3N1-W, TP-3N1-N, TP-3N1-S, TP-3N1-E, TP-3N-E and TP-3-E

The excavation of proposed test pits TP-3-SW, TP-3NW-S, TP-3NW-W, TP-3NW-N, TP-3N1-W, TP-3N1-N, TP-3N1-S, TP-3N1-E, TP-3N-E and TP-3-E will begin between approximately 10 to 15 feet from its associated historical test pit/sample location. A PID will be utilized to screen soil for the presence of VOCs as the test pits are being excavated. Once field observations indicate that a vertical limit to the soil impacts exceeding cleanup objectives (i.e., VOCs greater than RSCOs and waste materials present) has been reached, a confirmatory bottom soil sample will be collected from the 0- to 6-inch interval at the bottom of the test pit.

The minimum excavation target depth for each test pit is 6 feet below ground surface (bgs). Test pits will be advanced downward past the minimum 6-foot depth until observations indicate that no soil impacts exceeding cleanup objectives are present or until soil stability of the test pit becomes compromised. This minimum test pit excavation depth of 6 feet was arrived at based on historical data that indicates that wastes and impacted soils are generally present within the proposed East Bank Area at this depth. Upon reaching the minimum depth, if field indications or laboratory data indicates that impacts exceeding the soil cleanup objectives for this site are not present at the 6-foot depth and possibly the soils above, a confirmatory bottom soil sample will be obtained from the depth at which field observations indicate that impacts to soils do not appear to exceed the soil cleanup objectives for the site. The purpose of the soil samples discussed in this section is to provide pre-excavation, confirmatory soil bottom

samples that will be used to establish the vertical limits of the proposed excavation and satisfy all bottom confirmatory soil sampling requirements. These soil samples will be properly packaged, as discussed in Section 7, and submitted to the laboratory with a requested expedited turnaround time for the analytical results. Based on these initial reported analytical results, additional excavation downward of those test pits having soil samples exceeding the RSCOs for VOCs will be conducted and a confirmatory bottom soil sample from each of these test pits will be resampled. This process will continue for all test pits until confirmatory bottom soil sample analytical results do not indicate any VOC contamination present above the RSCOs.

Once the impacts exceeding the cleanup objectives have been delineated vertically, each test pit will be advanced in a straight, horizontal direction forming a trench. PID readings and observations of soils and any encountered waste materials will be documented as the test pit is being excavated. Excavation of the test pit will continue horizontally until PID readings and observations indicate that VOC soil contamination exceeding the RSCOs and any waste materials are not present. At this point, a soil sample will be obtained from the sidewall of the leading end of the test pit and submitted for analysis. The purpose of these end sidewall soil samples is to provide pre-excavation confirmatory sidewall sample locations that will be used to establish the limits of the proposed excavation. The depth of the confirmatory sidewall soil samples will be determined in the field and will be based on observations of VOC soil contamination made during the excavation activities, such that the sidewall soil sample depths will be biased towards the depth of higher contamination within that test pit.

The confirmatory sidewall soil samples will be properly packaged, as discussed in Section 7, and submitted to the laboratory with a requested expedited turnaround time for the analytical results. Based on these initial reported analytical results, additional excavation outward of those test pits having soil samples exceeding the RSCOs for VOCs will be conducted and a confirmatory sidewall soil sample from these test pits will be resampled. This process will continue for all test pits until confirmatory sidewall soil sample analytical results do not indicate any VOC contamination present above the RSCOs.

3.1.2.2 Test Pits TP-CSW-1 through TP-CSW-7

Proposed test pits TP-CSW-1 through TP-CSW-7 may be completed to provide pre-excavation confirmatory sidewall soil samples to supplement the pre-excavation sidewall soil samples obtained from the test pits discussed in Section 3.1.2.1. Test pits TP-CSW-1 through TP-CSW-7 will be required to provide adequate spacing of

confirmatory sidewall soil samples in the event that the soil analyses dictate that an increasing perimeter for the proposed excavation is necessary. The tentative location of these test pits, should they be necessary, positions them at approximately the mid-point between the end of adjacent test pits where sufficient spacing of confirmatory sidewall samples may be lacking, depending on the perimeter of the proposed excavation in this area, as determined by the analytical data. These locations are shown on Figure 3 and may change during implementation of the PDI in order to achieve their purpose.

In the event that these test pits are determined to be necessary, their excavation will be completed similar to the test pits previously discussed. The excavation of these test pits will initially be advanced vertically (downward) until PID readings and observations indicate that VOC soil contamination exceeding the RSCOs and any waste materials are not present (minimum of 6 feet bgs). Excavation of these test pits will continue horizontally (outward) until PID readings and observations indicate that VOC soil contamination exceeding RSCOs and any waste materials are not present. At this point, a confirmatory sidewall soil sample will be obtained from the sidewall of the leading end of each the test pit.

The confirmatory sidewall soil samples will be properly packaged, as discussed in Section 7, and submitted to the laboratory with a requested expedited turnaround time for the analytical results. Based on these initial reported analytical results, additional excavation outward of those test pits having soil samples exceeding the RSCOs for VOCs will be conducted and a confirmatory sidewall soil sample from each of these test pits will be resampled. This process will continue for each of these test pits until confirmatory sidewall soil sample analytical results do not indicate any VOC contamination present above the RSCOs.

All or a portion of these test pits and associated confirmatory sidewall soil sampling may be completed during the PDI. The DER-10 guidance (NYSDEC, 2002b) states that sidewall samples are to be taken from the sidewall of excavations greater than 20 feet in perimeter at a frequency of one for every 30 linear feet of sidewall to confirm remediation. The results of the confirmatory sidewall soil sample analyses obtained from the initial test pits discussed in the previous section and any resulting increase in the proposed excavation limits will determine the need to conduct the test pits discussed in this section in order to achieve the proper confirmatory sidewall soil sample spacing.

3.1.2.3 Test Pits TP-WC-1 through TP-WC-4

Test pits TP-WC-1 through TP-WC-4 are being proposed to collect soil samples to provide waste characterization data, which is discussed in Section 5 of this PDI Work Plan, and, if necessary, additional pre-excavation, confirmatory soil samples for the bottom of the proposed excavation area, which is discussed in this section, with the exception of the proposed test pit TP-WC-3. Test pit TP-WC-3 will have a confirmatory bottom soil sample obtained and analyzed to provide a sample location centrally located within the proposed East Bank Area excavation. Confirmatory bottom soil samples from test pits TP-WC-1, TP-WC-2 and TP-WC-4 are in addition to the bottom soil samples discussed in Section 3.1.2.1, and may be required to provide an adequate quantity of confirmatory bottom soil samples in the event that the confirmatory soil sample analytical results obtained from the initial test pits discussed in Section 3.1.2.1 indicate that the proposed excavation area should be increased.

The DER-10 guidance (NYSDEC, 2002b) states that bottom samples are to be taken for excavations greater than 900 square feet of bottom area at a frequency of one for every 900 square feet of excavation bottom to confirm remediation. As analytical data becomes available, the size of the proposed excavation will be estimated and determinations will be made as to the need to obtain additional pre-excavation bottom confirmatory soil samples from these test pits in order to meet the DER-10 guidance. The excavation of these test pits will initially be advanced vertically (downward) until PID readings and observations indicate that VOC soil contamination exceeding RSCOs and any waste materials are not present. At this point, a confirmatory bottom soil sample will be collected from the 0- to 6-inch interval at the bottom of each of these test pits. The samples will be properly packaged, as discussed in Section 7, and submitted to the laboratory with a requested expedited turnaround time for the analytical results. Based on the reported analytical results, additional excavation downward for those test pits having soil samples exceeding the RSCOs for VOCs will be conducted, and a confirmatory bottom soil sample from these test pits will be resampled. This process will continue for each of these test pits until analytical results do not indicate any VOC contamination present above the RSCOs for these confirmatory bottom soil samples.

3.1.3 Soil Analysis

Soil samples collected from the test pits for delineation and pre-excavation confirmatory sampling of the proposed excavation will be properly packaged and transported to the laboratory for analysis of Target Compound List (TCL) VOCs by

United States Environmental Protection Agency (USEPA) Method 8260B. As analytical results are made available, additional test pits and soil samples, as discussed in the previous sections, may be completed/obtained in order to establish the horizontal and vertical limits of the proposed East Bank Area excavation and to obtain a quantity and spacing of pre-excavation confirmatory soil samples consistent with the DER-10 guidance (NYSDEC, 2002b).

3.2 SS-2 Area

3.2.1 Purpose

The delineation and pre-excavation confirmatory soil sampling and analysis activities for the SS-2 Area are being proposed to provide soil data that will delineate the limits of excavation within this area and satisfy all confirmatory soil analytical requirements necessary to document that the objective of the ROD remedy has been achieved within the proposed excavation area prior to conducting the excavation activities.

3.2.2 Soil Sampling Activities

The ROD-established soil cleanup objective for the proposed SS-2 Area excavation is to meet NYSDEC TAGM #4046 RSCOs for the compound pentachlorophenol. Pentachlorophenol delineation, pre-excavation confirmatory and waste characterization soil samples will be collected from four test pits located outward from the historical sample identified as SS-2 (Figure 3) during the PDI. Soil samples will be collected during the PDI from locations within these test pits to satisfy confirmatory bottom and sidewall soil sampling and waste characterization sampling requirements.

Using the historical surface sample location SS-2, new test pits will be excavated in an outward direction to the north, south, east and west of the SS-2 location at the approximate locations shown on Figure 3. These proposed test pits have been given a unique identification based on its location to SS-2 and include SS-2-N, SS-2-S, SS-2-E and SS-2-W.

Proposed test pits SS-2-N, SS-2-S, SS-2-E and SS-2-W will begin approximately 5 feet from the SS-2 location, with the exception of test pit SS-2-S, which will begin at the approximate location of the historical soil sample location identified as SS-2. A PID will not be utilized to screen soil while conducting test pitting and sampling at the SS-2 Area because the compound being investigated, pentachlorophenol, cannot be detected by this instrument. Observations of soil conditions for the presence of

pentachlorophenol, which is described as a colorless to white crystalline solid with a benzene-like odor (National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards; U.S. Department of Health and Human Services, 2003), will be used to evaluate its possible presence during test pitting.

The test pits will be excavated initially to a depth of 12 inches bgs, or in the event that observations indicate the presence of pentachlorophenol, to a depth beyond where the presence of pentachlorophenol may exist. At this point, a confirmatory bottom soil sample will be collected from test pit SS-2-S from the 0- to 6-inch interval at the bottom of the test pit. The confirmatory bottom soil samples will be properly packaged, as discussed in Section 7, and submitted to the laboratory with a requested expedited turnaround time for the analytical results. In the event that the analytical results for this soil sample exceed the RSCO for pentachlorophenol, the test pit will be further excavated downward and the confirmatory bottom soil sample will be resampled. This process will continue until analytical results do not indicate any pentachlorophenol contamination present above the RSCOs for this confirmatory bottom soil sample.

In addition to the pre-excavation confirmatory bottom soil sample, pre-excavation confirmatory sidewall samples will be collected from these test pits to establish the limits of the proposed SS-2 excavation. The excavation of each test pit will be advanced in a straight, horizontal direction outward from the SS-2 sample location. Each test pit will be advanced outward until observations of soil conditions do not indicate the possible presence of pentachlorophenol, with a minimum distance of 5 linear feet beyond the start of each test pit, except test pit SS-2-S, which will be advanced a minimum of 10 linear feet. This will position the leading end of the test pits a minimum of 10 linear feet from SS-2. At this point, a pre-excavation confirmatory sidewall soil sample will be obtained from the leading end of each test pit sidewall at a depth interval of 0 to 6 inches bgs.

A second confirmatory sidewall soil sample will be obtained from those test pits where soil analyses indicate that pentachlorophenol contamination extends beyond a depth of 1.5 feet bgs. For these test pits, the depth of the second confirmatory sidewall soil sample will be obtained at the bottom portion of the leading end sidewall of each test pit.

The confirmatory sidewall soil samples will be properly packaged, as discussed in Section 7, and submitted to the laboratory with a requested expedited turnaround time for the analytical results. Based on the initial reported analytical results, additional excavation of those test pits having soil samples exceeding the RSCOs for

pentachlorophenol will be conducted and confirmatory sidewall soil samples from these test pits will be resampled, as needed. This process will continue for each of these test pits until confirmatory sidewall soil sample analytical results do not indicate any pentachlorophenol contamination present above the RSCO.

If necessary, additional test pits and soil samples will be completed in the SS-2 Area in order to meet confirmatory soil sampling frequencies stated in the DER-10 guidance (NYSDEC, 2002b). The excavation and soil sampling for these possible additional test pits will be conducted following procedures similar to those discussed in this section.

3.2.3 Soil Analysis

Soil samples collected from test pits SS-2-N, SS-2-S, SS-2-E and SS-2-W for delineation and pre-excavation confirmatory sampling of the proposed SS-2 Area excavation will be properly packaged and transported to the laboratory for analysis for pentachlorophenol by USEPA Method 8270C. As analytical results are made available, additional test pits and soil samples, as discussed in the previous section, may be obtained to establish horizontal and vertical limits of the proposed SS-2 Area excavation, such that confirmatory soil sample spacing and frequencies for the proposed SS-2 Area excavation are consistent with the DER-10 guidance (NYSDEC, 2002b).

4. Intermittent Pond Sediment Sampling and Analysis

4.1 Purpose

Sediment sampling within the intermittent pond area (pond) is being proposed to obtain and review sediment quality data within this area. Currently, the ROD remedy requires that the pond be filled in to mitigate the environmental threat due to migration of fill contaminants to the wetlands. A survey of the wetlands conducted by ARCADIS BBL (*Wetland Delineation Report*; ARCADIS BBL, 2007) indicated that the pond was within the wetland boundary at the site. Subsequent conversations with the NYSDEC communicated their desire to limit any disturbance to this wetland as it represents a beneficial habitat to the environment. Sampling of the sediment will provide data for use in evaluating the current ROD remedy element and other possible options, if needed, for this area. Sediment samples will be collected and handled in accordance with the FSP located in Appendix A of this PDI Work Plan.

4.1.1 Sediment Sampling Activities

Six sediment samples will be obtained from spatially located points within the pond. These sample points have been given a unique identification and include SED-1-1, SED-1-2, SED-1-3, SED-1-4, SED-1-5 and SED-1-6. The approximate location of these sample points is shown on Figure 3. The sediment samples will be obtained following the general guidelines for sediment sampling found in Appendix A of this PDI Work Plan. Lexan® tubing will be the primary method used to collect sediment cores. The tubing will be inserted with a straight, vertical entry into the sediments so as to secure a reliably representative cross-section sample at each location. The tubing will be advanced downward into the sediment by hand until refusal is met. It will then be advanced several more inches to obtain a plug at the end of the tubing and prevent any lose sediment from falling out of the tubing upon its extraction. Once the tubing is extracted, a sample of the sediment across the length of the sediment core will be obtained and submitted to the laboratory for analysis. Samples will be collected from more than one depth if there is a sediment recovery of 8 to 10 inches or more.

4.1.2 Sediment Analysis

All sediment samples will be properly packaged and transported to the laboratory for analysis. Sediment samples will be analyzed for semivolatile organic compounds (SVOCs) by USEPA Method 8270C, Target Analyte List (TAL) metals by USEPA Methods 6010B/7470A and total organic carbon (TOC) by Lloyd Kahn. SVOCs and

TAL metals analyses are being performed based on the historical sediment analytical results for the sediment sample located at the southeast corner of the pond (SED-01) that reported metals and SVOCs at concentrations exceeding the RSCOs (*Remedial Investigation Report*, Golden Road Disposal Site; URS Greiner Woodward Clyde, 2000). TOC analysis will be performed for possible use in developing more appropriate RSCOs for SVOCs within the sediments based on their organic carbon content. The sediment sample analyses will be evaluated using screening criteria provided in the NYSDEC's (1999) *Technical Guidance for Screening Contaminated Sediments.*

5. Waste Characterization Sampling and Analysis

5.1 Purpose

Waste characterization sampling and analyses are being obtained to appropriately characterize the wastes that are predicted to be generated and disposed off site during implementation of the ROD remedy. The wastes will be analyzed for comparison to appropriate Resource Conservation and Recovery Act (RCRA) hazardous waste characteristics for use in determining handling and disposal requirements, and for submission to an appropriate disposal facility(ies) to obtain their approval in accepting these wastes.

During excavation of test pits for the delineation and pre-excavation confirmatory soil sampling activities discussed in Section 3, samples will be collected from the East Bank Area and SS-2 Area for waste characterization.

5.2 East Bank Area Waste Characterization Sampling and Analysis

5.2.1 Waste Characterization Soil Sampling Activities

Waste characterization soil samples will be collected from nine proposed test pits within the East Bank Area. Each of these test pits have been given a unique identification number and include TP-WC-1, TP-WC-2, TP-WC-3 and TP-WC-4, and test pits TP-3NW-W, TP-3N1-W, TP-3N1-E, TP-3N-E and TP-3-E that are discussed in Section 3.1.2.1. The location of these test pits are shown on Figure 3. These test pits are positioned within the apparent source area of the soil contamination based on a review of the historical data for that area.

Historical data indicates that the most significant soil impacts within the East Bank Area exists within the depth interval of 1 to 6 feet bgs. As discussed in Section 3, soils will be screened using a PID during the excavation of each of these test pits. One waste characterization sample will be obtained from each of these nine test pits from the continuous, 2-foot depth interval of soils exhibiting the highest PID readings and submitted to the laboratory for analysis. For test pits TP-WC-1 through TP-WC-4, once a depth of 6 feet bgs is reached, the test pit will be continued until PID soil headspace readings begin to decrease. At this point, excavation of the test pits will cease and the select depth interval sampled as noted previously.

Test pits TP-3NW-W, TP-3N1-W, TP-3N1-E, TP-3N-E and TP-3-E will each have a waste characterization soil sample obtained from the end of the test pit closest to its adjacent historical test pit. Excavation of test pits TP-3NW-W, TP-3N1-W, TP-3N1-E, TP-3N-E and TP-3-E will proceed as discussed in Section 3.1.2.1 after collection of the waste characterization soil sample to obtain additional soil data.

5.2.2 Waste Characterization Soil Analysis

Of the nine waste characterization soil sample test pits discussed in the previous section, four of these test pits (TP-WC-1, TP-WC-2, TP-WC-3 and TP-WC-4) will have soil samples submitted to the laboratory for analysis of the following parameters:

- toxicity characteristics leaching procedure (TCLP) VOCs by USEPA Method 8260B
- TCLP SVOCs by USEPA Method 8270C
- TCLP for metals by USEPA Method 6010B/7470A series
- polychlorinated biphenyls (PCBs) by USEPA Method 8082A
- RCRA Waste Characteristic Flashpoint by USEPA Method 1030
- TCL VOCs by USEPA Method 8260B
- TCL SVOCs by USEPA Method 8270C

The TCL VOC and TCL SVOC analyses will only be run if the analytical results for TCLP VOCs or TCLP SVOCs indicate concentrations exceeding regulatory levels for hazardous characteristics.

Waste characterization soil samples from test pits TP-3NW-W, TP-3N1-W, TP-3N1-E, TP-3N-E and TP-3-E will be submitted to the laboratory and archived. Upon reviewing the analytical results for the East Bank Area soil delineation samples as discussed in Section 3.1, the quantity of impacted soil requiring excavation and off-site disposal will be estimated. Based on this estimate, all or a portion of the archived waste characterization soil samples may be released from archive and sampled for the analyses listed above to meet the disposal facilities' sampling frequency requirements.

An expedited turnaround time for the analytical results of select waste characterization soil samples will be requested to provide adequate time to review analytical results and, if necessary, release and analyze archived waste characterization soil samples. The analytical results will be compared to regulatory levels for hazardous characteristics, so that the soils designated for off-site disposal can be properly managed.

5.3 SS-2 Area Waste Characterization Sampling and Analysis

5.3.1 Waste Characterization Soil Sampling Activities

A waste characterization soil sample will be collected from the test pit identified as SS-2-S. The excavation of test pit SS-2-S is discussed in Section 3.2. The waste characterization soil sample from SS-2-S will be collected from the depth interval of 2 to 18 inches bgs and submitted to the laboratory for analysis. This depth interval was selected based on the depth interval of the historical surface soil sample SS-2, which was 0 to 2 inches bgs, the low volatility of the contaminant of concern (pentachlorophenol) in this area, the sample depth of the proposed initial bottom confirmatory soil samples (1 to 1.5 feet bgs) and the desire to obtain a sample representative of the soils that will be excavated from this area and disposed off site.

5.3.2 Waste Characterization Soil Analysis

The waste characterization soil sample obtained from test pit SS-2-S will be analyzed for the following parameters:

- TCLP VOCs by USEPA Method 8260B
- TCLP SVOCs by USEPA Method 8270C
- TCLP for metals by USEPA Method 6010B/7470A series
- PCBs by USEPA Method 8082A
- RCRA Waste Characteristic Flashpoint by USEPA Method 1030
- TCL VOCs by USEPA Method 8260B
- TCL SVOCs by USEPA Method 8270C

The TCL VOC and TCL SVOC analyses will only be run if the analytical results for TCLP VOCs or TCLP SVOCs indicate concentrations exceeding regulatory levels for hazardous characteristics. The analytical results will be compared to regulatory levels for hazardous characteristics, so that impacted soils designated for off-site disposal from this area can be properly managed.

5.4 Partially Filled Drum

5.4.1 Waste Characterization Soil Sampling Activities

Historical site investigations identified a partially filled drum (drum) at this site. The ROD remedy for this site requires off-site disposal of this drum. This drum will be located and a sample obtained of its contents and submitted to the laboratory for waste characterization.

5.4.2 Waste Characterization Soil Analysis

The waste characterization sample obtained from the drum will be analyzed for the following parameters:

- TCLP VOCs by USEPA Method 8260B
- TCLP SVOCs by USEPA Method 8270C
- TCLP for metals by USEPA Method 6010B/7470A series
- PCBs by USEPA Method 8082A
- RCRA Waste Characteristic Flashpoint by USEPA Method 1030
- TCL VOCs by USEPA Method 8260B
- TCL SVOCs by USEPA Method 8270C

The TCL VOC and TCL SVOC analyses will only be run if the analytical results for TCLP VOCs or TCLP SVOCs indicate concentrations exceeding regulatory levels for hazardous characteristics. The analytical results will be compared to regulatory levels for hazardous characteristics, so that the drum and its contents can be properly managed.

6. Sample Identification Procedure

Each sample collected during the PDI will be given a unique sample identification that correlates to the test pit, sediment sample or drum locations discussed in this PDI Work Plan and the purpose/location of the sample. For example, the initial bottom delineation and pre-excavation confirmatory soil sample from test pit TP-3N1-N will be identified as TP-3N1-N-B1. In the event that analytical results indicate exceedences in the RSCOs for that particular area and locations are resampled, the number portion at the end of the corresponding sample identifier will increase appropriately based on the sequencing of the resamples (e.g., 1, 2, 3 will correspond to the initial sample, the resample, the second resample). The following is a summary of the abbreviations that will be used for sample identification:

- "B" – Bottom Sample
- "SW" – Sidewall Sample
- "WC" – Waste Characterization Sample
- "SED" – Sediment Sample

A summary of all samples obtained during the PDI and analytical results will be included in the RD/RA Work Plan.

7. Sample Handling and Documentation

Sample handling and documentation will be conducted in accordance with the FSP and QAPP, which are included as Appendix A and B, respectively, to this PDI Work Plan.

8. Quality Assurance/Quality Control Procedures

Quality assurance/quality control requirements for field sampling and analysis activities associated with the site are presented in the QAPP. All quality assurance/quality control data will be presented in the RD/RA Work Plan.

9. Demobilization

All test pits will be backfilled with the same soils excavated from that particular test pit. Soils will be placed back into each test pit, such that the removed soils are placed as close as practicable to the same location from which they were excavated from and compacted. All equipment coming into contact with impacted soils will be appropriately decontaminated within the decontamination pad between test pits and prior to leaving the site. The decontamination pad will be dismantled and those materials used in its construction that came into contact with impacted materials, as well as materials generated during decontamination activities, will be properly containerized. All containerized waste generated during the PDI will be properly labeled, characterized and transported off site for disposal upon approval of the wastes by an approved disposal facility.

10. Schedule

Implementation of the PDI Work Plan will begin within 45 days of receiving the NYSDEC's approval of the PDI Work Plan. It is anticipated that the field work associated with the PDI will be completed within 3 weeks. The RD Work Plan will be submitted to the NYSDEC within 90 days of receiving all analytical laboratory data for the sampling completed during the PDI.

11. References

ARCADIS of New York, Inc., 2007, *Wetland Delineation Report*, June 2007.

New York State Department of Environmental Conservation, 1994, *Technical and Administrative Guidance Memorandum #4046*, January 24, 1994.

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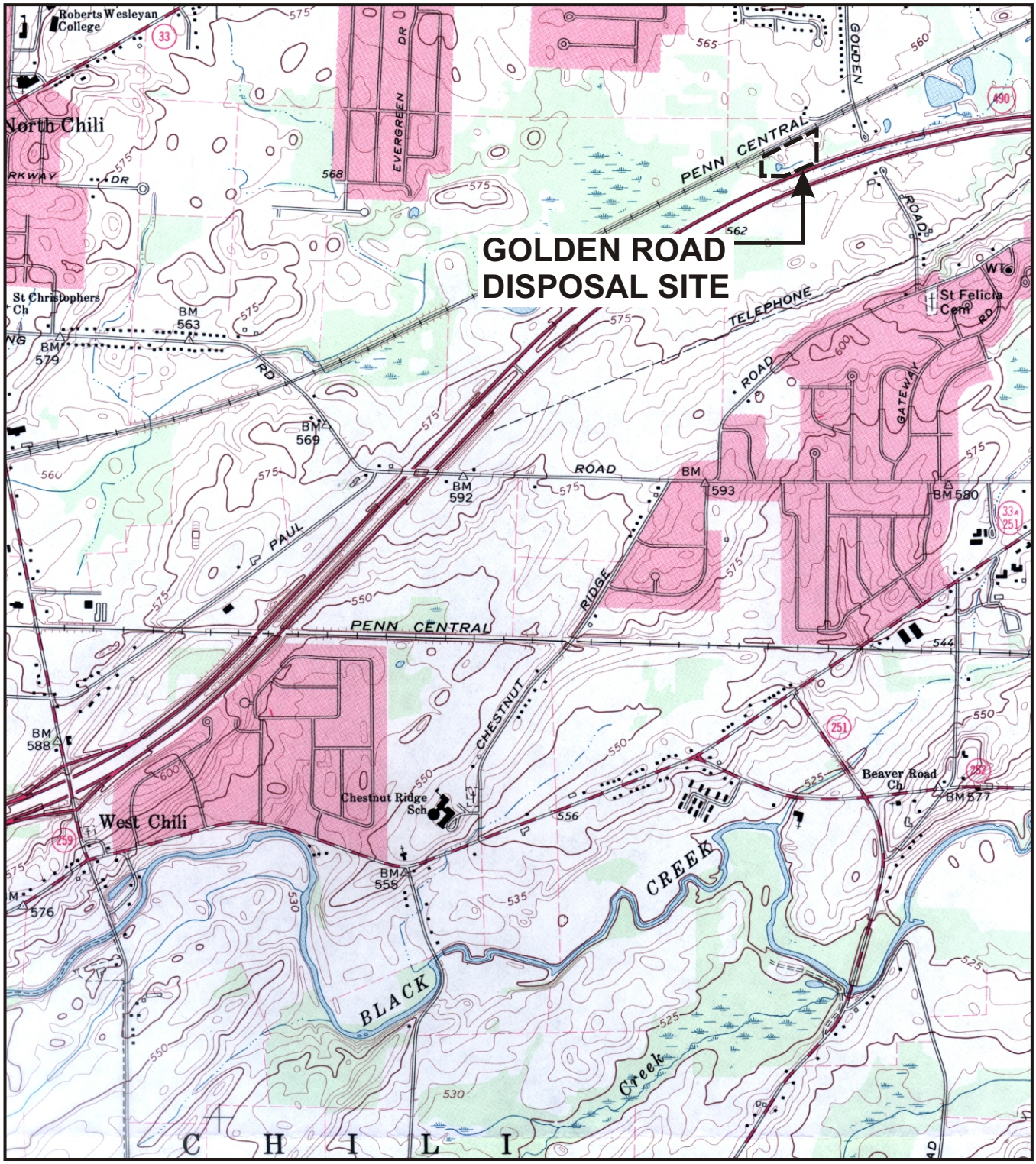
New York State Department of Environmental Conservation, 2002a, *Record of Decision – Golden Road Disposal Site*, October 2002.

New York State Department of Environmental Conservation, 2002b, *Draft DER-10 Technical Guidance for Investigation and Remediation*, December 2002.

United States Department of Health and Human Services, 2003, National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards, January 2003.

URS Griener Woodward Clyde, 2000, *Remedial Investigation Report*, prepared for New York State Department of Environmental Conservation, February 2000.

Figures



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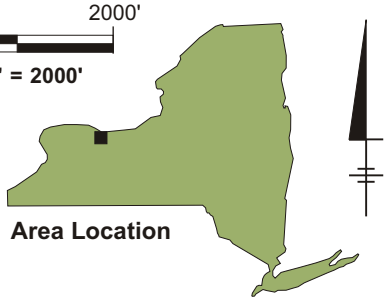

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
GOLDEN ROAD DISPOSAL SITE - CHILI, NY

PRE-DESIGN INVESTIGATION WORK PLAN

SITE LOCATION MAP

ARCADIS BBL
Infrastructure, environment, facilities

FIGURE 1

07/25/07 SYR-D85-DJH
43524104/43524N02.CDR

CONRAIL RAILROAD TRACKS

R.O.W.

#179
GOLDEN
ROAD

#189
GOLDEN
ROAD

INTERMITTENT
POND AREA

SS-2 AREA

EAST BANK
AREA

FP-1C
FP-1B
FP-1A
FM-2
FP-2C
FP-2A
FP-2B
FP-3A
FP-3C
3B

AST-SS-1
AST-SS-2
SED-8
SED-9
GW-2
GW-10
GW-9
SS-1
SS-2
SS-3
SS-4
SS-5
SS-6
SS-7
SS-8
SS-9
ASB-1
ASB-2
ASB-3
SG-2
SG-3
SG-4
SED-1
SED-2
SED-4
GW-5
SW/SED-5

TP-N1
TP-1
TP-2
TP-3
TP-3N1
TP-3NW
TP-3N
TP-3W
TP-3S
TP-4
TP-5
TP-6
TP-7
TP-8
TP-9
TP-10
TP-11
TP-12

WL-01
WL-02
WL-03
WL-04
WL-05
WL-06
WL-07
WL-08
WL-09
WL-10
WL-11
WL-12
WL-13
WL-14
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WL-39
WL-40
WL-41
WL-42
WL-43
WL-44
WL-45
WL-46

0 60' 120'
GRAPHIC SCALE

LEGEND:

ASB-3	ASBESTOS SAMPLE
FP-1B	FILL PILE SAMPLE
FM-3	FILL MATERIAL SAMPLE
SED-2	SEDIMENT SAMPLE
SW/SED-5	SURFACE WATER SEDIMENT SAMPLE
SS-5	SURFICIAL SOIL SAMPLE
GW-3	GROUNDWATER MONITORING WELL
UST-SB-E	SOIL BORING
	HISTORICAL TEST PIT
	GENERAL EXCAVATION AREA
	EXISTING ACCESS ROAD
	PARCEL BOUNDARIES
WL-18	WETLAND BOUNDARY POINT
	WETLAND BOUNDARY

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
GOLDEN ROAD DISPOSAL SITE - CHILI, NY
PRE-DESIGN INVESTIGATION WORK PLAN

SITE PLAN

ARCADIS BBL
infrastructure, environment, facilities

FIGURE
2

SYR-85-GHS LAF RCB LAYER: ON=*;OFF=REF*
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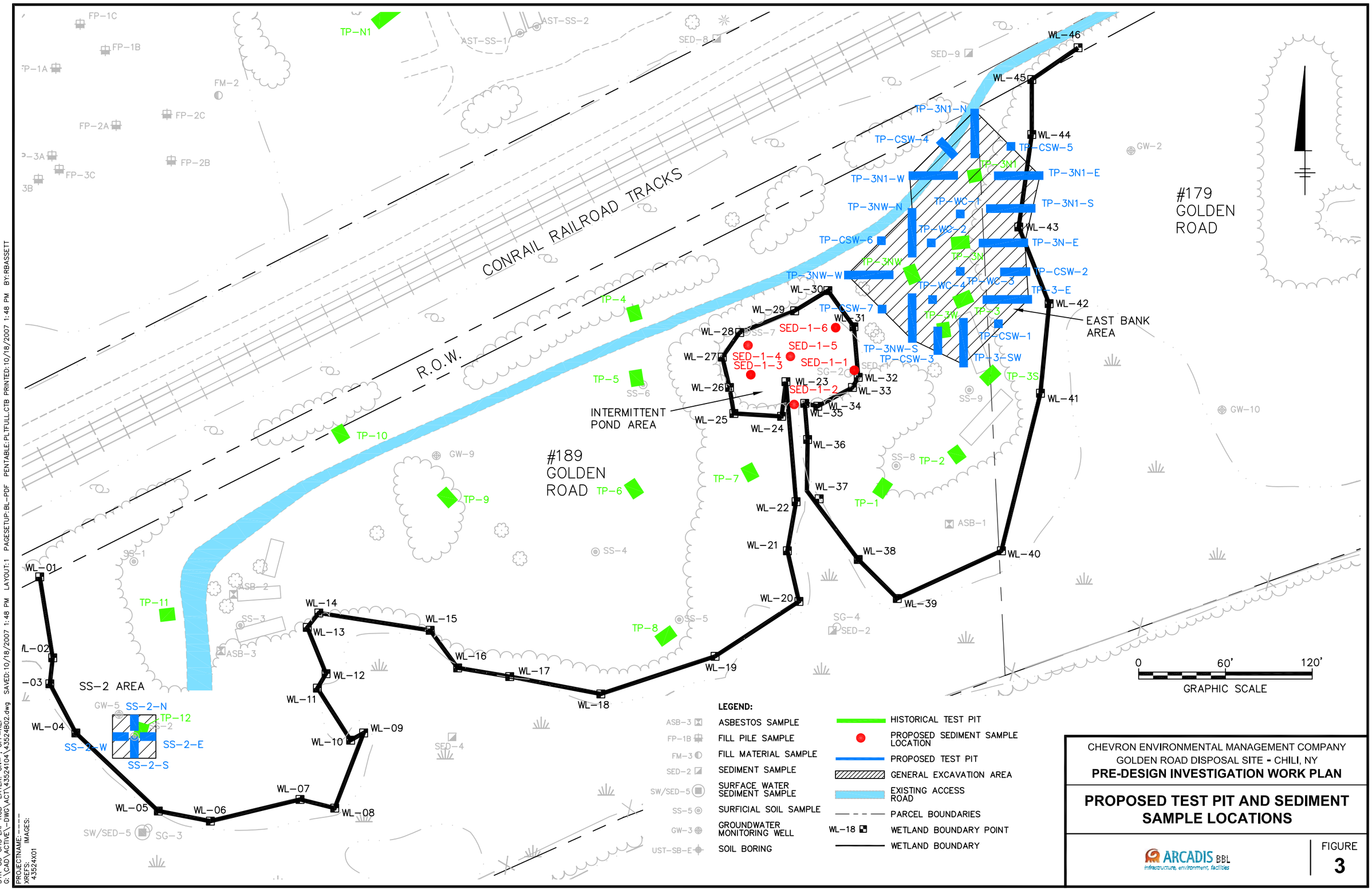

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
GOLDEN ROAD DISPOSAL SITE - CHILI, NY
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED TEST PIT AND SEDIMENT SAMPLE LOCATIONS

ARCADIS BBL
infrastructure, environment, facilities

FIGURE
3

SYR-85-GHS LAF RCB LAYER: ON=*;OFF=REF*
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PROJECTNAME:----
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ARCADIS BBL

Appendix A

Field Sampling Plan

ARCADIS BBL
Infrastructure, environment, facilities

Imagine the result

Chevron Environmental Management Company

Field Sampling Plan

Golden Road Disposal Site
Site No. 8-28-021
Chili, New York

December 2007

Acronyms

CEMC	Chevron Environmental Management Company
FSP	*Field Sampling Plan*
HASP	*Health and Safety Plan*
NYSDEC	New York State Department of Environmental Conservation
PDI	pre-design investigation
QAPP	*Quality Assurance Project Plan*
RI	remedial investigation
ROD	Record of Decision
VOC	volatile organic compound

1. Introduction

This *Field Sampling Plan* (FSP) has been prepared for Chevron Environmental Management Company (CEMC) to provide guidance for implementation of sampling activities that may be utilized at the Golden Road Disposal Site located on Golden Road in the Town of Chili, New York (site) during site investigations.

2. Site Background

The site is located on Golden Road in the Town of Chili, New York. A site location map is included as Figure 1 of the *Pre-Design Investigation Work Plan* (PDI Work Plan). The site occupies approximately 7 acres of land adjacent to NYS Route 490, and it is currently an undeveloped former disposal site with no existing structures. It is bounded to the north by a railway system owned by CSX Transportation, Inc., to the south by NYS Route 490, to the east by a residential property and to the west by undeveloped land. The layout of the site is shown on Figure 2 of the PDI Work Plan.

The site was privately run by Howard Fitzsimmons Jr. from 1955 through 1976. During this time period, the site received a wide variety of wastes, including household refuse, metal slag, fly ash, foundry sand, scrap metal, empty artillery shell casings, drums, used aboveground storage tanks and junked vehicles. The site was reported to the New York State Department of Environmental Conservation (NYSDEC) on August 7, 1980. The NYSDEC and the Monroe County Health Department investigated the site as a result of complaints. The site was placed on the NYSDEC Inactive Hazardous Waste Registry on August 12, 1980. In 1985, the NYSDEC removed approximately 562 drums and containers and 75 cubic yards of contaminated soil and debris from the site as part of an emergency drum removal action. A remedial investigation (RI) (July to September 1999) and a feasibility study (December 2001) were completed by URS Corporation on behalf of the NYSDEC. The RI identified soil, sediment and groundwater impacts at the site. A Record of Decision (ROD) was prepared for the site by the NYSDEC in October 2002, which presents the selected remedy for the site. In October 2006, CEMC executed an Order on Consent with the NYSDEC to implement the ROD remedy for the site. Since that time, Chevron has completed several activities at the site in preparation for implementing the ROD remedy, including gaining formal access to the site and an adjacent property, delineating wetlands, investigating suspected asbestos-containing materials not identified in the RI, conducting surveying activities and planning out physical access to the site.

3. Sampling Objectives

The overall objectives of the sampling for the PDI are summarized below:

- Delineation of the horizontal and vertical extents of soils impacted with volatile organic compounds (VOCs) within the East Bank Area (see Figure 2 of the PDI Work Plan) and pentachlorophenol contamination in the SS-2 Area (see Figure 2 of the PDI Work Plan) that exceed applicable Recommended Soil Cleanup Objectives established in the Technical and Administrative Guidance Memorandum #4046 (NYSDEC, 1994).

- Delineation of the horizontal and vertical extents of waste materials buried within the East Bank Area.

- Collection and analysis of soil samples prior to excavation activities, which are required to confirm that the elements of the ROD remedy requiring soil excavation have been satisfied.

- Characterization of soils proposed to be excavated and the contents of a partially filled drum that will be disposed off site during implementation of the ROD remedy.

- Collection and analysis of sediment samples within the intermittent pond area (see Figure 2 of the PDI Work Plan) to provide data for the evaluation of the current ROD remedy element requiring that the intermittent pond area be filled in.

4. Sampling Information

Samples will be collected during implementation of the PDI at locations and frequencies detailed in the PDI Work Plan and in accordance with this FSP. The *Health and Safety Plan* (HASP) provides health and safety procedures that will be followed when conducting sampling activities. Quality control samples will be obtained in accordance with the *Quality Assurance Project Plan* (QAPP) for the PDI.

4.1 Soil and Waste Sampling

This protocol describes the procedures for the collection of representative soil samples as described in the PDI Work Plan.

4.1.1 Materials

The following materials, as required, shall be available during soil sampling:

- appropriate health and safety equipment, as specified in the HASP
- plastic sheeting or aluminum foil (for each sampling location)
- stainless steel bucket auger
- stainless steel or disposable spades, shovels, trowels and scoops
- appropriate soil sample containers
- appropriate transport containers (coolers) with ice and appropriate labeling, packing and shipping materials
- chain of custody forms
- indelible ink pens
- field logbook
- site map with soil sampling locations

4.1.2 Procedures

4.1.2.1 Preparation

Preparation for obtaining soil and waste samples will be conducted as follows:

1. Determine the extent of the sampling effort, the sampling methods to be employed and the types and amounts of equipment and supplies required.

2. Obtain necessary sampling and monitoring equipment.

3. Decontaminate or pre-clean equipment and confirm that it is in working order.

4. Prepare schedules and coordinate with staff, client and regulatory agencies, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the HASP.

6. Use stakes or flagging to identify and mark all sampling locations. If required, the proposed locations may be adjusted based on site access, property boundaries and surface obstructions.

7. Notify the local one-call system and appropriate facility personnel at the site as to the extent of any intrusive work to be conducted associated with the sampling activities. Follow up with all entities having underground utilities in or adjacent to the area(s) where intrusive work will be conducted to make sure that all utilities have been properly located and marked.

4.1.2.2 Sample Collection

Samples will be collected following the procedure presented below:

1. Identify the soil sampling location in the field logbook and determine the appropriate soil sample collection method (stainless steel hand auger or excavator bucket retrieval of soil). Also indicate the temperature, weather, date and personnel at the site. **All soil sampling will be performed using an excavator bucket. Samples will be collected directly from the excavator bucket. No entry into any excavation will be allowed.**

2. If samples are collected using a stainless steel hand auger, place the soil sample directly into the appropriate sample container(s). If delineation and

documentation soil is retrieved using an excavator, the appropriate post-excavation soil samples will be collected using pre-cleaned or disposable, stainless steel scoop, plastic spoon or trowel and placed into appropriate sample container(s).

3. Decontaminate augers and sampling equipment and remove and contain disposable sampling equipment prior to collecting other samples.

4. Place excess soil in the soil excavation as close as practicable to its place of origin.

4.1.3 Decontamination

Any nondisposable sampling equipment used during sample collection that makes contact with the samples must be decontaminated in accordance with the procedures listed in Section 5 – Sampling Equipment Decontamination and Cleaning Procedures.

4.1.4 Disposal Methods

All waste materials generated during cleaning procedures will be properly managed and disposed off site.

4.2 Sediment Sampling

This protocol describes the procedures for the collection of representative sediment samples as described in the PDI Work Plan. Lexan® tubing will be the primary method used to collect sediment cores. The core will be inserted with a straight, vertical entry into the sediments so as to secure a reliably representative cross-section sample.

4.2.1 Materials

The following materials will be available, as required, during sediment sampling activities:

- health and safety equipment, as required by the HASP
- cleaning equipment
- boat
- Teflon® sheet or stainless steel tray

- duct tape
- Lexan® tubing with end caps
- brass push rod
- graduated rod for sediment depth measurement
- hacksaw
- vacuum pump
- endcap with appropriate fitting for vacuum pump attachment
- Teflon® tubing
- 6-foot rule or survey rod
- transport container with ice or “blue” ice
- appropriate sample containers and forms
- field logbook

4.2.2 Procedures

4.2.2.1 Preparation

Preparation for obtaining sediment samples will be conducted as follows:

1. Determine the extent of the sampling effort, the sampling methods to be employed and the types and amounts of equipment and supplies required.
2. Obtain necessary sampling and monitoring equipment.
3. Decontaminate or pre-clean equipment and confirm that it is in working order.
4. Prepare schedules and coordinate with staff, client and regulatory agencies, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the HASP.

6. Use stakes or flagging to identify and mark all sampling locations. If required, the proposed locations may be adjusted based on site access, property boundaries and surface obstructions.

4.2.2.2 Sample Collection

Samples will be collected following the procedures presented below:

1. Identify the proposed sample location on a sampling log sheet and/or field logbook, as well as with other appropriate information collected during sediment sampling activities.

2. Don personal protective equipment, as required by the HASP.

3. At each sample location, lower a section of Lexan® tube until it just reaches the top of sediment. Measure the depth of water. (Sections of Lexan® tube may need to be spliced together in deep water locations.)

4. Push the Lexan® tube into the sediment by hand until refusal. Measure the depth of sediment. If a procedure is being performed to determine sediment depth, a calibrated rod may be used in place of the Lexan® tube. If a procedure is being performed to collect samples for laboratory analysis, continue with Step 5.

5. Drive the tube several more inches using a stainless steel core driver block and measure the distance. This procedure is performed to obtain a “plug” at the bottom of the core and prevent the loose sediment from escaping.

6. Place a vacuum pump on the top end of the Lexan® tube (using a modified endcap with a fitting for attachment of the vacuum pump) and create a vacuum to prevent the sediments/plug from escaping. The vacuum is applied to the water column on top of the sediment core and does not directly affect the sediment sample to minimize the potential loss of VOCs. In addition, when VOC samples are to be collected, the application time and magnitude of the vacuum will be minimized to the extent practical.

7. Slowly pull the tube from the sediment, twisting it slightly as it is removed (if necessary).

8. Before the tube is fully removed from the water, place a cap on the bottom end of the tube while it is still submerged.

9. Keeping the tube upright, wipe the bottom end dry, seal the cap with duct tape and label. Measure the length of sediment recovered and evaluate the integrity of the core. If the core is not suitably intact, repeat coring procedure within 5 to 10 feet of the first location attempted.

10. Transport the core sample to the shore.

11. While still keeping the core upright, use a hacksaw to make a horizontal cut in the tube approximately 1 inch above the sediment. After cutting, carefully pour off any excess standing water.

12. Re-cap the cut end of the tube, seal the cap with duct tape and mark this end as “top.”

13. Wipe the tube dry.

14. Place a sample label on the tube.

15. Record the following information on both the tube and the cap: 1) sample number, 2) sampling date and 3) sampling time.

16. Place the core sample upright in a container on ice.

17. Repeat the above procedures until all core samples are collected (for the sampling event or the sampling day).

18. Sediment cores will be extruded from the Lexan® tubing onto a Teflon® sheet or stainless steel tray. Describe and record sample description. After extrusion, scrape the top of the core with a decontaminated stainless steel spatula to remove any Lexan® saw chips that may have accumulated during the tubing cutting procedure.

19. Cores will be sectioned into depth-proportioned increments as specified in the project-specific work plan. If sampling for VOCs, the core section will be placed immediately into the sample jar (without compositing) following extrusion from the Lexan® tubing.

20. Core sections may be frozen to facilitate sectioning when sediment is extremely loose.

21. The saw or knife used to section the core should be cleaned between each

cut.

22. Prepare equipment blank samples at the frequency specified in the QAPP by collecting distilled/deionized water that has been used to rinse the hacksaw and a representative section of the Lexan® tubing.

23. Label all sample containers with: 1) site, 2) project number, 3) location number, 4) sample interval, 5) date, 6) time of core collection and 7) names of sampling personnel.

24. Handle, pack and ship the samples in accordance with the procedures in the QAPP.

25. Record all appropriate information in the field logbook and sampling log form(s).

26. Return the remaining sediment to their place of origin or contain it.

4.2.3 Decontamination

Any nondisposable sampling equipment used during sample collection that makes contact with the samples must be decontaminated in accordance with the procedures listed in Section 5 – Sampling Equipment Decontamination and Cleaning Procedures.

4.2.4 Disposal Methods

All waste materials generated during cleaning procedures will be properly managed and disposed off site.

5. Sampling Equipment Decontamination and Cleaning Procedures

This section presents procedures that will be used to decontaminate equipment used to collect soil and sediment samples. The adequacy of cleaning procedures will be monitored through the collection of quality assurance/quality control rinse blank samples, as necessary, that will be submitted for laboratory analysis.

5.1 Sampling Equipment Decontamination

Whenever possible, disposable sampling equipment (i.e., disposable sample spoons) will be used. Equipment that is not disposable will be decontaminated prior to each use to mitigate the potential for cross-contamination of the samples collected for laboratory analysis. The decontamination steps to be used on nondisposable sampling equipment during the investigation are presented below.

5.2 Organic and Inorganic Sampling

1. Alconox® (or equivalent) detergent solution wash
2. tap water rinse
3. distilled water rinse
4. allow to air-dry
5. wrap in aluminum foil for storage or transport if it is not going to be used immediately

5.3 Disposal Methods

All waste materials generated during decontamination and cleaning procedures will be collected and contained on site for future off-site disposal.

6. Sample Handling, Packaging and Shipping Procedures

The handling, packaging and shipping of samples collected during implementation of the PDI will follow procedures detailed in the QAPP.

7. Air Monitoring

Air monitoring will be conducted during sampling activities in accordance with the HASP and QAPP, and will include work zone, upwind and downwind air monitoring. Field screening of soils for the presence of VOCs will also be conducted, where applicable.

ARCADIS BBL

Appendix B

Quality Assurance Project Plan

ARCADIS BBL
Infrastructure, environment, facilities

Imagine the result

Chevron Environmental Management Company

Quality Assurance Project Plan

Golden Road Disposal Site
Site No. 8-28.021
Chili, New York

December 2007

Table of Contents

Signature Page

SUPPLEMENTAL SUBSURFACE INVESTIGATION

QUALITY ASSURANCE PROJECT PLAN

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Approved: Tony Boyle

Project Manager
(Analytical Laboratory)

Approved: Neil D. Preston

Quality Assurance Manager
(Analytical Laboratory)

Approved:

_____

Project Manager
(Analytical Laboratory)

Approved:

_____

Quality Assurance Manager
(Analytical Laboratory)

Approved:

_____

Project Manager
New York State Department of Environmental Conservation

Approved:

_____

Quality Assurance Manager
New York State Department of Environmental Conservation

Preface

This *Quality Assurance Project Plan* (QAPP) was prepared for the Golden Road Disposal Site located in Chili, New York (site). It supplements the *Pre-Design Investigation Work Plan* (PDI Work Plan; ARCADIS of New York, Inc.) and presents the sampling and analytical methods and procedures that will be used during the PDI at the site. Together, this QAPP and the *Field Sampling Plan* constitute the *Sampling and Analysis Plan* for the site.

This QAPP was prepared in a manner consistent with the following reference and guidance documents:

- United States Environmental Protection Agency (USEPA) guidance document entitled *EPA Requirements for Quality Assurance Project Plans for Environmental Operations*, EPA-QA/R-5 (USEPA, 2001), which replaces QAMS-005/80, *Interim Guidance and Specifications for Preparing Quality Assurance Project Plans* (USEPA, 1980)

- USEPA *Guidance for Quality Assurance Project Plans* (USEPA, 2002b)

- The *NEIC Policies and Procedures Manual* (USEPA, 1991).

Information contained in this QAPP has been organized into the following sections:

Section	Content
Project Management	
1	Project Organization
2	Project Background
3	Project Description
4	Quality Objectives and Criteria for Measurement Data
5	Special Training Requirements/Certification
6	Documentation and Records
Measurement/Data Acquisition	
7	Sampling Process Design
8	Sampling Method Requirements
9	Sample Handling and Custody Requirements
10	Analytical Method Requirements
11	Quality Control Requirements
12	Instrument/Equipment Testing, Inspection and Maintenance Requirements
13	Instrument Calibration and Frequency
14	Inspection/Acceptance Requirements for Supplies and Consumables

Section	Content
15	Data Acquisition Requirements for Non-Direct Measurements
16	Data Management
Assessment/Oversight	
17	Assessment and Response Actions
18	Reports to Management
Data Validation and Usability	
19	Data Reduction and Review
20	Data Validation and Verification
21	Reconciliation with User Requirements

Details on each of the subjects listed above are provided in the subsequent sections.

Acronyms

ARCADIS BBL	ARCADIS of New York, Inc.
ASP	Analytical Services Protocol
CEMC	Chevron Environmental Management Company
CLP	Contract Laboratory Program
COC	chain of custody
DQOs	data quality objectives
EDD	Electronic Data Deliverable
FSP	Field Sampling Plan
GC/MS	gas chromatography/mass spectrometry
GIS	Geographic Information System
MS	matrix spike
MSD	matrix spike duplicate
NYSDEC	New York State Department of Environmental Conservation
OSHA	Occupational Safety and Health Administration
PDI	pre-design investigation
QAC	Quality Assurance Coordinator
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
RD/RA	remedial design/remedial action

RI	remedial investigation
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SDG	sample delivery group
SOP	Standard Operating Procedure
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
SVOC	semivolatile organic compound

1. Project Organization

1.1 Project Organization

Investigations performed as part of the pre-design investigation (PDI) and detailed in the *Sampling and Analysis Plan* (SAP) for the Golden Road Disposal Site, located in Chili, New York (site), will require integration of personnel from the organizations identified below, collectively referred to as the "project team." A detailed description of the responsibilities of each member of the project team is presented below.

1.1.1 Overall Project Management

On behalf of Chevron Environmental Management Company (CEMC), ARCADIS of New York, Inc. (ARCADIS BBL) has overall responsibility for the PDI activities. ARCADIS BBL personnel will perform related sampling activities, evaluate data and prepare the deliverables, as specified in the PDI Work Plan. Project direction will be provided by CEMC, with oversight by the New York State Department of Environmental Conservation (NYSDEC). A list of key project management personnel is provided below.

Company/Organization	Title	Name	Phone Number
NYSDEC	Project Manager	James A. Moras, P.E.	518.402.9812
	Quality Assurance Manager	TBD	TBD
CEMC	Project Manager	Caryl Weekley	925.842.1343
ARCADIS BBL	Project Officer	Joseph Molina III, , P.E.	585.385.0090
	Project Manager	William T. McCune, P.G.	315.671.9172
	Field Manager	David R. Kingsley	585.385.0090
	Quality Assurance Coordinator	Dennis K. Capria	315.671.9299
Laboratory: TestAmerica (Amherst, New York)	Project Manager	Candace Fox	716.691.2600
	Quality Assurance Manager	Verl Preston	716.691.2600

1.1.2 Task Managers

The staff performing the investigations and site activities will be directed by representatives of the project team. The personnel responsible for each of the site activities are listed below.

Company/Organization	Title	Name	Phone Number
ARCADIS BBL	Field Task Manager	David R. Kingsley	585.385.0090
	Survey Task Manager	TBD	TBD
	Health and Safety Officer	Chuck Webster	315.671.9297
	Database Administrator	John Garrett	315.671.9642
	Data Validator	Dennis K. Capria	315.671.9299

1.2 Team Member Responsibilities

The responsibilities of the various team members are summarized below by organization.

1.2.1 Chevron Environmental Management Company

Project Manager

Responsibilities and duties include:

- providing overall direction of site actions
- directing ARCADIS BBL personnel
- reviewing ARCADIS BBL work products, including data, memoranda, letters, reports and all other documents transmitted to the NYSDEC

1.2.2 ARCADIS BBL

Project Officer

Responsibilities and duties include:

- overseeing ARCADIS BBL work products
- providing ARCADIS BBL approval for major project deliverables

Project Manager

Responsibilities and duties include:

- managing and coordinating the project, as defined in the PDI Work Plan, with an emphasis on adhering to the objectives of the site activities
- reviewing documents prepared by ARCADIS BBL
- confirming that corrective actions are taken for deficiencies cited during any audits of site activities

Task Managers

The PDI, as detailed in the PDI Work Plan, will be managed by various Task Managers, as set forth in Section 1.1.2. Duties of each Task Manager include, as appropriate:

- managing relevant day-to-day activities
- developing, establishing and maintaining files on relevant site activities
- reviewing data reductions from the relevant site activities
- performing final data review of field data reductions and reports on relevant site activities
- confirming that corrective actions are taken for deficiencies cited during audits of relevant site activities
- performing overall quality assurance/quality control (QA/QC) of the relevant portions of the site activities
- reviewing relevant field records and logs
- instructing personnel working on relevant site activities
- coordinating field and laboratory schedules pertaining to relevant site activities
- requesting sample bottles from the laboratory
- reviewing field instrumentation, maintenance and calibration to meet quality objectives

- preparing reports pertaining to relevant site activities
- maintaining field and laboratory files of notebooks/logs, data reductions and calculations, and transmit originals to the Project Manager

Field Personnel

Responsibilities and duties include:

- performing field procedures associated with the PDI as set forth in the PDI Work Plan
- performing field analyses and collect QA samples
- calibrating, operating and maintaining field equipment
- reducing field data
- maintaining sample custody
- preparing field records and logs

Quality Assurance Coordinator

Responsibilities and duties include:

- reviewing laboratory data packages
- overseeing and interfacing with the analytical laboratory
- coordinating field QA/QC procedures with Task Managers (including audits of field activities), concentrating on field analytical measurements and practices to meet data quality objectives (DQOs)
- reviewing field reports
- performing and reviewing audit reports
- preparing interim QA/QC compliance reports

- preparing a QA/QC Report in accordance with United States Environmental Protection (USEPA) Region II guidelines, which includes an evaluation of field and laboratory data and data usability reports

1.2.3 Analytical Laboratories

General responsibilities and duties of the analytical laboratories include:

- performing sample analyses and associated laboratory QA/QC procedures
- supplying sampling containers and shipping cartons
- maintaining laboratory custody of sample
- strictly adhere to all protocols in this *Quality Assurance Project Plan* (QAPP)

Project Manager

Responsibilities and duties include:

- serving as the primary communication link between ARCADIS BBL and laboratory technical staff
- monitoring workloads and confirm availability of resources
- overseeing preparation of analytical reports
- supervising in-house chains of custody (COCs)

Quality Assurance Manager

Responsibilities and duties include:

- supervising personnel reviewing and inspecting all project-related laboratory activities
- conducting audits of all laboratory activities

1.2.4 New York State Department of Environmental Management

Project Manager

Responsibilities and duties include:

- providing the NYSDEC with review and approval of the PDI Work Plan, supporting documents and future deliverables
- monitoring progress of site activities

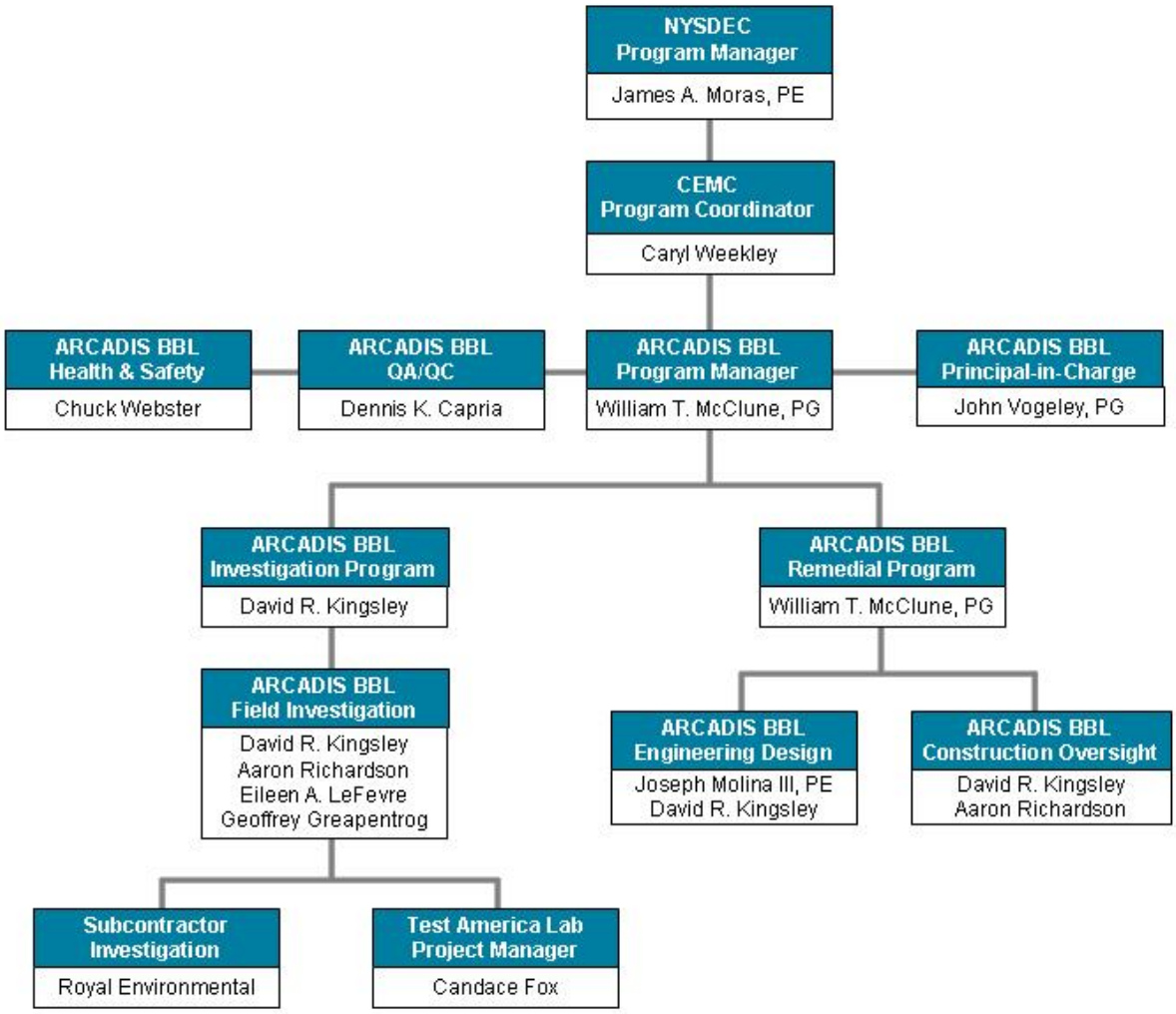
Quality Assurance Manager

Responsibilities and duties include:

- reviewing and approval of this QAPP
- review of the QA/QC portion of any submitted report
- monitoring progress of the PDI
- confirming that all activities are performed in compliance with applicable federal, state and regional requirements
- perform field and laboratory audits, if necessary

1.2.5 Project Organization Chart

The project organization chart is presented below. The end data users for the project, as indicated in the organization chart, include the NYSDEC and CEMC.


NYSDEC
Program Manager
James A. Moras, PE
CEMC
Program Coordinator
Caryl Weekley
ARCADIS BBL
Health & Safety
Chuck Webster
ARCADIS BBL
QA/QC
Dennis K. Capria
ARCADIS BBL
Program Manager
William T. McClune, PG
ARCADIS BBL
Principal-in-Charge
John Vogeley, PG
ARCADIS BBL
Investigation Program
David R. Kingsley
ARCADIS BBL
Remedial Program
William T. McClune, PG
ARCADIS BBL
Field Investigation
David R. Kingsley
Aaron Richardson
Eileen A. LeFevre
Geoffrey Greapentrog
ARCADIS BBL
Engineering Design
Joseph Molina III, PE
David R. Kingsley
ARCADIS BBL
Construction Oversight
David R. Kingsley
Aaron Richardson
Subcontractor
Investigation
Royal Environmental
Test America Lab
Project Manager
Candace Fox

2. Project Background

2.1 Site Location and Description

The site is located in the Town of Chili, in Monroe County, New York. A site location map is included as Figure 1 of the PDI Work Plan. The site occupies approximately 7 acres of land adjacent to NYS Route 490. The site currently is an undeveloped former disposal site with no existing structures. The site is presently bounded to the north by a railway system owned by CSX Transportation, Inc., to the south by NYS Route 490, to the east by a residential property and to the west by undeveloped land. The layout of the site is shown on Figure 2 of the PDI Work Plan.

2.2 Site History and Summary of Activities

The site was privately run by Howard Fitzsimmons Jr. from 1955 through 1976. During this time period, the site received a wide variety of wastes, including household refuse, metal slag, fly ash, foundry sand, scrap metal, empty artillery shell casings, drums, used aboveground storage tanks and junked vehicles. The site was reported to the NYSDEC on August 7, 1980. The NYSDEC and the Monroe County Health Department investigated the site as a result of complaints. The site was placed on the NYSDEC Inactive Hazardous Waste Registry on August 12, 1980. In 1985, the NYSDEC removed approximately 562 drums and containers and 75 cubic yards of contaminated soil and debris from the site as part of an emergency drum removal action. A remedial investigation (RI) (July to September 1999) and a feasibility study (December 2001) were completed by URS Corporation on behalf of the NYSDEC. The RI identified soil, sediment and groundwater impacts at the site. A Record of Decision (ROD) was prepared by the NYSDEC in October 2002.

2.3 Current Status

CEMC will be preparing a Remedial Design/Remedial Action Work Plan (RD/RA Work Plan) for submission to the NYSDEC. In order to complete the RD/RA Work Plan, CEMC is proposing to conduct a PDI at the site to obtain necessary data.

3. Project Description

This section presents a description of the investigation activities to be conducted in accordance with the QAPP during the PDI. Sampling activities associated with the PDI that will be conducted in accordance with the QAPP include:

- delineation and pre-excavation confirmatory soil sampling
- intermittent pond sediment sampling

Sampling protocols to be followed during the investigation activities are detailed in the SAP. Samples collected during the investigation will be analyzed in accordance with USEPA SW-846 Test Methods for Evaluating Solid Waste and NYSDEC Analytical Services Protocol (ASP), Revision 2005. Table 2 presents a list of the constituents that will be analyzed for samples collected as part of the PDI. Health and safety protocols to be followed by field personnel during completion of the investigation activities are discussed in the *Health and Safety Plan*.

A brief description of the objectives for each task associated with the PDI is presented below. A more detailed description can be found in the associated PDI Work Plan.

3.1 Delineation and Pre-Excavation Confirmatory Soil Sampling

The objectives of the delineation and pre-excavation confirmatory soil sampling activities are:

- Delineation of the horizontal and vertical extents of soils impacted with volatile organic compounds (VOCs) within the East Bank Area (Figure 2 of the PDI Work Plan) and pentachlorophenol contamination in the SS-2 Area (Figure 2 of the PDI Work Plan) that exceed applicable Recommended Soil Cleanup Objectives established in the Technical and Administrative Guidance Memorandum #4046 (NYSDEC, January 24, 1994).
- Delineation of the horizontal and vertical extents of waste materials buried within the East Bank Area.
- Collection and analysis of confirmatory soil samples prior to excavation activities, such that no post-excavation confirmatory soil samples will be necessary upon completion of excavation activities.

- Characterization of soils proposed to be excavated and the contents of a partially filled drum that will be disposed off site during implementation of the ROD remedy.

The characterization sampling is being conducted to satisfy disposal facility approval requirements, and therefore, it will not necessarily be completed in accordance with this QAPP.

3.2 Intermittent Pond Sediment Sampling

The objective of the intermittent pond sediment sampling activities is for the collection and analysis of sediment samples within the intermittent pond area to provide data for the evaluation of the current ROD remedy element, requiring that the intermittent pond area be filled in.

3.3 Approach

The PDI will be conducted, such that all sampling data necessary to satisfy the objectives of the PDI will be collected during a single mobilization to the site. An expedited turnaround time for analytical results will be requested and utilized to allow the PDI to proceed with sampling activities based on the analytical results received. Delineation and pre-excavation confirmatory soil samples and sediment samples collected during the PDI will be analyzed in accordance with the methods presented in this QAPP.

3.4 Project Schedule

The PDI will begin within a reasonable timeframe subsequent to acceptance of the QAPP and PDI Work Plan by the NYSDEC. The project schedule will take into account possible weather-related issues that could affect the PDI.

4. Quality Objectives and Criteria for Measurement Data

The DQO process, as described in the USEPA QA/G-4 QAPP instructions document, is intended to provide a "logical framework" for planning field investigations. The following section addresses, in turn, each of the seven sequential steps in the USEPA QA/G-4 QAPP DQO process.

Step 1: Problem Statement

The PDI will be conducted at the site to delineate impacts to soils exceeding site cleanup objectives, obtain pre-excavation confirmatory soil samples to establish the limits of the proposed excavation areas at the site and to obtain sediment quality data from the intermittent pond.

Step 2: Identify the Goal of the Study

The initial use of the data is descriptive (distribution and concentration) and there is no decision point for this descriptive application. Subsequent to review of the descriptive information, an exposure evaluation will be performed based on the findings of the site investigation. The decision in this case is to determine the potential presence and significance of complete exposure pathways based on the distribution and concentrations of constituents of concern present at the site.

Step 3: Identify Information Inputs

Decision inputs incorporate both concentration and distribution of constitutes of concern in site media. A fundamental basis for decision making is that a sufficient number of data points of acceptable quality are available from the investigation to support the decision. Thus, the necessary inputs for the decision are: 1) the proportion of non-rejected (usable) data points and 2) the quantity of data needed to evaluate whether there are unacceptable risks to human health and the environment at the site.

The data will be evaluated for completeness, general conformance with requirements of this QAPP and consistency among data sets and with historical data, as appropriate.

Step 4: Define the Boundaries of the Study

The site includes the area within the Town of Chili, New York bounded by a railroad track to the north, NYS Route 490 to the south, undeveloped land to the west and a residential lot to the east. Previous site investigations have provided information to establish the study boundaries.

Step 5: Develop the Analytical Approach

The decision on whether data can be used in the soil delineation and pre-excavation confirmation and sediment quality evaluation will be based on the validation results. Following validation, the data will be flagged, as appropriate, and any use restrictions noted. The SAP has been devised so that the loss of any single data point will not hinder description of the distribution of constitutes of concern or the development of a risk assessment. Given this, a reasonable decision rule would be that 90 percent of the data points not be rejected and deemed unusable for exposure evaluation purposes. Applicable actions would be evaluated, if needed, based on the results of the exposure evaluation.

Step 6: Specify Performance or Acceptance Criteria

Specifications for this step call for: 1) giving forethought to corrective actions to improve data usability and 2) understanding the representative nature of the sampling design. This QAPP has been designed to meet both specifications for this step. The sampling and analysis program has been developed based on a review of previous site data and knowledge of present site conditions. Corrective actions are described elsewhere in the document and in the appended documents. The representative nature of the sampling design has been assured by discussions among professionals familiar with the site and the appropriate government agencies.

Step 7: Develop the Plan for Obtaining Data

The overall QA objective is to develop and implement procedures for field sampling, COC, laboratory analysis and reporting that will provide results to support the evaluation of site data consistent with National Contingency Plan requirements. Specific procedures for sampling, COC, laboratory instrument calibration, laboratory analysis, data reporting, internal quality control, audits, preventive maintenance of field equipment and corrective action are described in other sections of this QAPP.

The SAP involves a phased approach to both sampling and analysis. This provides the opportunity to evaluate and focus each data collection step to optimize the overall data collection process.

A DQO summary for the sampling investigation efforts is presented in the subsequent section. The summary consists of stated DQOs relative to data uses, data types, data quantity, sampling and analytical methods and data measurement performance criteria.

4.1 Data Categories

Three data categories have been defined to address various analytical data uses and the associated QA/QC effort and methods required to achieve the desired levels of quality. These categories are:

- Screening Data: Screening data affords a quick assessment of site characteristics or conditions. This DQO is applicable to data collection activities that involve rapid, non-rigorous methods of analysis and QA. This objective is generally applied to physical and/or chemical properties of samples, degree of contamination relative to concentration differences and preliminary health and safety assessment.

- Screening Data with Definitive Confirmation: Screening data allows rapid identification and quantitation, although the quantitation can be relatively imprecise. This DQO is available for data collection activities that require qualitative and/or quantitative verification of a select portion of sample findings (10 percent or more). This objective can also be used to verify less rigorous laboratory-based methods.

- Definitive Data: Definitive data are generated using analytical methods, such as approved USEPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files.

For this project, three levels of data reporting have been defined. These are as follows:

- Level 1 – Minimal Reporting: Minimal or “results only” reporting is used for analyses that, either due to their nature (i.e., field monitoring) or the intended

data use (i.e., preliminary screening), do not generate or require extensive supporting documentation.

- Level 2 – Modified Reporting: Modified reporting is used for analyses that are performed following standard USEPA-approved methods and QA/QC protocols and that, based on the intended data use, require some supporting documentation but not, however, full "CLP-type" reporting.

- Level 3 – Full Reporting: Full "CLP-type" reporting is used for those analyses that, based on intended data use, require full documentation. This reporting level would include ASP Superfund and Category B reporting.

The analytical methods to be used during the PDI will be USEPA SW-846 Methods with NYSDEC ASP Revision 2005, QA/QC requirement and Category B reporting deliverables.

4.2 Field Investigations

As part of the PDI, field investigations will be conducted to support the DQOs. Details of the field sampling investigations are described in the PDI Work Plan.

5. Special Training Requirements/Certification

In compliance with the Occupational Safety and Health Administration's (OSHA's) final rule *Hazardous Waste Operations and Emergency Response*, 29 Code of Federal Regulations §1910.120(e), all personnel performing PDI activities at the site will have completed the requirements for OSHA 40-Hour Hazardous Waste Operations and Emergency Response training. Persons in field supervisory positions will have also completed the additional OSHA 8-Hour Supervisory Training.

6. Documentation and Records

6.1 General

Samples of the various media will be collected as described in the PDI Work Plan. Detailed descriptions of the documentation and reporting requirements are presented below.

6.2 Sample Designation System

6.2.1 Sample Codes

Samples will be identified with a unique designation system that will facilitate sample tracking. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events and conditions. An alpha-numeric system is considered appropriate and will be used by field personnel to assign each sample with a unique sample identification number. The sample identification number will begin with the historical sample identification number that is proximal to the sample location, followed by letters indicating the sample type and a single digit indicating the sequential sample number collected from the location.

The samples types will be designated using the following codes:

- Bottom Soil Sample – “BS”
- Sidewall Soil Sample – “SW”
- Sediment Sample – “SED”
- Trip Blank – “TB”
- Equipment Blank – “EB”

The single-digit sample number beginning with “1” will be assigned in the field and incremented by one as samples are collected from one to the next.

- Where necessary, the code system will be supplemented to accommodate additional sample identification information. For example, the code for soil and

sediment samples will include a qualifier to identify the section increment (e.g., 0 to 0.5 feet).

Additional sample volumes collected for matrix spike (MS) and matrix spike duplicate (MSD) analysis will be noted on the COC forms, and the associated additional sample containers will be labeled with the appropriate suffix (MS or MSD). Rinse blanks will use the same coding scheme noted above, substituting the location code with the prefix "RB" (e.g., the first rinse blank associated with sediment collection would be named RBSED1). Field duplicates will be labeled as ordinary field samples with a unique identification number (e.g., the first field duplicate associated with sediment collection would be named DUPSED1). Duplicate samples will not be identified and the laboratory will analyze them as "blind" QC samples.

6.2.2 Field Documentation

Field personnel will provide comprehensive documentation covering all aspects of field sampling, field analysis and sample COC. This documentation constitutes a record that allows reconstruction of all field events to aid in the data review and interpretation process. All documents, records and information relating to the performance of the field work will be retained in the project file.

The various forms of documentation to be maintained throughout the action include:

- Daily Production Documentation: A field notebook consisting of a waterproof, bound notebook that will contain a record of all activities performed at the site.

- Sampling Information: Detailed notes will be made as to the exact sampling location, physical observations and weather conditions (as appropriate).

- Sample COC: COC forms will provide the record of responsibility for sample collection, transport and submittal to the laboratory. COC forms will be filled out at each sampling site, at a group of sampling sites or at the end of each day of sampling by ARCADIS BBL's field personnel designated to be responsible for sample custody. In the event the samples are relinquished by the designated sampling person to other sampling or field personnel, the COC form will be signed and dated by the appropriate personnel to document the sample transfer. The original COC form will accompany the samples to the laboratory, and copies will be forwarded to the project files. A sample COC form is included in Appendix A.

Persons will have custody of samples when the samples are in their physical possession, in their view after being in their possession or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

- Field Equipment, Calibration and Maintenance Logs: To document the calibration and maintenance of field instrumentation, calibration and maintenance logs will be maintained for each piece of field equipment that is not factory-calibrated.

6.3 Laboratory Documentation Files

6.3.1 Laboratory Project Files

The laboratory will establish a file for all pertinent data. The file will include all correspondence, faxed information, phone logs and COC forms. The laboratory will retain all project files and data packages for a period of 5 years.

6.3.2 Laboratory Logbooks

Workbooks, bench sheets, instrument logbooks and instrument printouts will be used to trace the history of samples through the analytical process and document important aspects of the work, including the associated QCs. As such, logbooks, bench sheets, instrument logs and instrument printouts will be part of the permanent record of the laboratory.

Each page or entry will be dated and initialed by the analyst at the time of entry. Errors in entry will be crossed out in indelible ink with a single stroke, corrected without the use of white-out or by obliterating or writing directly over the erroneous entry and initialed and dated by the individual making the correction. Pages of logbooks that are not used will be completed by lining out unused portions.

Information regarding the sample, analytical procedures performed and the results of the testing will be recorded on laboratory forms or personal notebook pages by the analyst. These notes will be dated and will also identify the analyst, the instrument used and the instrument conditions.

Laboratory notebooks will be periodically reviewed by the laboratory group leaders for accuracy, completeness and compliance to this QAPP. All entries and calculations will be verified by the laboratory group leader. If all entries on the pages are correct, then the laboratory group leader will initial and date the pages. Corrective action will be taken for incorrect entries before the laboratory group leader signs.

6.3.3 Computer Tape and Hard Copy Storage

All electronic files and deliverables will be retained by the laboratory for not less than 5 years; hard copy data packages (or electronic copies) will also be retained for not less than 5 years.

6.4 Data Reporting Requirements

Data will be reported both in the field and by the analytical laboratory, as described below.

6.4.1 Field Data Reporting

Information collected in the field through visual observation, manual measurement and/or field instrumentation will be recorded in field notebooks or data sheets and/or on forms. Such data will be reviewed by the appropriate Task Manager for adherence to the *Field Sampling Plan* (FSP) and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible and, as necessary, incorporated into the data evaluation process.

If applicable, field data forms and calculations will be processed and included in appendices to the appropriate reports (when generated). The original field logs, documents and data reductions will be kept in the project file at the ARCADIS BBL office in Fairport, New York.

6.4.2 Laboratory Data Reporting

The laboratory is responsible for preparing ASP Category B data packages for all VOC, semivolatile organic compounds (SVOC), inorganics and total organic carbon (TOC) data and reduced data packages and case narratives for all other analyses.

All data reports for all parameters will include, at a minimum, the following items:

Narrative: Summary of activities that took place during the course of sample analysis, including the following information:

- laboratory name and address
- date of sample receipt
- cross reference of laboratory identification number to contractor sample identification
- analytical methods used
- deviations from specified protocol
- corrective actions taken

Included with the narrative will be any sample handling documents, including field and internal COC forms, air bills and shipping tags.

Analytical Results: Reported according to analysis type, including the following information, as acceptable:

- sample ID
- laboratory ID
- date of collection
- date of receipt
- date of extraction
- date of analysis
- detection limits

Sample results on the report forms will be collected for dilutions. Soil samples will be reported on a dry weight basis. Unless otherwise specified, results will be reported uncorrected for blank contamination.

The data for VOCs, SVOCs, inorganics and TOC analyses will be expanded to include all supporting documentation necessary to provide a Category B package. This additional documentation will include, but is not limited to, all raw data required to recalculate any result, including printouts, chromatograms and quantitation reports. The report will also include standards used in calibration and calculation of analytical results; sample extraction, digestion, and other preparation logs; standard preparation logs; instrument run logs; and moisture content calculations.

6.5 Project File

Project documentation will be placed in project files according to ARCADIS BBL requirements identified in the corporate quality procedure (QP 1.02) for document management. Project files typically consist of the following components:

1. Agreements/Proposals (filed chronologically)
2. Change Orders/Purchase Orders (filed chronologically)
3. Invoices (filed chronologically)
4. Project Management (filed by topic)
5. Correspondence (filed chronologically)
6. Notes and Data (filed by topic)
7. Public Relations Information (filed by topic)
8. Regulatory Documents (filed chronologically)
9. Marketing Documents (filed chronologically)
10. Final Reports/Presentations (filed chronologically)
11. Draft Reports/Presentations (filed chronologically)
12. Documents Prepared by Others (filed chronologically)

Final reports (including QAPPs and QA Reports) are filed in a designated folder within the project file. Analytical laboratory documentation (when received) and field data will also be filed in a designated folder within the project file. Filed materials may be removed and signed out by authorized personnel on a temporary basis only.

7. Sampling Process Design

Information regarding the sampling design and rationale and associated sampling locations can be found in the PDI Work Plan.

8. Sampling Method Requirements

Soil and sediment samples will be collected as described in the PDI Work Plan and the FSP. The FSP also contains procedures that will be followed to decontaminant and clean sampling equipment and handle, package and ship collected samples.

9. Sample Handling and Custody Requirements

9.1 Sample Containers and Preservation

Appropriate sample containers, preservation methods and laboratory holding times for PDI samples are shown in Table 4.

The analytical laboratory will supply appropriate sample containers and preservatives, as necessary. The bottles will be purchased pre-cleaned according to the USEPA Office of Solid Waste and Emergency Response Directive 9240.05A requirements. The field personnel will be responsible for properly labeling containers and preserving samples (as appropriate). Sample labeling procedures are discussed in Section 9.2.2.

9.2 Field Custody Procedures

The objective of field sample custody is to confirm that samples are not tampered with from the time of sample collection through time of transport to the analytical laboratory. Persons will have "custody of samples" when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

Field custody documentation consists of both field logbooks and field COC forms.

9.2.1 Field Logbooks

Field logbooks will provide the means of recording data collecting activities performed. As such, entries will be described in as much detail as possible so that persons going to the site could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in a secure location when not in use. Each logbook will be identified by the project-specific document number. The title page of each logbook will contain the following:

- person to whom the logbook is assigned
- logbook number

- project name
- project start date
- end date

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection being used and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigation team personnel and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. Entries will be made in ink, and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark. Whenever a sample is collected or a measurement is made, a detailed description of the location of the station shall be recorded. The number of the photographs taken of the station, if any, will also be noted. All equipment used to make measurements will be identified, as well as the date of calibration.

Samples will be collected following the sampling procedures documented in the FSP. The equipment used to collect samples will be noted, as well as with the time of sampling, sample description, depth at which the sample was collected, volume and number of containers. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description.

9.2.2 Sample Labeling

Preprinted sample labels will be affixed to sample bottles prior to delivery at the sampling site. The following information is required on each sample label:

- project
- date collected
- time collected
- location

- sampler
- analysis to be performed
- preservative
- sample number

9.2.3 Field Chain of Custody Forms

Completed COC forms will be required for all samples to be analyzed. COC forms will be initiated by the sampling crew in the field. The COC forms will contain the unique sample identification number, sample date and time, sample description, sample type, preservation (if any) and analyses required. The original COC form will accompany the samples to the laboratory. Copies of the COC will be made prior to shipment (or multiple copy forms used) for field documentation. The COC forms will remain with the samples at all times. The samples and signed COC forms will remain in the possession of the sampling crew until the samples are delivered to the express carrier (e.g., Federal Express) or hand delivered to a mobile or permanent laboratory or placed in secure storage.

Sample labels will be completed for each sample using waterproof ink. The labels will include sample information, such as sample number and location, type of sample, date and time of sampling, sampler's name or initials, preservation and analyses to be performed. The completed sample labels will be affixed to each sample bottle and covered with clear tape.

Whenever samples are split with a government agency or other party, a separate COC will be prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the facility or agency should request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, this is noted in the "Received By" space.

9.3 Management of Investigation-Derived Materials and Wastes

Management of investigation-derived materials and wastes will be performed consistent with the USEPA guidance *Guide to Management of Investigation-Derived Wastes,* 9345.3-03FS, dated January 1992. Disposable equipment (including personal protective equipment) and debris will be containerized and appropriately labeled during

the sampling events and will be disposed of accordingly. Equipment will be decontaminated, as appropriate, as discussed in the FSP. All wastes will be collected and temporally stored on site in 55-gallon drums, and disposed of properly following receipt of analytical results.

9.4 Packing, Handling and Shipping Requirements

Sample packaging and shipment procedures are designed to confirm that the samples will arrive at the laboratory, including the COC, intact.

Samples will be packaged for shipment as outlined below:

- Confirm that sample containers have the sample labels securely affixed to the container with clear packing tape.
- Check the caps on the sample containers to confirm that they are properly sealed.
- Wrap the sample container cap with clear packing tape to prevent it from becoming loose.
- Complete the COC form with the required sampling information and confirm that the recorded information matches the sample labels. NOTE: If the designated sampler relinquishes the samples to other sampling or field personnel for packing or other purposes, the sampler will complete the COC prior to this transfer. The appropriate personnel will sign and date the COC form to document the sample custody transfer.
- Using duct tape, secure the outside drain plug at the bottom of the cooler.
- Wrap sample containers in bubble wrap or other cushioning material.
- Place 1 to 2 inches of cushioning material at the bottom of the cooler.
- Place the sealed sample containers into the cooler.
- Place ice in plastic bags and seal. Place loosely in the cooler.
- Fill the remaining space in the cooler with cushioning material.

- Place COC forms in a plastic bag and seal. Tape the forms to the inside of the cooler lid.
- Close the lid of the cooler, lock and secure with duct tape.
- Wrap strapping tape around both ends of the cooler at least twice.
- Mark the cooler on the outside with the following information: shipping address, return address, “Fragile” labels and arrows indicating “this side up.” Cover the labels with clear plastic tape. Place a signed custody seal over the sample cooler lid.

Samples will be hand delivered or delivered by an express carrier within 48 hours of the time of collection. Shipments will be accompanied by the COC form identifying the contents. The original form will accompany the shipment; copies will be retained by the sampler for the sampling office records. If the samples are sent by common carrier, a bill of lading will be used. Receipts or bills of lading will be retained as part of the permanent project documentation. Commercial carriers are not required to sign off on the COC form as long as the forms are sealed inside the sample cooler and the custody seals remain intact.

Sample custody seals and packing materials for filled sample containers will be provided by the analytical laboratory. The filled, labeled and sealed containers will be placed in a cooler on ice and carefully packed to eliminate the possibility of container breakage.

Additional procedures for packing, handling and shipping environmental samples are presented in the FSP.

9.5 Laboratory Custody Procedures

9.5.1 General

Upon sample receipt, laboratory personnel will be responsible for sample custody. The original field COC form will accompany all samples requiring laboratory analysis. The laboratory will use COC guidelines described in the USEPA guidance documents. Samples will be kept secured in the laboratory until all stages of analysis are complete. All laboratory personnel having samples in their custody will be responsible for documenting and maintaining sample integrity.

9.5.2 Sample Receipt and Storage

Immediately upon sample receipt, the laboratory sample custodian will verify the cooler seal, open the cooler and compare the contents against the field COC. If a sample container is missing, a sample container is received broken, the sample is in an inappropriate container or has not been preserved by appropriate means, ARCADIS BBL will be notified. The laboratory sample custodian will be responsible for logging the samples in, assigning a unique laboratory identification number to each sample, labeling the sample bottle with the laboratory identification number and moving the sample to an appropriate storage location to await analysis. The project name, field sample code, date sampled, date received, analysis required, storage location and date and action for final disposition will be recorded in the laboratory tracking system. Relevant custody documentation will be placed in the project file.

9.5.3 Sample Analysis

Analysis of an acceptable sample will be initiated by worksheets that contain all pertinent information for analysis. The analyst will sign and date the laboratory COC form when removing the samples from storage.

Samples will be organized into sample delivery groups (SDGs) by the laboratory. An SDG may contain up to 20 field samples (field duplicates, trip blanks and rinse blanks are considered field samples for the purposes of SDG assignment). All field samples assigned to a single SDG shall be received by the laboratory over a maximum of 7 calendar days and must be processed through the laboratory (preparation, analysis and reporting) as a group. Every SDG must include a minimum of one site-specific MS/MSD pair, which shall be received by the laboratory at the start of the SDG assignment.

9.5.4 Sample Storage Following Analysis

Samples will be maintained by the laboratory for at least 1 month after the final report is delivered to ARCADIS BBL. The laboratory will be responsible for the eventual and appropriate disposal of the samples. The analytical laboratory will inform ARCADIS BBL before any samples are disposed. Unused portions of the samples, sample extracts and associated wastes will be disposed of by the laboratory in accordance with applicable rules and regulations as specified in their Standard Operating Procedure (SOP) for waste disposal.

10. Analytical Method Requirements

10.1 Field Parameters and Methods

Any specific field measurement protocols are provided in the FSP.

10.2 Laboratory Parameters and Methods

The methods listed below include the range of analyses expected to be performed. The associated laboratory SOPs can be found in Attachment 1.

Laboratory analytical requirements presented in the subsections below include a general summary of requirements, specifics related to each sample medium to be analyzed and details of the methods to be used for this project. SW-846 methods with NYSDEC ASP 2005 Revision, QA/QC and reporting deliverables requirements will be used for all analytes.

10.2.1 General

The following tables summarize general analytical requirements:

Table	Title
Table 1	Environmental and Quality Control Sample Analyses
Table 3	Parameters, Methods and Quantitation Limits
Table 4	Sample Containers, Preservation Methods and Holding Times Requirements

10.2.2 PDI Sample Matrices

This QAPP covers the soil and sediment analyses to be completed for the PDI. Analyses will be performed following the methods listed in Table 1. Results will be reported as dry weight, in units presented in Table 3. Moisture content will be reported separately.

10.2.3 Analytical Requirements

The primary sources to describe the analytical methods to be used during the investigation are provided in USEPA SW-846 Test Methods for Evaluating Solid Waste, Third Edition and USEPA Methods for Chemical Analysis of Water and Waste with NYSDEC ASP 2005 Revision, QA/QC and reporting deliverables requirements.

Detailed information regarding QA/QC is provided in NYSDEC ASP 2005 Revision, Exhibit E.

11. Quality Control Requirements

11.1 Quality Assurance Indictors

The overall QA objective for this QAPP is to develop and implement procedures for sampling, COC, laboratory analysis, instrument calibration, data reduction and reporting, internal quality control, audits, preventive maintenance and corrective action, such that valid data will be generated. These procedures are presented or referenced in the following sections of this QAPP. Specific QC checks are discussed in Section 11.2.

QA indicators are generally defined in terms of five parameters:

1. representativeness
2. comparability
3. completeness
4. precision
5. accuracy

Each parameter is defined below. Specific objectives for the site actions are set forth in other sections of this QAPP, as referenced below.

11.1.1 Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent site conditions, and is dependent on sampling and analytical variability and the variability of environmental media at the site. The actions have been designed to assess the presence of the chemical constituents at the time of sampling. The PDI Work Plan presents the rationale for sample quantities and location. This QAPP presents field sampling and laboratory analytical methodologies. The use of the prescribed field and laboratory analytical methods with associated holding times and preservation requirements are intended to provide representative data.

11.1.2 Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Comparability between this investigation, and to the extent possible, with existing data will be maintained through consistent sampling and analytical methodology set forth in the FSP and this QAPP, SW-846 analytical methods with NYSDEC ASP Revision 2005, QA/QC requirements and Category B reporting deliverables and through use of QA/QC procedures and appropriately trained personnel.

11.1.3 Completeness

Completeness is defined as a measure of the amount of valid data obtained from an event and/or investigation compared to the total amount that was obtained. This will be determined upon final assessment of the analytical results, as discussed in Section 11.6.

11.1.4 Precision

Precision is the measure of reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the project objectives. To maximize precision, sampling and analytical procedures will be followed. All work for this investigation will adhere to established protocols presented in the PDI Work Plan. Checks for analytical precision will include the analysis of MSDs, laboratory duplicates and field duplicates. Checks for field measurement precision will include obtaining duplicate field measurements. Further discussion of precision QC checks is provided in Section 11.4.

11.1.5 Accuracy

Accuracy is the deviation of a measurement from the true value of a known standard. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, internal standards, MSs, blank spikes and surrogates (system monitoring compounds) will be used to assess the accuracy of the laboratory analytical data. Further discussion of these QC samples is provided in Section 11.5.

11.2 Field Quality Control Checks

11.2.1 Field Measurements

To verify the quality of data using field instrumentation, duplicate measurements will be obtained and reported for all field measurements. A duplicate measurement will involve obtaining measurements a second time at the same sampling location.

11.2.2 Sample Containers

Certified, clean sample containers in accordance with Exhibit I of the NYSDEC ASP Revision 2005 (Eagle Picher pre-cleaned containers or equivalent) will be supplied by the laboratory.

11.2.3 Field Duplicates

Field duplicates will be collected from the different site materials to verify the reproducibility of the sampling methods. Field duplicates will be prepared by placing well homogenized aliquots (except samples for VOC analysis) from the same sample location into individual sample containers, which are submitted blind to the laboratory. Field duplicate water samples and soil samples for VOC analysis will constitute co-located samples rather than homogenized aliquots. In general, field duplicates will be analyzed at a 5 percent frequency (every 20 samples) for the chemical constituents. Table 1 provides an estimated number of field duplicates to be prepared for each applicable parameter and matrix.

11.2.4 Rinse Blanks

Rinse blanks are used to monitor the cleanliness of the sampling equipment and the effectiveness of the cleaning procedures. Rinse blanks will be prepared and submitted for analysis once per day per matrix. Rinse blanks will be prepared by filling sample containers with analyte-free water (supplied by the laboratory) that has been routed through a cleaned sampling device. When dedicated sampling devices or sample containers are used to collect the samples, rinse blanks will not be necessary. Table 1 provides an estimated number of rinse blanks for environmental media samples to be collected during the PDI.

11.2.5 Trip Blanks

Trip blanks will be used to assess whether site samples have been exposed to non-site-related volatile constituents during storage and transport. Trip blanks will be analyzed at a frequency of once per day, per cooler containing samples to be analyzed for VOCs. A trip blank will consist of a container filled with analyte-free water (supplied by the laboratory) that remains unopened with field samples throughout the sampling event. Trip blanks will only be analyzed for VOCs. Table 1 provides an estimated number of trip blanks collected for each matrix and parameter during the PDI.

11.3 Analytical Laboratory Quality Control Checks

11.3.1 General

Internal laboratory QC checks will be used to monitor data integrity. These checks will include method blanks, MS/MSDs, spike blanks, internal standards, surrogate samples, calibration standards and reference standards. Project QC limits for duplicates and MSs are identified in Table 2. Laboratory control charts will be used to determine long-term instrument trends.

11.3.2 Method Blanks

Sources of contamination in the analytical process, whether specific analyses or interferences, need to be identified, isolated and corrected. The method blank is useful in identifying possible sources of contamination within the analytical process. For this reason, it is necessary that the method blank is initiated at the beginning of the analytical process and encompasses all aspects of the analytical work. As such, the method blank would assist in accounting for any potential contamination attributable to glassware, reagents, instrumentation or other sources that could affect sample analysis. One method blank will be analyzed with each analytical series associated with no more than 20 samples.

11.3.3 Matrix Spike/Matrix Spike Duplicates

MS/MSDs will be used to measure the accuracy of analyte recovery from the sample matrices and will be site-specific. MS/MSD pairs will be analyzed at a 5 percent frequency (every 20 samples or once every week, whichever comes first).

When MS recoveries are outside QC limits, associated control sample and surrogate spike recoveries will be evaluated, as applicable, to attempt to verify the reason for the deviation and determine the effect on the reported sample results. Table 1 presents an estimated number of MS and MSD analyses for each applicable parameter.

11.3.4 Surrogate Spikes

Surrogates are compounds that are unlikely to occur under natural conditions that have properties similar to the analytes of interest. This type of control is primarily used for organic samples analyzed by gas chromatography/mass spectrometry (GC/MS) and GC methods, and is added to the samples prior to purging or extraction. The surrogate spike is utilized to provide broader insight into the proficiency and efficiency of an analytical method on a sample-specific basis. This control reflects analytical conditions that may not be attributable to the sample matrix.

If surrogate spike recoveries exceed specified QC limits, the analytical results need to be evaluated thoroughly in conjunction with other control measures. In the absence of other control measures, the integrity of the data may not be verifiable and re-analysis of the samples with additional control may be necessary.

Surrogate spike compounds will be selected utilizing the guidance provided in the analytical methods.

11.3.5 Laboratory Duplicates

For inorganics, laboratory duplicates will be analyzed to assess laboratory precision. Laboratory duplicates are defined as a separate aliquot of an individual sample that is analyzed as a separate sample. Table 1 presents an estimated number of laboratory duplicates for each applicable parameter.

11.3.6 Calibration Standards

Calibration check standards analyzed within a particular analytical series provide insight regarding the instruments' stability. A calibration check standard will be analyzed at the beginning and end of an analytical series or periodically throughout a series containing a large number of samples.

In general, calibration check standards will be analyzed after every 12 hours, or more frequently, as specified in the applicable analytical method. In analyses where internal

standards are used, a calibration check standard will only be analyzed in the beginning of an analytical series. If results of the calibration check standard exceed specified tolerances, then all samples analyzed since the last acceptable calibration check standard will be re-analyzed.

Laboratory instrument calibration standards will be selected utilizing the guidance provided in the analytical methods, as summarized in Section 13.

11.3.7 Internal Standards

Internal standard areas and retention times will be monitored for organic analyses performed by GC/MS methods. Method-specified internal standard compounds will be spiked into all field samples, calibration standards and QC samples after preparation and prior to analysis. If internal standard areas in one or more samples exceed the specified tolerances, the cause will be investigated, the instrument will be recalibrated, if necessary, and all affected samples will be re-analyzed.

The acceptability of internal standard performance will be determined using the guidance provided within the analytical methods.

11.3.8 Reference Standards/Control Samples

Reference standards are standards of known concentration and independent in origin from the calibration standards. The intent of reference standard analysis is to provide insight into the analytical proficiency within an analytical series. This includes preparation of calibration standards, validity of calibration, sample preparation, instrument set-up and the premises inherent in quantitation. Reference standards will be analyzed at the frequencies specified within the analytical methods.

11.4 Data Precision Assessment Procedures

Field precision is difficult to measure because of temporal variations in field parameters. However, precision will be controlled through the use of experienced field personnel, properly calibrated meters and duplicate field measurements. Field duplicates will be used to assess precision for the entire measurement system, including sampling, handling, shipping, storage, preparation and analysis.

Laboratory data precision for organic analyses will be monitored through the use of MS/MSD and laboratory duplicates as identified in Table 1.

The precision of data will be measured by calculation of the relative percent difference (RPD) by the following equation:

$$RPD = \frac{(A-B)}{(A+B)/2} \times 100$$

Where:

A = analytical result from one of two duplicate measurements

B = analytical result from the second measurement

Precision objectives for MSD and laboratory duplicate analyses are identified in the NYSDEC ASP Revision 2005 and contained in Table 2.

11.5 Data Accuracy Assessment Procedures

The accuracy of field measurements will be controlled by experienced field personnel, properly calibrated field meters and adherence to established protocols. The accuracy of field meters will be assessed by review of calibration and maintenance logs.

Laboratory accuracy will be assessed via the use of MSs, surrogate spikes, internal standards and reference standards. Where available and appropriate, QA Performance Standards will be analyzed periodically to assess laboratory accuracy. Accuracy will be calculated in terms of percent recovery as follows:

$$\text{Percent Recovery} = \frac{A-X}{B} \times 100$$

Where:

A = value measured in spiked sample or standard

X = value measured in original sample

B = true value of amount added to sample or true value of standard

This formula is derived under the assumption of constant accuracy over the original and spiked measurements. If any accuracy calculated by this formula is outside of the acceptable levels, data will be evaluated to determine whether the deviation represents

unacceptable accuracy, or variable, but acceptable accuracy. Accuracy objectives for MS recoveries and surrogate recovery objectives are identified in the NYSDEC ASP 2005 Revision and contained in Table2.

11.6 Data Completeness Assessment Procedures

Completeness of a field or laboratory data set will be calculated by comparing the number of valid sample results generated to the total number of results generated.

$$\text{Completeness} = \frac{\text{Number valid results}}{\text{Total number of results generated}} \times 100$$

As a general guideline, overall project completeness is expected to be at least 90 percent. The assessment of completeness will require professional judgment to determine data usability for intended purposes.

12. Instrument/Equipment Testing, Inspection and Maintenance Requirements

12.1 General

Testing and maintenance schedules have been developed for both field and laboratory instruments. A summary of the testing and maintenance activities to be performed is presented below.

12.2 Field Instruments and Equipment

Prior to field sampling, each piece of field equipment will be inspected to confirm that it is operational. If the equipment is not operational, it will be serviced prior to its use. All meters that require charging or batteries will be fully charged and have fresh batteries. If instrument servicing is required, it is the responsibility of the appropriate Task Manager or field personnel to follow the maintenance schedule and arrange for timely service. Field instruments will be maintained according to the manufacturers' instructions.

Logbooks will be kept for each field instrument. Each logbook will contain records of operation, maintenance, calibration and any problems and repairs. Logbooks for each piece of equipment shall be maintained in project records. The Task Managers will review calibration and maintenance logs.

12.2.1 Equipment Maintenance

All measuring and test equipment to be used in support of the PDI activities that directly affect the quality of the analytical data shall be subject to preventative maintenance measures that minimize equipment downtime. Equipment will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual to confirm that all maintenance requirements are being observed. Field notes from previous sampling events will be reviewed to confirm that any prior equipment problems are not overlooked and that any necessary repairs to equipment have been carried out.

Field equipment returned from a site will be inspected to confirm that it is in working order. The inspection will be recorded in the logbook or field notebooks, as appropriate. It will also be the obligation of the last user to record any equipment problems in the logbook. Non-operational field equipment will either be repaired or replaced. Appropriate spare parts will be made available for field meters.

Consultant-/subcontractor-owned or leased equipment maintenance shall be in accordance with the manufacturer's instructions and all maintenance records shall be requested from the equipment owner/leasing company and reviewed prior to mobilizing any equipment to the site. No equipment shall be allowed on site if proper maintenance has not been performed and recorded for that piece of equipment.

12.3 Laboratory Instruments and Equipment

12.3.1 General

Laboratory instrument and equipment documentation procedures include details of any observed problems, corrective measure(s), routine maintenance and instrument repair (which will include information regarding the repair and the individual who performed the repair).

Preventive maintenance of laboratory equipment generally will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired immediately by in-house staff or through a service call from the manufacturer.

12.3.2 Instrument Maintenance

Maintenance schedules for laboratory equipment adhere to the manufacturer's recommendations. Records reflect the complete history of each instrument and specify the timeframe for future maintenance. Major repairs or maintenance procedures are performed through service contracts with manufacturer or qualified contractors. Paperwork associated with service calls and preventative maintenance calls will be kept on file by the laboratory.

Laboratory Systems Managers are responsible for the routine maintenance of instruments used in the particular laboratory. Any routine preventative maintenance carried out is logged into the appropriate logbooks. The frequency of routine maintenance is dictated by the nature of samples being analyzed, the requirements of the method used and/or the judgment of the Laboratory Systems Manager.

All major instruments are backed up by comparable (if not equivalent) instrument systems in the event of unscheduled downtime. An inventory of spare parts is also available to minimize equipment/instrument downtime.

12.3.3 Equipment Monitoring

On a daily basis, the operation of balances, incubators, ovens, refrigerators and water purification systems will be checked and documented. Any discrepancies will be immediately reported to the appropriate laboratory personnel for resolution.

13. Instrument Calibration and Frequency

13.1 Field Instruments and Equipment

The calibration of field instruments is documented in the FSP for the applicable field analysis method, and such procedures take precedence over the following discussion.

Field personnel are responsible for confirming that a master calibration/maintenance log is maintained following the procedures specified for each measuring device. Where applicable, each log will include, at a minimum, the following information:

- name of device and/or instrument calibrated
- device/instrument serial/identification numbers
- calibration method
- tolerance
- calibration standard used
- frequency of calibration
- date(s) of calibration(s)
- name of person(s) performing calibration(s)

Instruments and equipment used to gather, generate or measure environmental data will be calibrated at the intervals specified by the manufacturer or more frequently, and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications. In the event that an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be returned to the manufacturer for service. Equipment found to be out of tolerance during the period of use shall be removed from the field and measuring and testing activities performed using the equipment shall be addressed via the corrective action system described in Section 17.4 of this QAPP.

13.2 Laboratory Instrument and Equipment

Instrument calibration will follow the specifications provided by the instrument manufacturer or specific analytical method used. The analytical methods for target constituents are identified separately below.

Volatile Organic Compounds

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 2005 Revision, Exhibit E, Part II Section 2.

Semivolatile Organic Compounds

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 2005 Revision, Exhibit E, Part II Section 3.

Metals

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 2005 Revision, Exhibit E, Part III Sections 1 and 3.

Total Organic Carbon

Equipment calibration procedures will follow guidelines presented in Lloyd Kahn Method.

When analyses are conducted according to the USEPA SW-846 Methods, the calibration procedures and frequencies specified in the applicable method will be followed, as noted in the attached SOPs (Attachment 1). For analyses governed by SOPs, see the appropriate SOP for the required calibration procedures and frequencies. Records of calibrations will be filed and maintained by the laboratory. These records will be subject to QA audits. For all instruments, the laboratory will maintain trained repair staff with in-house spare parts or will maintain service contracts with vendors.

All standards used in the calibration of equipment are traceable, directly or indirectly, to the National Institute of Standards and Technology. All standards received shall be logged into standard receipt logs maintained by the individual analytical groups. Each

group shall maintain a standards log that tracks the preparation of standards used for calibration and QC purposes.

14. Inspection/Acceptance Requirements for Supplies and Consumables

All supplies to be used in the field and laboratory will be available when needed. They will be free of target chemicals and interferences. All reagents will be tested prior to use with site samples. All standards will be verified against a second source standard. The laboratory will follow a "first in first out" procedure for the storage and use of all consumables to minimize the risk of contamination and degradation. The various supplies and consumables required on site are noted in the various field SOPs included in the FSP.

15. Data Acquisition Requirements for Non-Direct Measurements

At this point in time, historical data generated by outside parties is not anticipated to be used directly in completing the PDI. However, historical data will be used as a guidance in determining sampling locations for the PDI.

Prior to their use, historic data sets will be reviewed according to the procedures identified in subsequent sections of this QAPP to determine the appropriate uses of such data. The extent to which these data can be validated will be determined by the analytical level and QC data available. The evaluation of historic data for PDI purposes requires the following:

- identification of analytical levels
- evaluation of QC data, when available
- development of conclusions regarding the acceptability of the data for intended uses

Acceptability of historic data for intended uses will be determined by application of these procedures and professional judgment. If the historic data quality cannot be determined, its use will be limited to general trend evaluations.

16. Data Management

The purpose of data management is to confirm that all of the necessary data are accurate and readily accessible to meet the analytical and reporting objectives of the project. The field investigations will include a relatively large number of samples. Due to the large amount of resulting data, the need arises for a structured, comprehensive and efficient program for management of data.

The data management program established for the project includes field documentation and sample QA/QC procedures, methods for tracking and managing the data and a system for filing all site-related information. More specifically, data management procedures will be employed to efficiently process the information collected, such that the data are readily accessible and accurate. These procedures are described in detail in the following section.

The data management plan has five elements: 1) sample designation system, 2) field activities, 3) sample tracking and management, 4) data management system and 5) document control and inventory.

16.1 Sample Designation System

A concise and easily understandable sample designation system is an important part of the project sampling activities. It provides a unique sample number that will facilitate both sample tracking and easy resampling of select locations to evaluate data gaps, if necessary. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events or conditions. A combination of letters and numbers will be used to yield a unique sample number for each field sampled collected, as outlined in Section 6.2.1.

16.2 Field Activities

Field activities designed to gather the information necessary to make decisions during the PDI process require consistent documentation and accurate record keeping. During site activities, standardized procedures will be used for documentation of field activities, data security and QA. These procedures are described in further detail in the following subsections.

16.2.1 Field Documentation

Complete and accurate record keeping is a critical component of the field investigation activities. When interpreting analytical results and identifying data trends, investigators realize that field notes are an important part of the review and validation process. To confirm that the field investigation is thoroughly documented, several different information records, each with its own specific reporting requirements, will be maintained, including:

- field logs
- COC forms
- Instrument calibration records

A description of each of these types of field documentation is provided below.

Field Logs

The personnel performing the field activities will keep field logs that detail all observations and measurements made during the PDI. Data will be recorded directly into site-dedicated, bound notebooks, with each entry dated and signed. To determine that at any future date that notebook pages are not missing, each page will be sequentially numbered. Erroneous entries will be corrected by crossing out the original entry, initialing it and then documenting the proper information. In addition, certain media sampling locations will be surveyed to accurately record their locations. The survey crew will use their own field logs and will supply the sampling location coordinates to the Database Administrator.

Chain of Custody Forms

COC forms are used as a means of documenting and tracking sample possession from time of collection to the time of disposal. A COC form will accompany each field sample collected, and one copy of the form will be filed in the field office. All field personnel will be briefed on the proper use of the COC procedure. COC procedures and a sample form are included in FSP.

Instrument Calibration Records

As part of data QA procedures, field monitoring and detection equipment will be routinely calibrated. Instrument calibration confirms that equipment used is of the proper type, range, accuracy and precision to provide data compatible with the specified requirements and desired results. Calibration procedures for the various types of field instrumentation are described in Section 13.1. In order to demonstrate that established calibration procedures have been followed, calibration records will be prepared and maintained to include, as appropriate, the following:

- calibration date and time
- type and identification number of equipment
- calibration frequency and acceptable tolerances
- identification of individual(s) performing calibration
- reference standards used
- calibration data
- information on calibration success or failure

The calibration record will serve as a written account of monitoring or detection equipment QA. All erratic behavior or failures of field equipment will be subsequently recorded in the calibration log.

16.2.2 Data Security

Measures will be taken during the field investigation to confirm that samples and records are not lost, damaged or altered. When not in use, all field notebooks will be stored at the field office or locked in the field vehicle. Access to these files will be limited to the field personnel who utilize them.

16.3 Sample Management and Tracking

A record of all field documentation will be maintained to confirm the validity of data used in the site analysis. To effectively execute such documentation, specific sample

tracking and data management procedures will be used throughout the sampling program.

Sample tracking will begin with the completion of COC forms as summarized in Section 9.2.3. The completed COC forms associated with samples collected will be faxed to the Quality Assurance Coordinator (QAC). Copies of all completed COC forms will be maintained in the field office. The laboratory shall verify receipt of the samples electronically (via email) on the following day.

When analytical data are received from the laboratory, the QAC will review the incoming analytical data packages against the information on the COCs to confirm that the correct analyses were performed for each sample and that results for all samples submitted for analysis were received. Any discrepancies noted will be promptly followed up by the QAC.

16.4 Data Management System

In addition to the sample tracking system, a data management system will be implemented. The central focus of the data management system will be the development of a personal computer-based project database. The project database, to be maintained by the Database Administrator, will combine pertinent geographical, field and analytical data. Information that will be used to populate the database will be derived from three primary sources: surveying of sampling locations, field observations and analytical results. Each of these sources is discussed in the following sections.

16.4.1 Computer Hardware

The database will be constructed on Pentium®-based personal computer work stations connected through a network server. The network will provide access to various hardware peripherals, such as, laser printers, backup storage devices, image scanners and modems. Computer hardware will be upgraded to industrial and corporate standards, as necessary, in the future.

16.4.2 Computer Software

The database will be written in Microsoft Access, running in a Windows operating system. Custom applets, such as diskette importing programs, will be written in either Microsoft VBA or Microsoft Visual Basic. Geographic Information System (GIS) applications will be developed in ESRI ArcGIS, with additional customization performed

with Visual Basic. Tables and other database reports will be generated through Access in conjunction with Microsoft Excel, Microsoft Word and/or Seagate Crystal Reports. These software products will be upgraded to current industrial standards, as necessary.

16.4.3 Survey Information

In general, each location sampled as part of the PDI will be surveyed to confirm accurate documentation of sample locations for mapping and GIS purposes (if appropriate), to facilitate the resampling of select sample locations during future monitoring programs, if needed, and for any potential remediation activities. The surveying activities that will occur in the field will consist of the collection of information that will be used to compute a northing and easting in state plane coordinates for each sample location and the collection of information to compute elevations relative to the National Geodetic Vertical Datum of 1988 for select sample locations, as appropriate. All field books associated with the surveying activities will be stored as a record of the project activities.

16.4.4 Field Observations

An important part of the information that will ultimately reside in the data management system for use during the project will originate in the observations that are recorded in the field.

Following each sampling event, a status memorandum may be prepared by the field personnel who performed the sampling activities. The purpose of the status memo is to present a summary and a record of the sampling event. Topics to be discussed include the locations sampled, the sampling methodologies used, QA/QC procedures, blind duplicate and MS/MSD sample identification numbers, equipment decontamination procedures, personnel involved in the activity and any other noteworthy events that occurred.

Tables are typically attached to the memorandum and are used to summarize measurements that were recorded in the field books. It is anticipated that these tables will be developed using a personal computer spreadsheet program to reduce possible transcription error and to facilitate the transfer of information to the data management system. For example, for sediment samples, the table would present the sampling date and time, water depth, sediment depth, depth of sediment recovered in a given core, the depth increment submitted for analysis and a description of the lithology.

Status memos are valuable tools to keep project personnel informed on the details of the field activities and are also invaluable during the development of the final report. Each status memo will be reviewed for accuracy and completeness by the respective sampling activity manager. Following the approval and finalization of each memo, the status memo will be used to transfer field observations into the data management system.

All pertinent field data will be manually entered into the appropriate database tables from the COC forms and field notebooks.

16.4.5 Analytical Results

Analytical results will be provided by the laboratory in both a digital and a hard copy format. The data packages will be examined to confirm that the correct analyses were performed for each sample submitted and that all of the analyses requested on the COC form were performed. If discrepancies are noted, the QAC will be notified and will promptly follow up with the laboratory to resolve any issues.

Each data package will be validated in accordance with the procedures presented in Section 20. Any data that does not meet the specified standards will be flagged pending resolution of the issue. The flag will not be removed from the data until the issue associated with the sample results is resolved. Although flags may remain for certain data, the use of that data may not necessarily be restricted.

Following completion of the data validation, the digital files will be used to populate the appropriate database tables. An example of the format of electronic data deliverable (EDD) format is included in Table 5. This format specifies one data record for each constituent for each sample analyzed. Specific fields include:

- sample identification number
- date sampled
- date analyzed
- parameter name
- analytical result

- units
- detection limit
- qualifier(s)

The individual EDDs, supplied by the laboratory in either an ASCII comma separated value format or in a Microsoft Excel worksheet, will be loaded into the appropriate database table via a custom-designed user interface Visual Basic program. Any analytical data that cannot be provided by the laboratory in electronic format will be entered manually. After entry into the database, the EDD data will be compared to the field information previously entered into the database to confirm that all requested analytical data have been received.

16.4.6 Data Analysis and Reporting

The database management system will have several functions to facilitate the review and analysis of the PDI data. Data entry screens will be developed to assist in the keypunching of field observations. Routines will also be developed to permit the user to scan analytical data from a given site for a given media. Several output functions that have been developed by ARCADIS BBL will be appropriately modified for use in the data management system.

A valuable function of the data management system will be the generation of tables of analytical results from the project databases. The capability of the data management system to directly produce tables reduces the redundant manual entry of analytical results during report preparation and precludes transcription errors that may occur otherwise. This data management system function creates a digital comma-delimited ASCII file of analytical results and qualifiers for a given media. The ASCII file is then processed through a spreadsheet, which transforms the comma-delimited file into a table of rows and columns. Tables of analytical data will be produced as part of data interpretation tasks, the reporting of data and the generation of the PDI Report.

Another function of the data management system will be to create digital files of analytical results and qualifiers suitable for transfer to mapping/presentation software. A function has been created by ARCADIS BBL that creates a digital file consisting of sample location number, state plane coordinates, sampling date and detected constituents and associated concentrations and analytical qualifiers. The file is then transferred to an AutoCAD work station, where another program has been developed

to plot a location's analytical data in a "box" format at the sample location (represented by the state plane coordinates). This routine greatly reduces the redundant keypunching of analytical results and facilitates the efficient production of interpretative and presentation graphics.

The data management system also has the capability of producing a digital file of select parameters that exists in one or more of the databases. This type of custom function is accomplished on an interactive basis and is best used for transferring select information into a number of analysis tools, such as statistical or graphing programs.

16.5 Document Control and Inventory

ARCADIS BBL maintains project files at its Syracuse, New York and Fairport, New York offices for this site. Each client project is assigned a file/job number. Each file is then broken down into the following subfiles:

1. Agreements/Proposals (filed chronologically)
2. Change Orders/Purchase Orders (filed chronologically)
3. Invoices (filed chronologically)
4. Project Management (filed by topic)
5. Correspondence (filed chronologically)
6. Notes and Data (filed by topic)
7. Public Relations Information (filed by topic)
8. Regulatory Documents (filed chronologically)
9. Marketing Documents (filed chronologically)
10. Final Reports/Presentations (filed chronologically)
11. Draft Reports/Presentations (filed chronologically)
12. Documents Prepared by Others (filed chronologically)

Originals, when possible, are placed in the files. These are the central files and will serve as the site-specific files for the PDI.

17. Assessment and Response Actions

17.1 General

Performance and systems audits will be completed in the field and laboratory during the PDI as described below.

17.2 Field Audits

The following field performance and systems audits will be completed during this project.

The appropriate Task Manager will monitor field performance. Field performance audit summaries will contain an evaluation of field activities to verify that activities are performed according to established protocols. The ARCADIS BBL QAC will review field reports and communicate concerns to the ARCADIS BBL Project Manager and/or Task Managers, as appropriate. In addition, the ARCADIS BBL QAC will review the rinse and trip blank data to identify potential deficiencies in field sampling and cleaning procedures. In addition, systems audits comparing scheduled QA/QC activities from this document with actual QA/QC activities completed will be performed. The appropriate Task Manager and QAC will periodically confirm that work is being performed consistent with this QAPP, the PDI Work Plan and the FSP.

17.3 Laboratory Audits

The laboratory will perform internal audits consistent with NYSDEC ASP 2005 Revision, Exhibit E.

Internal laboratory audits are conducted by the laboratory QAC. As part of the audit, the overall performance of the laboratory staff is evaluated and compared to the performance criteria outlined in the laboratory QA manual and SOPs. The results of the audits are summarized and issued to each department supervisor, the Laboratory Manager and the Laboratory Director. A systems audit of each laboratory is also performed by the QAC to determine if the procedures implemented by each laboratory are in compliance with the QA manual and SOPs.

In addition to the laboratory's internal audits, as participants in state and federal certification programs, the laboratory is audited by representatives of the regulatory agency issuing certification. Audits are usually conducted on an annual basis and

focus on laboratory conformance to the specific program protocols for which the laboratory is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action, if necessary.

ARCADIS BBL reserves the right to conduct an on-site audit of the laboratory prior to the start of analyses for the project. Additional audits may be performed during the course of the project, as deemed necessary.

17.4 Corrective Action

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP, the FSP, or the PDI Work Plan. Corrective actions include procedures to promptly investigate, document, evaluate and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for the actions are described below.

17.4.1 Field Procedures

When conducting the action field work, if a condition is noted by the field crew that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause and corrective action implemented by the Field Manager or a designee will be documented on a Corrective Action Form and reported to the appropriate ARCADIS BBL Task Manager, QAC and Project Manager.

Examples of situations that would require corrective actions are provided below:

- Protocols as defined by the QAPP, PDI Work Plan and the FSP have not been followed.
- Equipment is not in proper working order or is not properly calibrated.
- QC requirements have not been met.
- Issues resulting from performance or systems audits have not been resolved.

Project personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

17.4.2 Laboratory Procedures

In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause and corrective action taken will be documented and reported to the appropriate Project Manager and QAC.

Corrective action may be initiated, at a minimum, under the following conditions:

- Specific laboratory analytical protocols have not been followed.
- Protocols as defined by this QAPP have not been followed.
- Predetermined data acceptance standards are not obtained.
- Equipment is not in proper working order or calibrated.
- Sample and test results are not completely traceable.
- QC requirements have not been met.
- Issues resulting from performance or systems audits have not been resolved.

Laboratory personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities. Corrective action is initiated at a point were the problem has been identified. At whatever level this occurs (analyst, supervisor, data review or quality control), it is brought to the attention of the laboratory QAC and, ultimately, the Laboratory Director. Final approval of any action deemed necessary is subject to the approval of the Laboratory Director.

Any corrective action deemed necessary based on system or performance audits or the results of data review will be implemented. The corrective action may include sample re-extraction, repreparation, re-analysis, cleanup, dilutions, matrix modifications or other activities.

18. Reports to Management

18.1 Internal Reporting

The analytical laboratory will submit analytical reports to ARCADIS BBL for review. If required, ARCADIS BBL will, in turn, submit the reports to the data validator for review. Supporting data (i.e., historic data, related field or laboratory data) will also be reviewed to evaluate data quality, as appropriate. The ARCADIS BBL QA Manager will incorporate results of the data validation reports (if required) and assessments of data usability into a summary report (if required) that will be submitted to the ARCADIS BBL Project Manager and appropriate Task Managers. If required, this report will be filed in the project file at ARCADIS BBL's office and will include the following:

1. Assessment of data accuracy, precision and completeness for both field and laboratory data.

2. Results of the performance and systems audits.

3. Significant QA/QC problems, solutions, corrections and potential consequences.

4. Analytical data validation report.

18.2 Remedial Investigation Reporting

Upon sample transport to the laboratory, a copy of the COC will be forwarded to ARCADIS BBL's Project Manager. Upon receipt of the ASP – Category B Data Package from the laboratory, the ARCADIS BBL QA Manager will determine if the data package has met the required data quality objectives. The analytical data package will be submitted to the ARCADIS BBL Project Manager and the analytical data will be incorporated into the RD/RA Work Plan in a tabulated format.

19. Data Reduction and Review

19.1 General

After field and laboratory data are obtained, the data will be subject to the following:

1. reduction, or manipulation mathematically, or otherwise into meaningful and useful forms
2. review
3. organization, interpretation and reporting
4. data validation

19.2 Field Data Reduction and Review

19.2.1 Field Data Reduction

Information collected in the field through visual observation, manual measurement and/or field instrumentation will be recorded in field notebooks or data sheets, and/or on forms. Such data will be reviewed by the appropriate Task Manager for adherence to the PDI Work Plan, the FSP and this QAPP and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and, as necessary, incorporated into the data evaluation process.

19.2.2 Field Data Review

Field data calculations, transfers and interpretations will be conducted by field personnel and reviewed for accuracy by the appropriate Task Manager and the QAC. Logs and documents will be checked for:

1. general completeness
2. readability
3. usage of appropriate procedures
4. appropriate instrument calibration and maintenance

5. reasonableness in comparison to present and past data collected

6. correct sample locations

7. correct calculations and interpretations

19.3 Laboratory Data Reduction and Review

19.3.1 Laboratory Data Reduction

The calculations used for data reduction will be specified in each of the analytical methods referenced previously. Whenever possible, analytical data will be transferred directly from the instrument to a computerized data system. Raw data will be entered into permanently bound laboratory notebooks. The data entered are sufficient to document all factors used to arrive at the reported value.

Concentration calculations for chromatographic analyses will be based on response factors. Quantitation will be performed using either internal or external standards.

Inorganic analyses will be based on regression analysis. Regression analysis is used to fit a curve through the calibration standard data. The sample concentrations will be calculated using the resulting regression equations.

Nonaqueous values will be reported on a dry-weight basis. Unless otherwise specified, all values will be reported uncorrected for blank contamination.

19.3.2 Laboratory Data Review

Data will be subject to multi-level review by the laboratory. The group leader will review all data reports prior to release for final data report generation and signature by the laboratory PM. The Laboratory QAC will review a cross-section of the final data reports prior to shipment to ARCADIS BBL.

If discrepancies or deficiencies exist in the analytical results, then corrective action will be taken, as discussed in Section 17. Deficiencies discovered as a result of internal data review, as well as the corrective actions to be used to rectify the situation, will be documented on a Corrective Action Form. This form will be submitted to the ARCADIS BBL Project Manager.

19.4 Data Validation and Verification

All data generated for health and safety and engineering design/control purposes will be subjected to the data validation and verification procedures outlined in Section 20. Data generated for disposal purposes will not be reviewed.

20. Data Validation and Verification

Data validation entails a review of the QC data and the raw data to verify that the laboratory was operating within required limits, the analytical results were correctly transcribed from the instrument read outs, and which, if any, environmental samples were related to any out-of-control QC samples. The objective of data validation is to identify any questionable or invalid laboratory measurements.

ARCADIS BBL will validate all data generated producing a NYSDEC Data Usability Summary Report for each individual SDG using the most recent versions of the USEPA's Function Guidelines (USEPA, 1999) and USEPA Region II SOPs for data validation available at the time of project initiation, where appropriate. These procedures and criteria may be modified, as necessary, to address project-specific and method-specific criteria, control limits and procedures. Data validation will consist of data screening, checking, reviewing, editing and interpretation to document analytical data quality and to determine whether the quality is sufficient to meet the DQOs.

The data validator will verify that reduction of laboratory measurements and laboratory reporting of analytical parameters is in accordance with the procedures specified for each analytical method and/or as specified in this QAPP. Any deviations from the analytical method or any special reporting requirements apart from that specified in this QAPP will be detailed on COC forms.

Upon receipt of laboratory data, the following procedures will be executed by the data validator:

- Evaluate completeness of data package.
- Verify that field COC forms were completed and that samples were handled properly.
- Verify that holding times were met for each parameter. Holding time exceedences, should they occur, will be documented. Data for all samples exceeding holding time requirements will be flagged as either estimated or rejected. The decision as to which qualifier is more appropriate will be made on a case-by-case basis.
- Verify that parameters were analyzed according to the methods specified.

- Review QA/QC data (i.e., make sure duplicates, blanks and spikes were analyzed on the required number of samples, as specified in the method; verify that duplicate and MS recoveries are acceptable).

- Investigate anomalies identified during review. When anomalies are identified, they will be discussed with the Project Manager and/or Laboratory Manager, as appropriate.

- If data appears suspect, investigate the specific data of concern. Calculations will be traced back to raw data; if calculations do not agree, the cause will be determined and corrected.

Deficiencies discovered as a result of the data review, as well as the corrective actions implemented in response, will be documented and submitted in the form of a written report addressing the following topics as applicable to each method:

- assessment of the data package

- description of any protocol deviations

- failures to reconcile reported and/or raw data

- assessment of any compromised data

- overall appraisal of the analytical data

- table of site name, sample quantities, matrix and fractions analyzed

It should be noted that qualified results do not necessarily invalidate data. The goal to produce the best possible data does not necessarily mean producing data without QC qualifiers. Qualified data can provide useful information.

Resolution of any issues regarding laboratory performance or deliverables will be handled between the laboratory and the data validator. Suggestions for re-analysis may be made by the ARCADIS BBL QAC at this point.

Data validation reports will be kept in the project file at the ARCADIS BBL office in Syracuse, New York.

21. Reconciliation with User Requirements

The data results will be examined to determine the performance that was achieved for each data usability criteria. The performance will then be compared with the project objectives and DQOs. Deviations from objectives will be noted. Additional action may be warranted when performance does not meet performance objectives for critical data. Options for corrective action relating to incomplete information, questionable results or inconsistent data, may include any or all of the following:

- retrieval of missing information
- request for additional explanation or clarification
- re-analysis of sample from extract (when appropriate)
- recalculation or reinterpretation of results by the laboratory

These actions may improve the data quality, reduce uncertainty, and may eliminate the need to qualify or reject data.

If these actions do not improve the data quality to an acceptable level, the following additional actions may be taken:

- extrapolation of missing data from existing data points
- use of historical data
- evaluation of the critical/non-critical nature of the sample

If the data gap cannot be resolved by these actions, an evaluation of the data bias and potential for false negatives and positives can be performed. If the resultant uncertainty level is unacceptable, the following action must be taken:

- additional sample collection and analysis

22. References

United States Environmental Protection Agency. *Interim Guidance and Specifications for Preparing Quality Assurance Project Plans*. QAMS-005/80. Office of Research and Development. (December 1980).

United States Environmental Protection Agency. *NEIC Policies and Procedures Manual*. EPA-330/9-78-001R. National Enforcement Investigations Center. (May 1978, Revised August 1991).

United States Environmental Protection Agency. *Guide to Management of Investigation-Derived Wastes*. 9345.3-03FS. (January, 1992).

United States Environmental Protection Agency. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. EPA-540/R-94-013. (February 1994a).

United States Environmental Protection Agency. *Contract Laboratory Program National Functional Guidelines for Organic Data Review*. EPA-540/R-99-008 (October 1999).

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United States Environmental Protection Agency. *Test Methods for Evaluating Solid Waste*. SW-846 3rd Edition, Update 3. Office of Solid Waste (December 1996).

New York State Department of Environmental Conservation. *Draft DER-10 Technical Guidance for Investigation and Remediation* (December 2002)

Tables

TABLE 1
SAMPLE QUANTITIES AND QUALITY CONTROL FREQUENCIES

QUALITY ASSURANCE PROJECT PLAN
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
GOLDEN ROAD DISPOSAL SITE

Parameter	Estimated Environmental Sample Quality	Field QC Analyses						Laboratory QC Sample						Total
		Trip Blank		Rinse Blank		Field Duplicate		Matrix Spike		Matrix Spike Duplicate		Lab Duplicate		
		Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	
Soil														
Volatile Organic Compounds (SW-846 8260- TCL)	20	1/cooler	5	1/day	0	1/20	1	1/20	1	1/20	1	NA	--	28
Semivolatile Organic Compounds (SW-846 8270-Pentachlorophenol)	5	NA	--	1/day	0	1/20	1	1/20	1	1/20	1	NA	--	8
Sediment														
Semivolatile Organic Compounds (SW-846 8270-TCL)	6	NA	--	1/day	0	1/20	1	1/20	1	1/20	1	NA	--	9
Metals (SW-846 6010/7000-TAL)	6	NA	--	1/day	0	1/20	1	1/20	1	NA	--	1/20	1	9
TOC (Lloyd Kahn)	6	NA	--	1/day	0	1/20	1	1/20	1	NA	--	1/20	1	9

Notes:
Sample counts are an approximation of the estimated minimal quantity. Additional samples may be obtained based on analytical data and result in increased QC samples.
1/day One rinse blank per day or one per 20 samples, whichever is more frequent. Rinse blanks not required when dedicated sampling equipment or new, clean, unused disposable sampling equipment is used.
Freq frequency
NA not applicable
No. number
QC quality control

TABLE 2
ANALYTICAL QUALITY CONTROL LIMITS [1]

QUALITY ASSURANCE PROJECT PLAN
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
GOLDEN ROAD DISPOSAL SITE

	Accuracy - % Recovery			Precision - RPD		
Parameter	**Surrogate**	**MS/MSD**	**LCS**	**MS/MSD**	**Lab Duplicate**	**Field Duplicate**
Soil/Sediment						
Volatile Organics	60-140	60-140	70-140	25	--	50
Semivolatile Organics	20-140	20-140	40-120	40	--	50
Metals	--	80-120	80-120	--	30	50
Total Organic Carbon	--	70-130	70-130	--	30	50

Note:

1 The listed QC limits are based on SW-846 guidance and are advisory. The actual limits are determined based on laboratory performance. Frequent failure to meet the QC limits; however, warrant investigation of the laboratory.

TABLE 3
PARAMETERS, METHODS AND TARGET REPORTING LIMITS

QUALITY ASSURANCE PROJECT PLAN
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
GOLDEN ROAD DISPOSAL SITE

Analyte	Soil/Sediment[2] (µg/kg)		
	TAGM G.V.[4]	Laboratory MDL	Laboratory RL
Volatile Organic Compounds 8260 [1]			
Dichlorodifluoromethane	NA	0.41	5
Chloromethane	NA	0.30	5
Bromomethane	NA	0.46	5
Vinyl chloride	200	6.25	10
Chloroethane	1,900	0.36	5
Trichlorofluoromethane	NA	0.55	5
Methylene chloride	100	2.20	5
1,1,2-Trichloro-1,2,2-trifluoroethane	6,000	0.53	5
Acetone	200	1.10	25
Carbon disulfide	2,700	0.43	5
Methyl acetate	NA	1.00	5
1,1-Dichloroethene	400	0.61	5
1,1-Dichloroethane	200	0.58	5
trans-1,2-Dichloroethene	300	0.52	5
Chloroform	300	0.31	5
1,2-Dichloroethane	100	0.25	5
cis-1,2-Dichloroethene	NA	0.25	5
2-Butanone	300	0.81	25
1,1,1-Trichloroethane	800	0.36	5
Cyclohexane	NA	0.23	5
Carbon tetrachloride	600	0.68	5
Bromodichloromethane	NA	0.26	5
1,2-Dichloropropane	NA	0.26	5
cis-1,3-Dichloropropene	NA	0.29	5
Trichloroethene	700	0.35	5
Methylcyclohexane	NA	0.32	5
Dibromochloromethane	NA	0.28	5
1,2-Dibromoethane	NA	0.19	5
1,1,2-Trichloroethane	NA	0.25	5
Benzene	60	0.55	5
trans-1,3-Dichloropropene	NA	0.64	5
Bromoform	NA	0.46	5
Isopropylbenzene	NA	0.33	5
4-Methyl-2-pentanone	1,000	6.25	25
2-Hexanone	NA	6.25	25
Tetrachloroethene	1,400	0.30	5
Toluene	1,500	0.85	5
1,1,2,2-Tetrachloroethane	600	0.33	5
Chlorobenzene	1,700	0.51	5
Ethylbenzene	5,500	0.35	5
Styrene	NA	0.25	5
Xylenes (total)	1,200	2.94	15
1,3-Dichlorobenzene	1,600	0.30	5
1,4-Dichlorobenzene	8,500	0.23	5
1,2-Dichlorobenzene	7,900	0.32	5
1,2-Dibromo-3-chloropropane	NA	0.37	5
1,2,4-Trichlorobenzene	3,400	0.30	5
Methyl t-butyl ether (MTBE)	NA	0.49	5

TABLE 3
PARAMETERS, METHODS AND TARGET REPORTING LIMITS

QUALITY ASSURANCE PROJECT PLAN
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
GOLDEN ROAD DISPOSAL SITE

Analyte	Soil/Sediment[2] (µg/kg)		
	TAGM G.V.[4]	Laboratory MDL	Laboratory RL
Semivolatile Organic Compounds 8270[2]			
Benzaldehyde	NA	18.51	170
Phenol	330	17.77	170
2-Chlorophenol	800	8.59	170
2-Methylphenol	330	5.19	170
2,2'-oxybis(1-Chloropropane)	NA	17.64	170
Acetophenone	NA	8.66	170
4-Methylphenol	900	9.40	170
N-Nitrosos-di-n-propylamine	NA	13.37	170
Hexachloroethane	NA	13.06	170
Nitrobenzene	330	7.48	170
Isophorone	4,400	8.44	170
2-Nitrophenol	330	7.72	170
2,4-Dimethylphenol	NA	45.60	170
bis(2-Chloroethoxy)methane	NA	9.18	170
2,4-Dichlorophenol	400	8.85	170
Naphthalene	13,000	2.81	170
4-Chloroaniline	330	49.55	170
Hexachlorobutadiene	NA	8.64	170
Caprolactam	NA	73.02	170
4-Chloro-3-methylphenol	330	6.94	170
2-Methylnaphthalene	36,400	2.04	170
Hexachlorocyclopentadiene	NA	51.04	170
2,4,6-Trichlorophenol	NA	11.14	170
2,4,5-Trichlorophenol	100	36.81	170
1,1'-Biphenyl	NA	10.51	170
2-Chloronaphthalene	NA	11.33	170
2-Nitroaniline	800	54.15	330
Dimethylphthalate	2,000	4.40	170
Acenaphthylene	41,000	1.38	170
2,6-Dinitrotoluene	1,000	41.30	170
3-Nitroaniline	800	38.81	330
Acenaphthene	50,000	1.98	170
2,4-Dinitrophenol	800	59.06	330
4-Nitrophenol	800	40.92	330
Dibenzofuran	6,200	1.76	170
2,4-Dinitrotoluene	NA	26.13	170
Diethylphthalate	7,100	5.10	170
4-Chlorophenyl-phenylether	NA	3.60	170
Fluorene	50,000	3.89	170
4-Nitroaniline	NA	18.86	330
4,6-Dinitro-2-methylphenol	NA	58.29	330
N-Nitrosodiphenylamine	NA	9.23	170
4-Bromophenyl-phenylether	NA	53.71	170
Hexachlorobenzene	410	8.39	170
Atrazine	NA	7.51	170
Pentachlorophenol	1,000	57.90	330
Phenanthrene	50,000	3.54	170
Anthracene	50,000	4.32	170
Carbazole	NA	1.95	170
Di-n-butyl phthalate	8,100	58.35	170
Fluoranthene	50,000	2.45	170

TABLE 3
PARAMETERS, METHODS AND TARGET REPORTING LIMITS

QUALITY ASSURANCE PROJECT PLAN
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
GOLDEN ROAD DISPOSAL SITE

Analyte	Soil/Sediment[2] (µg/kg)		
	TAGM G.V.[4]	Laboratory MDL	Laboratory RL
Semivolatile Organic Compounds 8270 (cont'd)			
Pyrene	50,000	1.09	170
Butylbenzylphthalate	50,000	45.33	170
3,3'-Dichlorobenzidine	NA	148.00	170
Benzo(a)anthracene	330	2.91	170
Chrysene	400	1.69	170
bis(2-Ethylhexyl)phthalate	50,000	54.39	170
Di-n-octyl phthalate	50,000	3.95	170
Benzo(b)fluoranthene	1,100	3.28	170
Benzo(k)fluoranthene	1,100	1.86	170
Benzo(a)pyrene	330	4.07	170
Indeno(1,2,3-cd)pyrene	3,200	4.67	170
Dibenz(a,h)anthracene	330	1.99	170
Benzo(g,h,i)perylene	50,000	2.03	170
Inorganics 6010 [1]			
Arsenic	7,500	390	2000
Barium	300,000	50	500
Cadmium	1,000	40	200
Chromium	10,000	90	500
Lead	SB	290	1000
Selenium	2,000	590	4000
Silver	SB	150	500
Inorganics 7470/7471 [1]			
Mercury	100	4.7	20

Notes:

1 USEPA. Office of Solid Waste and Emergency Response. *Test Methods for* Evaluating Solid Waste SW-846 3rd ed.*Washington, D.C. 1996.*

2 The target reporting limits are based on wet weight. The actual reporting limits wil vary based on sample weight and moisture content.

3 Water guidance values (GV) are as presented in the NYSDEC, Division of Water, Technical and Operation Guidance Series (TOGS) document etitled, *Ambient Wa* Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1), dated June 1998, last revised April 2000.

4 Soil/Sediment guidance values (GV) are as presented in the NYSDEC Technical a Administrative Guidance Memorandum (TAGM) etitled, *Determination of Soil* Cleanup Objectives and Cleanup Levels, HWR-94-4046 (TAGM 4046) dated January 24, 1994.

TABLE 4
SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

QUALITY ASSURANCE PROJECT PLAN
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
GOLDEN ROAD DISPOSAL SITE

Parameter	Method[1]	Bottle Type	Preservation	Holding Time[2]
Soil/Sediment				
Volatile Organic Compounds	8260	2 - 40 mL glass vials with Teflon®-lined lid	Cool to 4°C	48 hours to preservation 10 days to analysis
Semivolatile Organic Compounds	8270	1 - 8 oz glass jar with Teflon®-lined lid	Cool to 4°C	5 days to extraction
Metals (except mercury)	6010	1 - 4 oz wide mouth glass jar	Cool to 4°C	180 days to analysis
Mercury	7471			28 days to analysis
Total Organic Carbon	Lloyd Kahn	1 - 125 mL glass jar	Cool to 4°C	28 days to analysis

Notes:
1 USEPA. Office of Solid Waste and Emergency Response. *Test Methods for Evaluating Solid Waste. SW-846 3rd ed. Washington, D.C. 1996.*
2 All holding times are calculated from verified time of sample receipt and will be consistent with Exhibit I of the NYSDEC Analytical Services Protocol

TABLE 5
ELECTRONIC DATA DELIVERABLE FORMAT

QUALITY ASSURANCE PROJECT PLAN
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
GOLDEN ROAD DISPOSAL SITE

Field Name	Maximum Length	Data Type	Comments
FIELD SAMPLE ID	50	TEXT	From the chain of custody. Add "RE" or "DL" to differentiate reanalyses and dilutions.
SDG	50	TEXT	
LAB SAMPLE ID	50	TEXT	
MATRIX	10	TEXT	SOIL, WATER, SEDIMENT, etc.
SAMPLE TYPE	10	TEXT	FB, RB, TB, FD, FS for Field Blank, Rinse Blank, Trip Blank, Field Duplicate and Field Sample, respectively. DEFAULT TO FS
DATE COLLECTED	--	DATE/TIME	MM/DD/YY
TIME COLLECTED*	--	DATE/TIME	Military time
DEPTH START	--	NUMBER	
DEPTH END	--	NUMBER	
DEPTH UNITS	25	TEXT	FEET, INCHES, METERS, etc.
ANALYTICAL METHOD	50	TEXT	
CAS NUMBER	25	TEXT	
ANALYTE	100	TEXT	
RESULT VALUE	--	NUMBER	For non-detected results, enter Reporting Limit ("U" must be present in Lab Qualifier field).
LAB QUALIFIER	10	TEXT	"U" for non-detected, others as defined by laboratory.
REPORTING LIMIT	--	NUMBER	
RESULT UNIT	25	TEXT	
DILUTION FACTOR	--	NUMBER	
REPORTABLE RESULT	--	YES/NO	DEFAULT TO YES
FILTERED?	--	YES/NO	
DATE ANALYZED	--	DATE/TIME	MM/DD/YY
TIME ANALYZED*	--	DATE/TIME	Military time
DATE EXTRACTED*	--	DATE/TIME	MM/DD/YY
LABORATORY NAME*	50	TEXT	

Notes:
1 This definition is for an "Excel-type" spreadsheet. Fields flagged with an "*" are optional and may be left blank if not available electronically from the laboratory.
2 Depth-related fields may be left blank for samples and matrices for which they are not applicable.

ARCADIS BBL

Attachment 1

Laboratory Standard Operating Procedures

ARCADIS BBL

Appendix C

Health and Safety Plan

ARCADIS BBL
Infrastructure, environment, facilities

Imagine the result

Chevron Environmental Management Corporation

Health and Safety Plan

Golden Road Disposal Site
Site No. 8-28.021
Chili, New York

December 2007

Tables

Attachments

Approvals and Acknowledgements

Approvals

I have read and approved this *Health and Safety Plan* (HASP) with respect to project hazards, regulatory requirements, and ARCADIS BBL procedures.

Project Name: Golden Road Site
Project Number: B0043524

11/06/07 11/06/07

Project Manager/Date Health and Safety Officer/Date

Acceptance

Chevron Environmental Management Company has reviewed this HASP and has accepted that it meets the objectives of the Operational Excellence Guidelines.

11/15/07

CEMC Project Manager/Date

Acknowledgement

The final accepted version of this HASP has been provided to the Site Supervisor. I acknowledge my responsibility to provide the site supervisor with the equipment, materials and qualified personnel to implement fully all safety requirements in this HASP. I will formally review this HASP with the Health and Safety Staff every 6 months until project completion.

12/3/07

Project Manager/Date

I acknowledge receipt of this HASP from the Project Manager, and that it is my responsibility to explain its contents to all site personnel and cause these requirements to be fully implemented. Any change in conditions, scope of work, or other change that might affect worker safety requires me to notify the project manager and/or health and safety officer.

Site Supervisor/Date

BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

Health and Safety Plan Acknowledgment

I have read the Site-Specific Health and Safety Plan, or its contents have been presented to me, and I understand the contents and I agree to abide by its requirements. Every person visiting the Site must provide their mobile phone number so they may be contacted in an event of an emergency.

Name/Company (Print)	Signature	Mobile Phone Number	Date

Subcontractor Acceptance

Acceptance

I have read this Health and Safety Plan with respect to project hazards, regulatory requirements and ARCADIS U.S., Inc. procedures

Project Name: Golden Road Disposal Site

_____

Subcontractor/Date

_____

Subcontractor/Date

_____

Subcontractor/Date

_____

Subcontractor/Date

Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
ARCADIS BBL	ARCADIS of New York, Inc.
CFR	Code of Federal Regulations
Chevron	Chevron Products Company
COC	constituent of concern
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
dBA	decibels
DEET	diethyltoluamide
DOT	Department of Transportation
^{o}F	degrees Fahrenheit
FM	Factory Mutual Engineering Corporation
EMS	Emergency Medical Services
EZ	Exclusion Zone
HASP	Health and Safety Plan
HSO	Health and Safety Officer
HSS	Health and Safety Supervisor
IDW	investigation-derived waste
II	Incident Investigation
JMP	Journey Management Plan
JSA	Job Safety Analysis
kV	kilovolt

LPO	Loss Prevention Observation
LPS	Loss Prevention System
LEL	lower explosive limit
mph	miles per hour
MSDS	Material Safety Data Sheet
MOT	Maintenance of Traffic
NIOSH	National Institute of Occupational Safety and Health
NRR	Noise Reduction Rating
NYSDEC	New York State Department of Environmental Conservation
OE Tenets	Tenets of Operation Excellence
OSHA	Occupational Safety and Health Administration
OTIPS	One Team Incident Prevention System
PIC	Principle-in-Charge
PID	photoionization detector
PM	Project Manager
PO	Project Officer
PPE	personal protective equipment
ppm	parts per million
RMSF	Rocky Mountain Spotted Fever
ROD	Record of Decision
SOP	Standard Operating Procedure
SPSA	Safe Performance Self-Assessment
SSE	Short Service Employee
SZ	Support Zone
TCP	Traffic Control Plan

TLV	Threshold Limit Value
UL	Underwriters Laboratories
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency

1. Introduction

1.1 Objective

The purpose of site activities is to perform site assessment and remediation activities at the site. This base document contains information to address various activities performed at this subject location. This document must be accompanied by an attached Site-Specific/Task-Specific Job Safety Analysis (JSA) identifying characteristics and information specific to tasks to be performed.

Project activities potentially include the following tasks:

- mobilization/demobilization
- soil excavation
- soil, sediment and groundwater sampling
- decontamination activities

The objective of this *Health and Safety Plan* (HASP) is to provide a mechanism for establishing safe working conditions at the site for the individual tasks. The safety organization, procedures and protective equipment have been established based on an analysis of potential physical, chemical and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of accident or injury.

1.2 Site Description and Site History

The Golden Road Disposal Site (site) is a Class 2 site, listed on the New York State Department of Environmental Conservation (NYSDEC) Registry of Inactive Hazardous Waste Sites (NYSDEC Site No. 8-28-021). The site is located adjacent to Route 490 in the Town of Chili, Monroe County, New York. Access to the site is obtained from Golden Road, and the surrounding area is zoned Rural-Agricultural. The site itself lies immediately adjacent to designated wetlands and is characterized by poor drainage and a high water table.

CSX Transportation, Inc. tracks run southwest to northeast through the site, separating it into a north parcel and south parcel. The north parcel (approximately 12 acres) has

been previously remediated and is not included in this HASP. The south parcel (approximately 7 acres) can be characterized as a hazardous waste disposal site, with access to the area by a gravel road and broken gate. A site map is included as Attachment A.

The site was privately run by Howard Fitzsimmons, Jr. (now deceased) from 1955 through 1976. During this time period, Mr. Fitzsimmons also operated Chili Fuels and Great Western Construction Company at the site. The site received a wide variety of wastes, including household refuse, metal slag, fly ash, foundry sand and junked vehicles. In addition, the south parcel was used for the disposal of drums, approximately 562 of which were removed from the site in 1985 as part of an emergency removal action. A portion of the wetland area to the west and south of the site was filled in during operation of the site. Possible waste sources include the United States Army 98th Division Reserve Unit (Rochester, New York), Chevron Oil, University of Rochester and Abex Corporation.

A number of previous investigations were performed at the site and include:

- *Preliminary Investigation, 1982* – This investigation was conducted by the Monroe County Health Department prior to the Phase I Investigation and included sampling private water wells.

- *Initial Site Inspection, 1983* – Fly ash, foundry sand and approximately 200 drums in various stages of decay were exposed and identified at the site.

- *Golden Road Disposal Site, New York State Superfund Phase I, 1982* – Recra Research, Inc. documented the findings of their preliminary investigation, including the Preliminary Hazard Ranking System score.

- *Emergency Drum Removal, 1985* – Under the direction of the NYSDEC, 562 drums and containers and 75 cubic yards of contaminated soil and debris were removed from the south parcel.

- *Phase II Investigations, 1992* – Ecology and Environment Engineering, P.C. conducted a Phase II Investigation, including a geophysical survey; installation and sampling of seven groundwater monitoring wells; and sampling of multiple surface-water/sediment, surface soil, and waste samples.

- *Environmental Investigation and Preliminary Health Risk Assessment, 1994* – KR Applin & Associates documented an environmental investigation that included excavating and sampling 16 test pits and sampling monitoring well GW-6.

- *Petition to the New York State Department of Environmental Conservation for Partial Deletion of Site No. 828021, the Golden Road Disposal Site, Town of Chili, Monroe County, NY, from the Registry of Inactive Hazardous Waste Sites, 1995* – KR Applin & Associates collected four soil samples and one background sample from the site to support the conclusions of the 1994 investigation.

- *Remedial Investigation Report, 2000* – URS Greiner Woodward Clyde performed a remedial investigation at the site that included Historical Records Search, Water Use/Basement Surveys, Land Survey, Geophysical Survey, Radiological Survey, Sampling of Fill Materials and Fill Piles, Containerized Waste Material Sampling, Geoprobe® Sampling, Test Pit Investigation, Surface Soil Sampling, Groundwater Investigation, Subsurface Soil Sampling, Surface-Water/Sediment Sampling, Waste Sampling, and Ecological Investigation.

In October 2002, the NYSDEC issued a Record of Decision (ROD) for the site. In the ROD, the NYSDEC selected a remedy for the site that included hot spot remediation with off-site disposal and site regrading.

1.3 Policy Statement

The policy of ARCADIS of New York, Inc. (ARCADIS BBL, formerly known as Blasland, Bouck & Lee, Inc.), is to provide a safe and healthful work environment for employees. No aspect of operations is of greater importance than injury and illness prevention. A fundamental principle of safety is that accidents and injuries are preventable. ARCADIS BBL and ARCADIS BBL subcontractors will take reasonable steps to eliminate or control hazards in order to minimize the possibility of injury, illness or accident.

This HASP describes the procedures that must be followed during site activities performed at the site. Operational changes that could affect the health and safety of personnel, the community or the environment will not be made without the prior approval of the Project Manager (PM) and an ARCADIS BBL Health and Safety Officer

(HSO) or his/her designee. This HASP will be periodically reviewed to confirm that it is current and technically correct. Changes in site conditions and/or the scope of work will require a review and modification to this HASP. Such changes will be completed in the form of an addendum to this HASP or a revision of this HASP.

The provisions of this HASP are mandatory for ARCADIS BBL personnel and ARCADIS BBL's subcontractors assigned to the project. Visitors to the work site must also abide by the requirements of this HASP. Employees of other consulting and/or contracted companies may work in accordance with their own independent HASPs, provided that those HASPs meet the minimum requirements of this HASP.

This HASP is not intended or represented to be suitable for use by other organizations, reuse by Chevron Products Company (Chevron) or others on extensions of this or any other project. Any reuse without prior written approval or adaptation by ARCADIS BBL will be at the user's sole risk and without liability and legal exposure to ARCADIS BBL. The policies and procedures presented in this document shall not be construed to supersede any federal, state or local regulations and do not relieve any employer, agent or invitee involved in the project from complying with applicable federal, state and local regulations.

This HASP was prepared by ARCADIS BBL and is intended to be implemented during ARCADIS BBL project activities at each Chevron site. During such activities, a potential exists for the presence of personnel from client-contracted companies performing work on site. Non-ARCADIS BBL contractors are solely responsible for their own actions and those of their employees, agents and invitees activities on the project site. Neither delivery of this HASP to Chevron nor the presence of ARCADIS BBL or ARCADIS BBL's employees shall be construed to imply that ARCADIS BBL has any responsibility for the actions of separately-contracted parties present at the project site.

1.4 Modifications to the Health and Safety Plan

Although this HASP focuses on specific site conditions described herein, it must remain flexible because conditions may change and unforeseen situations may arise that require deviations from the original HASP. This flexibility allows modification of this HASP by the PM, the Health and Safety Supervisor (HSS) and the HSO to take into account changing site conditions, such as new data on chemical hazards, weather and modifications to the scope of work.

Recognizing that corrective action activities at the site are long term and may consist of many different field tasks, this HASP has been organized in a manner that will easily identify the current ongoing work being conducted. In addition, addendums to this HASP, as needed, will be clearly displayed in Attachment B (Addendum and Changes to HASP Log). Changes to the HASP must be approved by the HSO and the PM. If unanticipated field conditions are encountered that are not addressed in this HASP, these conditions shall be immediately reported to the HSS, PM and the Chevron PM. If necessary, any field activities shall be halted until this HASP has been amended to reflect changed conditions and reviewed and approved by the HSO, PM and accepted by the Chevron PM.

1.5 References

This HASP complies with applicable Occupational Safety and Health Administration (OSHA) regulations, United States Environmental Protection Agency (USEPA) regulations and ARCADIS BBL health and safety policies and procedures. This HASP follows the guidelines established in the following:

- *Standard Operating Safety Guides*, USEPA (Publication 9285.1-03, June 1992).
- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, National Institute of Occupational Safety and Health (NIOSH), OSHA, United States Coast Guard (USCG), USEPA (86116, October 1985).
- *Title 29 of the Code of Federal Regulations* (CFR), Part 1910.
- Title 29 CFR, Part 1926.
- *Pocket Guide to Chemical Hazards*, DHHS, PHS, CDC, NIOSH (2003).
- *Threshold Limit Values* (TLV), American Conference of Governmental Industrial Hygienists (ACGIH) (2006).
- *Guide to Occupational Exposure Values*, ACGIH (2006).
- *Quick Selection Guide to Chemical Protective Clothing*, Forsberg, K. and S.Z. Mansdorf, 2nd Ed. (1993).

- *Health and Safety Policies and Procedures Manual*, Blasland, Bouck & Lee, Inc.

- *Site Specific HES Protection Plan Generation and Implementation Process – (Health and Safety Plan [HASP] Process),* Chevron (2005).

1.6 Definitions

The following definitions (listed alphabetically) are applicable to this HASP:

- *Contamination Reduction Zone (CRZ)* – Area between the exclusion zone (EZ) and support zone (SZ) that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.

- *Exclusion Zone (EZ)* – Any portions of the site where hazardous substances are, or are reasonably suspected to be present, and pose an exposure hazard to on-site personnel.

- *Incident* – All losses, including first-aid cases, injuries, illnesses, near misses, spills/leaks, equipment and property damage, motor vehicle accidents, regulatory violations, fires and business interruptions.

- *Near Miss* – An incident in which no injury, illness, motor vehicle accident, equipment or property damage occurred, but under slightly different circumstances could have occurred.

- *On-Site Personnel* – Chevron personnel or site owner personnel involved with ARCADIS BBL activities, ARCADIS BBL and ARCADIS BBL subcontractor personnel involved with the project.

- *Project* – All on-site work performed under the scope of work.

- *Site* – The area described in Section 1.2 – Site Description and Site History where the work is to be performed by ARCADIS BBL personnel and subcontractors.

- *Support Zone (SZ)* – All areas of the site, except the EZ and CRZ. The SZ surrounds the CRZ and EZ. Support equipment and break areas are located in this zone.

- *Subcontractor* – Includes contractor personnel hired by ARCADIS BBL.
- *Visitor* – All other personnel, except the on-site personnel.
- *Work Area* – The portion of the site where work activities are actively being performed. This area may change daily as work progresses and includes the SZ, CRZ and EZ. If the work area is located in an area on site that is not contaminated, or suspected of being contaminated, the entire work area may be an SZ.

2. Roles and Responsibility

2.1 All Personnel

All ARCADIS BBL and subcontractor personnel must adhere to the procedures outlined in this HASP during the performance of their work. Each person is responsible for completing tasks safely and reporting any unsafe acts or conditions to their supervisor. No person may work in a manner that will conflict with these procedures. After due warnings, the PM will dismiss from the site any person or subcontractor who violates safety procedures.

All ARCADIS BBL and subcontractor personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all personnel will attend an initial hazard briefing prior to beginning work at the site and take a written test that documents their understanding of the site-specific risks. The test can be found in Attachment C. The test will be administered at the beginning of each phase of work for personnel involved in that specific phase of work. A phase of work may involve more than 1 day and more than one specific task.

All ARCADIS BBL and subcontractor personnel that will be performing or overseeing work on this project must attend a Chevron Loss Prevention System™ (LPS™) training session. This training session explains the objectives, elements and requirements of LPS™ to personnel that will be expected to perform or oversee work on Chevron property or sites. Personnel will not be allowed to perform work on Chevron property or sites prior to attending an LPS™ training session.

Cell phone use while driving is prohibited when working on all ARCADIS BBL and Chevron projects. This includes driving on site, as well as driving to and from the site. Hands-free devices are also prohibited.

The roles of ARCADIS BBL personnel and subcontractors are outlined in the following sections. Key project personnel and contacts are summarized in the task-specific JSAs (Attachment G).

2.1.1 Stop Work Authority

Every ARCADIS BBL employee, ARCADIS BBL subcontractor and Chevron employee at a Chevron work site is empowered, expected and responsible for stopping the work

of another coworker if the working conditions or behaviors are considered unsafe. No repercussions will result from this action.

Site or project conditions that are possible reasons to stop work and to consider modifications to this HASP include:

- Site temperatures outside the range predicted in this HASP (possibly resulting in greater risk of heat or cold stress).
- Personal protective equipment (PPE) breakthrough or unexpected degradation.
- Unusual odors that can not be identified.
- Unexplained, elevated readings on an organic vapor monitor.
- Unexpected changes in soil coloration or texture that might indicate undisclosed contamination.

This list is not comprehensive and should be used only as guidance (also refer to Section 9 for emergency response procedures).

If anyone is discouraged from exercising the "Stop Work Authority" or are penalized for doing so, they should report this action to Chevron's Health and Environmental Safety Manager at 925.842.0623.

2.1.2 Tenets of Operational Excellence

The Tenets of Operation Excellence (OE Tenets) are an extension of Chevron's values and principles that apply to all ARCADIS BBL employees, ARCADIS BBL subcontractors and Chevron employees at Chevron work sites. Any deviation from "always" in the OE Tenets requires a Management of Change, including a risk assessment with involvement of appropriate subject matter experts. A Management of Change Form is included in Attachment D and a Management of Change Tracking Log is included in Attachment E. The following OE Tenets are intended to protect people, the environment and equipment:

1. Always operate within design or environmental limits.

2. Always operate in a safe and controlled condition.
3. Always confirm that safety devices are in place and functioning.
4. Always follow safe work practices and procedures.
5. Always meet or exceed customer's requirements.
6. Always maintain integrity of dedicated systems.
7. Always comply with all applicable rules and regulations.
8. Always address abnormal conditions.
9. Always follow written procedures for high-risk of unusual situations.
10. Always involve the right people in decisions that affect procedures and equipment.

Every ARCADIS BBL employee, ARCADIS BBL subcontractor and Chevron employee at a Chevron work site must take action if a tenet is violated.

2.1.3 Chevron Compliance Reporting Process and Hotline

Chevron has established a **Compliance Reporting Hotline Number at 800.284.3084.** This is a risk-free and anonymous way to report to Chevron, a Chevron or Contractor violation of United States, state, or local laws and company policies, including but not limited to:

- health, safety and environmental (not reporting incidents)
- discrimination/harassment/retaliation
- conflicts of interest
- theft, bribes, kickbacks
- fraudulent transactions

When appropriate (when appropriate action is not taken by ARCADIS BBL and/or Chevron management), Chevron contractors may use the reporting hotline.

2.1.4 Near-Miss Reporting Hotline

In an effort to streamline near-miss reporting, especially for employees conducting field work who do not have real-time access to the web, a Near-Miss Reporting Hotline is available. The hotline will be checked daily and data will be entered into the Chevron One Team Incident Prevention System (OTIPS) with the caller listed as the primary contact for the event. All entries will be saved as initial and can be accessed by the caller when they return to their computers. Entry into the database does not relieve the caller from the responsibility of following through with the near-miss investigation or of notifying other employees in the office or project team of the occurrence.

NEAR-MISS REPORTING HOTLINE: 1.866.242.4304

2.1.5 Short-Service Employee Program

Recognizing that employees who are new to ARCADIS BBL or one of their subcontractors are at a greater risk for incidents, the following guidelines are established to identify those employees and ease their transition. Short Service Employees (SSEs) will have an assigned field mentor to assist them in adjusting to the project requirements and procedures. SSEs will be identified in the field by wearing an orange hardhat or hat. The following procedures apply to SSEs:

- Employees new to ARCADIS BBL or one of their subcontractors will be designated as an SSE for 6 months.
- ARCADIS BBL or subcontractor firm employees with less than 6 months of experience in a similar job will be designated as an SSE.

Additionally, the following apply:

- All SSEs have to be approved by the Chevron PM by submitting the SSE Form (Attachment F).
- A two to four person crew may have only one SSE on site.

- A crew of five or more may have no more than 20 percent of the crew staffed with SSEs on site.

2.2 ARCADIS BBL Personnel

2.2.1 Project Officer

The Project Officer (PO) is responsible for providing resources to confirm that project activities are completed in accordance with this HASP and for meeting all regulatory and contractual requirements. The PO has the ultimate responsibility for LPS™ Stewardship for all Chevron projects.

2.2.2 Health and Safety Officer

The HSO (or his designee) has overall responsibility for the technical health and safety aspects of the project, including review and approval of this HASP. Inquiries regarding ARCADIS BBL health and safety procedures, project procedures and other technical or regulatory issues should be addressed to this individual. The HSO or his designee must approve changes or addendum to this HASP. The HSO will provide the process measures for implementation of LPS™ for Chevron projects.

2.2.3 Project Manager

The PM is responsible for verifying that project activities are completed in accordance with the requirements of this HASP. The PM is responsible for confirming that the HSS has the equipment, materials and qualified personnel to fully implement the safety requirements of this HASP, and/or subcontractors assigned to this project meet the requirements established by ARCADIS BBL. It is also the responsibility of the PM to:

- Consult with the HSO on site health and safety issues.
- Verify that subcontractors meet health and safety requirements prior to commencing work.
- Validate, via questioning, the performance of Safe Performance Self-Assessments (SPSAs).
- Review Loss Prevention Observation (LPO) forms.

- Participate in LPO feedback sessions.
- Verify that all incidents are thoroughly investigated.
- Report all near-misses to the HSO and the Chevron PM within 24 hours.
- Validate that near-miss investigation corrective actions are implemented within the same time period.
- Contact the PO immediately and the Chevron PM prior to close of business on the day of the incident and schedule an Incident Investigation (II) conference call within 24 hours of notification of an injury or accident.
- Approve, in writing, addendum or modifications to this HASP.
- Suspend work or modify work practices, as necessary, for personal safety, protection of property and regulatory compliance.
- Participate in all IIs and confirm that they are reported to the HSO, client, PO and Principle in Charge (PIC).

2.2.4 Health and Safety Supervisor

The HSS is responsible for implementing this HASP, including communicating requirements to on-site personnel and subcontractors. The HSS will be responsible for informing the PM of changes in the work plan, procedures or site conditions so that those changes may be addressed in this HASP.

Additional responsibilities of the HSS include the following:

- Review site activities with respect to compliance with this HASP.
- Maintain required health and safety documents and records.
- Consult with the PM on site health and safety issues.
- Coordinate site and personal air monitoring as required, including equipment maintenance and calibration.

- Conduct site safety orientation training and safety meetings.
- Conduct LPOs at the site and complete the LPO forms (Attachment P).
- Participate in all IIs and confirm that they are reported to the HSS and PM immediately.
- Report all near-misses to the PM within 24 hours. Begin near-miss investigation immediately and implement corrective actions.
- Validate, via questioning, the performance of SPSAs.
- Contact underground utility locator personnel to mark out underground utilities.
- Stop work, as necessary, for personal safety, protection of property and regulatory compliance.
- Obtain a site map and determine and post routes to medical facilities and emergency telephone numbers.
- Notify local public emergency representatives (as appropriate) of the nature of the site operations and post their telephone numbers (i.e., local fire department and ambulance service).
- Observe on-site project personnel for signs of ill health effects.
- Investigate and report any incidents to the HSO.
- Verify that all on-site personnel have had applicable training.
- Verify that on-site personnel are informed of the physical, chemical and biological hazards associated with the site activities, and the procedures and protective equipment necessary to control the hazards.
- Issue/obtain any required work permits (e.g., hot work).

2.3 Subcontractors

Subcontractors and their personnel must understand and comply with applicable regulations and site requirements established in this HASP. Subcontractors may prepare their own site-specific HASP that must be consistent with the requirements of this HASP.

All subcontractor personnel will receive training in accordance with applicable regulations, and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. All subcontractor personnel will attend an initial hazard briefing prior to beginning work at the site. Additionally, on-site subcontractor personnel must attend and participate in the daily site safety meetings.

All subcontractor personnel that will be performing or overseeing work on this project must attend a Chevron LPS™ training session. This training session explains the objectives, elements and requirements of LPS™ to personnel that will be expected to perform or oversee work on Chevron property or sites. Subcontractor personnel will not be allowed to perform work on Chevron property or sites prior to attending an LPS™ training session.

Subcontractors must designate individuals to function as the PM, HSO and HSS. In some firms, it is not uncommon for the duties of the HSO to be carried out by the PM. This is acceptable, provided the PM has the required knowledge, training and experience to properly address all hazards associated with the work and to prepare, approve and oversee the execution of a site-specific HASP. A subcontractor may designate the same person to perform the duties of both the HSO and the HSS. However, depending on the level of complexity of a contractor's scope of work, it may be infeasible for one person to perform both functions satisfactorily. No photographs are permitted while on site without approval from the client.

2.4 All On-Site Personnel

All on-site personnel (including subcontractors) must read and acknowledge their understanding of this HASP before commencing work and abide by the requirements of this HASP. All on site personnel shall sign the HASP Acknowledgement Form following their review of this HASP. In addition, all personnel will take and pass (passing is 90 percent) a written test that documents their understanding of the site-specific risks. Employees who do not pass the test will receive one-on-one retraining and will be given the opportunity to retake the exam. Employees who fail the exam the

second time will not be allowed to work that day on site but may come back at a later time to retake the exam. The test can be found in Attachment C.

All on-site personnel that will be performing or overseeing work on this project must attend a Chevron LPS™ training session. This training session explains the objectives, elements and requirements of LPS™ to personnel that will be expected to perform or oversee work on Chevron property or sites. Personnel will not be allowed to perform work on Chevron property or sites prior to attending an LPS™ training session.

All ARCADIS BBL and subcontractor personnel will receive training in accordance with applicable regulations, and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all on-site personnel will attend an initial hazard briefing prior to beginning work at the site and the daily safety meetings.

All on-site personnel must perform an SPSA prior to beginning each work activity. The SPSA process is presented in Section 4.3.1. This process must be performed prior to beginning each activity and must be performed after any near miss or other incident in order to determine if it is safe to proceed. On-site personnel will immediately report the following to the HSO or HSS:

- Personal injuries and illnesses no matter how minor.
- Unexpected or uncontrolled release of chemical substances.
- Symptoms of chemical exposure.
- Unsafe or hazardous situations.
- Unsafe or malfunctioning equipment.
- Changes in site conditions that may affect the health and safety of project personnel.
- Damage to equipment or property.
- Situations or activities for which they are not properly trained.

- Near misses.

No photographs are permitted while on site without approval from the client.

2.5 Visitors

All visitors to ARCADIS BBL work areas must check in with the HSS. Visitors will be cautioned to avoid skin contact with surfaces, soil, groundwater or other materials that may be impacted or suspected to be impacted by constituents of concern (COCs). Visitors must complete a Site-Specific Visitors Test prior to being escorted by the HSS. Visitors must remain in contact with the HSS or HSS-designated individual at all times. The Site-Specific HASP and Visitors Test can be found in Attachment C.

Visitors requesting to observe work at the site must wear appropriate PPE prior to entry to the work area and must have the appropriate training and medical clearances to do so. If respiratory protective devices are necessary, visitors who wish to enter the work area must have been respirator-trained and fit tested for a respirator within the past 12 months. No photographs are permitted while on site without approval from the client.

Table 2-1
Key Personnel and Health and Safety Hierarchy

Chevron Products Co.		
Title/Role	**Name**	**Address**
Environmental Project Manager	Caryl Weekley	Chevron Environmental Management Company 6001 Bollinger Canyon Road San Ramon, California 94583 Tel: 925.842.1343 Fax: 925.842.0213 Cell: 925.413.2401
ARCADIS BBL		
Title/Role	**Name**	**Address**
Project Officer – Ultimate stewardship responsibility	Bill McCune	6723 Towpath Road Syracuse, New York Tel: 315.446.2570, ext. 19172
Health and Safety Officer – Overall responsibility for the technical health and safety aspects of the project, including review and approval of this HASP	Chuck Webster	6723 Towpath Road Syracuse, NY Tel: 315.446.2570, ext. 13214
Project Manager – Responsible for verifying that project activities are completed in accordance with the requirements of this HASP	Dave Kingsley	295 Woodcliff Drive, Suite 301 Fairport, New York 14450 Tel: 585.385.0090, ext. 17 Fax: 585.385.0090 Cell: 585.233.7046

Chevron Products Co.		
Health and Safety Site Supervisor – Responsible for implementing and communicating HASP requirements to all on-site personnel	Site Supervisor will be named on Site-Specific/Task-Specific JSA located in Attachment G.	

Key Personnel and Health & Safety Hierarchy

3. Project Hazards and Control Measures

3.1 Scope of Work

The scope of work at the site includes site investigation and remedial activities. The scope of work may include the following field activities at each site:

- mobilization
- soil, sediment and groundwater sampling
- soil excavation
- decontamination activities
- demobilization

These major activities were used to develop the hazard analyses in this section of this HASP. A brief description of each major activity is presented in the sections below.

3.1.1 Job Hazard Assessment

A job hazard assessment identifies potential safety, health and environmental hazards associated with each type of field activity. Because of the complex and changing nature of field projects, supervisors must continually inspect the work site to identify hazards that may harm site personnel, the community or the environment. The HSS must be aware of these changing conditions and discuss them with the PM whenever these changes impact employee health, safety, the environment or performance of the project. The HSS will keep ARCADIS BBL and ARCADIS BBL subcontractor personnel informed of the changing conditions. A member of ARCADIS BBL's Corporate Health and Safety staff will write or approve addendum or revisions to this HASP as necessary. Task-/Site-Specific JSAs for field activities are located in Attachment G. The Task-/Site-Specific JSAs will incorporate, at a minimum, the requirements as outlined in this section of this HASP for each activity.

3.2 Field Activities, Hazards and Control Procedures

The following sections discuss general safety hazards associated with specific field activities outlined in the scope of work for this project. ARCADIS BBL has also

specified minimum safety precautions for various field activities. Each ARCADIS BBL subcontracted company must review these activities and safety procedures with respect to their own standard safe operating procedures. Each subcontracted company may utilize their own standard safe operating procedures provided the minimum requirements set forth in this HASP and 29 CFR 1910, 29 CFR 1926 and CCR 5192 are met. Each subcontracted company is responsible for operating in a safe and healthful manner in order to protect their personnel and all site personnel.

3.2.1 Mobilization

Mobilization activities include travel to and from the site. A Journey Management Plan (JMP), including a Traffic Control Plan (TCP) has been prepared and included in Attachment H to provide recommended safe travel routes to and from the site. The JMP also addresses potential hazards that may be encountered during travel.

Site mobilization may include establishing EZs, CRZs and SZs. A break area will be set up outside the regulated work area. Mobilization may involve clearing or isolating areas for the support and CRZs. During this initial phase, project personnel will walk the site to confirm the existence of anticipated hazards, and identify safety and health issues that may have arisen since the writing of this HASP.

The hazards of this phase of activity are associated with heavy equipment movement, manual materials handling, manual site preparation and exposure to vehicular traffic.

Manual materials handling and manual site preparation may cause blisters, sore muscles and joint and skeletal injuries and may present eye, contusion and laceration hazards. The work area presents slip, trip and fall hazards from scattered debris and irregular walking surfaces. Freezing-weather hazards include frozen, slick and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil.

In the event that work must be conducted in close proximity to a public roadway (within 15 feet of the right-of way), site personnel must isolate the work area with barricades, signs, cones, caution tape or other appropriate means to alert passing motorists to the presence of an active work area. Also, personnel who are exposed to vehicular traffic must wear an outer layer of orange or yellow warning garments, such as vests, jackets, or shirts. If work is performed in darkness, workers will be outfitted with reflective garments in orange, white (including silver-coated reflective coatings or elements that reflect white light), yellow, fluorescent red-orange or fluorescent yellow-orange.

Environmental hazards may include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, heat, and cold-related illnesses; and pathogens, such as rabies, Lyme disease, and blood borne pathogens. Control procedures for these hazards are discussed in Section 4.

The site is wooded and partially bordered by wooded areas. The site is accessible at the wooded borders via foot traffic and site personnel should be weary of possible hunters on and adjacent to the property during the Fall and Winter months. A highly visible orange sticker shall be worn on all sides of all hard hats worn during these months. In the event that a hunter is observed, call to the hunter and make eye contact with the individual before approaching him or her.

3.2.2 Field Sampling

Field sampling activities that may be undertaken during this project include soil, pond sediment and groundwater sampling. Hazards and control measures and procedures for each sampling activity are discussed in the following subsections.

3.2.2.1 Soil Sampling

This task involves collecting soil samples for subsequent analysis and evaluation of potential impact by COCs. The physical hazards of these operations are primarily associated with the sample collection methods and procedures used. In addition, personnel may be exposed to hazards associated with working in or near excavations and heavy equipment.

3.2.2.1.1 Hazards

Inhalation and absorption of COCs are the primary routes of entry associated with soil sampling due to the manipulation of sample media and equipment, manual transfer of media into sample containers and proximity of operations to the breathing zone. During this project, several different soil sampling methodologies may be used based on equipment accessibility and the types of materials to be sampled. These sampling methods may include the use of hand-auger/sampling probes, sampling spoons or trowels. The primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area or the conditions under which samples must be collected may present chemical and physical hazards. The hazards directly associated with soil sampling procedures are generally limited to

strains or sprains and potential eye hazards. Exposure to soil containing COCs is also possible. In addition to the safety hazards specific to sampling operations, hazards associated with the operation of vehicles (especially large vehicles with limited operator visibility) is a concern. Of particular concern will be the backing up of trucks, excavation equipment and other support vehicles.

The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, ants, fleas, mosquitoes, wasps, spiders and snakes. The work area presents slip, trip and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick and irregular walking surfaces.

3.2.2.1.2 Control

To control dermal exposure during soil sampling activities, a minimum of Modified Level D protection will be worn. Avoid laying tools and equipment on the ground to avoid contact with native poisonous or irritating flora and fauna. If necessary, based on field observations and site conditions, air monitoring may be conducted during soil sampling activities to assess the potential for exposure to airborne COCs. If the results of air monitoring indicate the presence of organic vapors in a concentration causing concern, personnel will upgrade to Level C protection. Section 6.1 – Air Monitoring describes air monitoring requirements and action levels. Each level of personal protection is described in Section 5 – Personal Protective Equipment. Control procedures for environmental and general hazards are discussed in Section 4 – General Safety Practices. The Task-/Site-Specific JSAs are included as Attachment G.

3.2.2.2 Pond Sediment Sampling

This task involves collecting pond sediment samples for subsequent analysis and evaluation of potential impact by COCs. The physical hazards of these operations are primarily associated with the sample collection methods and procedures used. In addition, personnel may be exposed to hazards associated with working in or near water.

3.2.2.2.1 Hazards

Absorption of COCs is the primary route of entry associated with pond sediment sampling due to the manipulation of sample media and equipment, manual transfer of

media into sample containers and proximity of operations to the breathing zone. During this project, several different sediment sampling methodologies may be used based on equipment accessibility and the types of materials to be sampled. These sampling methods may include the use of hand-auger/sampling probes or trowels. The primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area or the conditions under which samples must be collected may present chemical and physical hazards. The hazards directly associated with sediment sampling procedures are generally limited to strains or sprains and potential eye hazards. Exposure to sediment containing COCs is also possible. In addition to the safety hazards specific to sampling operations, hazards associated with the operation of vehicles (especially large vehicles with limited operator visibility) is a concern. Of particular concern will be the backing up of trucks, excavation equipment and other support vehicles.

The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, ants, fleas, mosquitoes, wasps, spiders and snakes. In addition to slip, trip and fall hazards from scattered debris and irregular and potentially unknown (i.e., underwater) walking surfaces, the nature of working in and around a pond area presents potential drowning hazards. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick and irregular walking surfaces.

3.2.2.2.2 Control

To control dermal exposure during sediment sampling activities, a minimum of Modified Level D protection will be worn. In addition, sampling personnel will wear waders and life preserving vests whenever they are in or near the pond area. Avoid laying tools and equipment on the ground to avoid contact with native poisonous or irritating flora and fauna. Control procedures for environmental and general hazards are discussed in Section 4 – General Safety Practices. The Task-/Site-Specific JSAs are included as Attachment G.

3.2.2.3 Groundwater Sampling

Groundwater sampling and monitoring will involve uncapping, purging (purging groundwater out of the well), sampling and monitoring new or existing monitoring groundwater wells. A mechanical pump may be used to purge the wells and can be hand-, gas- or electric-operated. Water samples taken from the wells are then placed in containers and shipped to analytical laboratory for analysis. The physical hazards of

these operations are primarily associated with the sample collection methods and procedures used.

3.2.2.3.1 Hazards

Inhalation and absorption of COCs are the primary routes of entry associated with groundwater sampling, due to the manipulation of sample media and equipment, manual transfer of media into sample containers and proximity of operations to the breathing zone. During this project, several different groundwater sampling methodologies may be used based on equipment accessibility and the types of materials to be sampled. These sampling methods may include hand or mechanical bailing. The primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area or the conditions under which samples must be collected may present chemical and physical hazards. The hazards directly associated with groundwater sampling procedures are generally limited to strains or sprains from hand bailing and potential eye hazards. There is also a hazard of sustaining cuts when handling broken sample containers. Exposure to water containing COCs is also possible.

The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, ants, fleas, mosquitoes, wasps, spiders and snakes. The work area presents slip, trip and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick and irregular walking surfaces.

3.2.2.3.2 Control

To control dermal exposure during groundwater sampling activities, a minimum of Modified Level D protection will be worn. Avoid laying tools and equipment on the ground to avoid contact with native poisonous or irritating flora and fauna. If necessary, based on field observations and site conditions, air monitoring may be conducted during groundwater sampling to assess the potential for exposure to airborne COCs. If the results of air monitoring indicate the presence of organic vapors in a concentration causing concern, personnel will upgrade to Level C protection. Section 6.1 – Air Monitoring describes air monitoring requirements and action levels. Each level of personal protection is described in Section 5 – Personal Protective Equipment. Control procedures for environmental and general hazards are discussed in Section 4 – General Safety Practices.

3.2.3 Excavation Safety

3.2.3.1 Soil Excavation

This task involves the creation of a man-made cut, trench or depression in the earth's surface.

Physical Hazards – The physical hazards involved in the excavation of soils are related to the excavation itself and the operation of heavy equipment. Excavations pose significant hazards to employees if they are not carefully controlled. There exists a chance for the excavation to collapse in on itself if it is not dug properly, sloped, benched or shored as required. The excavation is also a fall hazard and employees must pay careful attention to what they are doing or they risk a fall into the excavation.

In some areas of the site, the presence of overhead utilities, such as power lines, requires careful positioning of the excavating equipment in order to maintain a safe distance between the lines and the closest part of the equipment. The presence of underground utilities, such as natural gas lines, power lines, water lines, telephone lines and sewer pipes, must be determined prior to beginning the excavation.

Entry into excavations is not necessary to complete the site work. Therefore, excavations will not be allowed to be entered while completing site activities. All soil sampling will be performed using an excavator bucket with the exception of excavation depths of 2 feet or less, which may utilize a slide hammer or hand augering sample collection techniques.

Noise may also present a hazard. Heavy equipment operation frequently results in noise levels exceeding 85 decibels (dBA), requiring the use of hearing protection for exposed personnel.

Chemical Hazards – Airborne concentrations of soil contaminants and the dust from the procedure pose the potential for exposure.

Control – Prior to beginning any excavation activities, traffic cones will be used to demarcate the maximum swing arm radius of all excavation equipment. No one will be allowed to enter the coned area until the excavator bucket is resting on the ground and the operator signals that it is safe to do so. All excavation shall be performed from a stable ground position. Communication with personnel operating heavy equipment and other site personnel will be accomplished using established hand signals and two-

way radios. Daily inspections of the excavation shall be made by a competent person, one who has received training in excavation safety (see Attachment J for a copy of the inspection form) (see Attachment K for the Excavation and Trenching Policy and Procedure Memo). The inspector shall determine the likelihood of a cave-in, and corrective action, such as sloping or shoring, shall be taken if the walls appear to be unstable.

All spoil shall be located at least 2 feet from the edge of the excavation to prevent it from falling back into the excavation. The excavation shall be guarded on all sides by barricades or caution tape at least 2 feet from the edge.

Before any digging can be done, all underground utilities must be located and identified. The Underground/ Overhead Utilities Checklist in Attachment I will be used to document this process. PPE for this phase is described in Section 5.

All project personnel shall participate in the daily safety meetings and be instructed on the following requirements:

- Before excavating, the existence and location of underground pipe, electrical equipment and gas lines will be determined by contacting the appropriate utility company and/or client representative to mark the location of the lines. If the client's knowledge of the area is incomplete, an appropriate device, such as a cable avoiding tool, will be used to locate the service line.

- A combustible gas indicator will be used to monitor the excavation area if flammable vapors are suspected.

- Operations must be suspended and the area vented if the airborne flammable concentration exceeds 10 percent of the lower explosive limit (LEL) in the area of an ignition source (i.e., sparks from bucket of excavator).

- If excavating equipment is located in the vicinity of overhead power lines, a minimum distance must be maintained between the lines and any point on the equipment (see Table 3-1 – Minimum Safe Distances).

When the equipment is in transit, with the boom lowered and no load, the equipment clearance must be at least 4 feet for voltages less than 50 kilovolts (kV), 10 feet for voltages of 50 kV to 345 kV and 16 feet for voltages above 345 kV.

Dust Control – Airborne particulate generation will be controlled during site excavations. Although the site soils are sandy, dust generation is possible; dry, dusty soil will be wetted with a water spray from a potable water source to control the generation of dust. Soil will not be wetted to a degree that will cause runoff or soil erosion.

3.2.3.2 Asphalt Removal

Physical Hazards – The most likely hazard is cuts, punctures or abrasions resulting from the cutting of the asphalt as the saw blade penetrates the surface of the asphalt. High speed saws may hurl pieces of material at high rates of speed that can cause serious injury to unprotected areas of the body.

Serious injury or death can result if an employee makes contact with the rotating saw blades. Cuts or possible amputation are the likely results of this contact.

Noise is a significant hazard during this operation. Hand-operated power saws generate noise exceeding 85 dBA, and, therefore, require hearing protection. Heavy equipment operation frequently results in noise levels exceeding 85 dBA, requiring the use of hearing protection as well. Exposure to high levels of noise for a sufficient period of time may result in loss of hearing in certain frequencies.

Chemical Hazards – The most likely hazard is airborne concentrations of the dust from the cutting procedure. The dust components may pose a health hazard and PPE will be used to protect employees from exposure.

Control – Only the personnel using the saw are permitted within 50 feet of the cutting area until the saw has stopped operating.

3.2.3.3 Concrete Removal

This task involves breaking concrete with a jackhammer and removing the pieces with a loader.

Physical Hazards – Cuts, punctures or abrasions resulting from improperly placing the hammer bit. High-pressure hammers tend to hurl pieces of material at a high speed that can cause serious injury to unprotected areas of the body.

Noise is a hazard during this operation. Pneumatic hammers generate noise exceeding 85 dBA and, therefore, require hearing protection during their use.

Chemical Hazards – The most likely hazard is airborne dust from the breaking procedure. The dust components pose a health hazard and PPE will be used to protect employees from exposure.

Control – All personnel shall wear hearing protection during this operation, unless monitoring has been done to determine the areas where the noise exposure is safe. Only the personnel using the jackhammer are permitted within 25 feet of the hammering area until the hammer has stopped operating.

3.2.4 Equipment Decontamination

All equipment is decontaminated before leaving the site. In addition, all operations that have the potential to generate or release hazardous material will be conducted in a controlled area using the appropriate engineering controls. Specific decontamination techniques will be established based on site conditions. Decontamination procedures will be reviewed with all personnel on site. A decontamination pad on a suitable surface (concrete or paved area) with polyethylene sheeting or other appropriate containment system will be established. Pressure washing with manual scrub brushing, as needed, will be used to decontaminate equipment. COC-impacted equipment will be determined “clean” by visually inspecting all equipment.

The decontamination facility will be inspected daily for evidence of leaks or loss of integrity to the containment system. If any deficiencies are noted, they will be corrected immediately. All wastewater and waste materials generated on site will be contained in the decontamination system for characterization and proper disposal.

Personnel involved in decontamination activities may be exposed to skin contact with contaminated materials and chemicals brought to the site as part of the project work. All personnel will review the operating procedures and PPE prior to decontamination. Personnel involved in decontamination activities must wear PPE that is appropriate for the task and no more than one level below the level worn by personnel working in the EZ.

3.2.5 Demobilization

Demobilization involves removing all tools, equipment, supplies and vehicles brought to the site. The hazards of this phase of activity are associated with heavy equipment operation and manual materials handling.

3.2.5.1 Hazards

Manual materials handling may cause blisters, sore muscles and joint and skeletal injuries and may present eye, contusion and laceration hazards. Heavy equipment operation presents noise and vibration hazards and hot surfaces to operators. Personnel in the vicinity of heavy equipment operation may be exposed to physical hazards resulting in fractures, contusions and lacerations, and may be exposed to high noise levels. The work area presents slip, trip and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick and irregular walking surfaces.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, and heat- or cold-related illnesses; and pathogens, such as rabies, Lyme disease, and blood-borne pathogens.

3.2.5.2 Control

Control procedures for these hazards are discussed in Section 4.

3.3 Chemical Hazards

The chemical hazards associated with site operations are related to inhalation, ingestion and skin exposure to site COCs. Air monitoring requirements for site tasks are outlined in Section 6.1.

The primary classes of potential COCs are presented in Table 3-2. Potential COCs in soil and groundwater are presented in Table 3-3. Material safety data sheets (MSDSs) can be found in Attachment L for each COC. The physical properties, hazards, exposure limits and first-aid measures for each contaminant are presented in the Chemical Hazard Data Table in Attachment M.

Table 3-2
Primary Constituent of Concern Classes

Primary COC Classes
Volatile Organic Compounds
Polycyclic Aromatic Hydrocarbonss
Metals
Asbestos

Table 3-3
Potential Site-Related Constituents of Concern

Constituents of Concern
Acetone
Pentachlorophenol
Benzene
Benzo(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Indeno(1,2,3-cd)pyrene
Methylene Chloride
Methylphenol
Toluene
Xylenes
Aluminum
Antimony
Arsenic
Barium
Beryllium
Chromium
Cobalt
Copper
Lead
Manganese
Mercury
Nickel
Selenium
Zinc
Asbestos
Endrin Ketone
Dieldrin
Aroclor-1016
Aroclor-1254
Aroclor-1260

Site-related COCs and maximum concentrations of each COC detected at each site are presented in Attachment N.

4. General Safety Practices

4.1 General Safety Rules

General safety rules for site activities include, but are not limited to, the following:

- At least one copy of this HASP must be in a location at the site that is readily available to personnel and all project personnel shall review and sign this HASP prior to starting work.

- Consume or use food, beverages, chewing gum and tobacco products only in the SZ or other designated areas outside the EZ and CRZ. Cosmetics shall not be applied in the EZ or CRZ.

- Wash hands before eating, drinking, smoking or using toilet facilities.

- Wear all PPE, as required, and stop work and replace damaged PPE immediately.

- Secure disposable coveralls, boots and gloves at the wrists and legs and confirm closure of the suit around the neck.

- Upon skin contact with materials that may be impacted by COCs, remove contaminated clothing and wash the affected area immediately. Contaminated clothing must be changed. Any skin contact with materials potentially impacted by COCs must be reported to the HSS immediately. If needed, medical attention should be sought.

- Practice contamination avoidance. Avoid contact with surfaces either suspected or known to be impacted by COCs, such as standing water, mud or discolored soil. Equipment must be stored on elevated or protected surfaces to reduce the potential for incidental contamination.

- Remove PPE, as required, in the CRZ to limit the spread of COC-containing materials.

- At the end of each shift or as required, dispose of all single-use coveralls, soiled gloves and respirator cartridges in designated receptacles designated for this purpose.

- Do not remove soil containing site COCs from protective clothing or equipment with compressed air, shaking or any other means that disperses contaminants into the air.

- Inspect all non-disposable PPE for contamination in the CRZ. Any PPE found to be contaminated must be decontaminated or disposed appropriately.

- Recognize emergency signals used for evacuation, injury, fire, etc.

- Report all injuries, illnesses, near misses,and unsafe conditions or work practices to the HSS.

- Use the "buddy system" during all operations requiring Level C PPE, and when appropriate, during Modified Level D operations.

- Obey all warning signs, tags and barriers. Do not remove any warnings unless authorized to do so.

- Use, adjust, alter and repair equipment only if trained and authorized to do so, and in accordance with the manufacturer's directions.

- Discard faulty tools.

- Personnel are to perform only tasks for which they have been properly trained and will advise their supervisor if they have been assigned a task for which they are not trained.

- When passenger vehicles are in motion, all occupants must be seated in designated areas of the passenger vehicle and wear safety belts. Personnel may not occupy the bed of trucks or trailers while the vehicle is in motion.

- The presence or consumption of alcoholic beverages or illicit drugs during the workday, including breaks, is strictly prohibited. Notify your supervisor if you must take prescription or over-the-counter drugs that indicate they may cause drowsiness or that heavy equipment should not be operated.

- Remain upwind during site activities whenever possible.

4.2 Drug, Alcohol and Search Policy

Employees will comply with Chevron's Drug, Alcohol and Search Policy (Exhibit-Safety Regulations, Contract No. 99014516). Subcontractors, by acceptance of ARCADIS BBL's Subcontractor Agreement Form and the Schedule "D" Flowdown provisions, must also comply with this policy. According to the Policy:

- CONTRACTOR (ARCADIS BBL) shall have the right to perform controlled substance and alcohol tests based on a reasonable belief by CONTRACTOR or COMPANY (Chevron) that an individual is using alcohol or drugs on the basis of specific physical, behavioral or performance indicators.

- CONTRACTOR shall have the right to remove any employee from performing work if the individual exhibits unusual job behavior or unacceptable job performance and is believed by CONTRACTOR or COMPANY that he/she may be using controlled substances or presently under the influence of alcohol.

Work should be stopped immediately if at any time an employee or subcontracor's employee is suspected of being under the influence. The employee's supervisor should be contacted and arrangements made for transportation for the employee from the site. The cut-off level for a positive alcohol test is a blood alcohol concentration of no more than 0.04 percent.

4.3 Loss Prevention System

LPS™ is a behavior-based safety system meant to prevent or reduce the occurrence of injury, illness or other incident. This program seeks the prevention or reduction of losses by:

- Emphasizing proactive activities.

- Capitalizing on the on-the-job expertise of field employees.

- Maximizing the use of positive reinforcement.

- Integrating with daily field operations.

- Solving problems from the bottom up while providing direction from the top down.

Prior to assignment on a project in the field, ARCADIS BBL personnel that will be performing or overseeing work on this project must attend an LPS™ training session. This training session explains the objectives, elements and requirements of LPS™. Elements of the LPS™ program are briefly outlined below in Sections 4.3.2 and 4.3.2.2.

4.3.1 Safe Performance Self-Assessment

All on-site personnel are required to perform an SPSA prior to beginning any activity. This three-step process requires each individual to:

- *Assess* the risk of the task to be performed. Ask the following questions:
  - What could go wrong?
  - What is the worst thing that could happen if something does go wrong?
- *Analyze* the ways the risk can be reduced. Ask the following questions:
  - Do I have all the necessary training and knowledge to do this task safely?
  - Do I have all the proper tools and PPE?
- *Act* to control the risk and perform the task safely.
  - Take the necessary action to perform the job safely.
  - Follow written procedures and ask for assistance, if necessary.

This process must be performed prior to beginning any activity and must be performed after any near miss or other incident in order to determine if it is safe to proceed.

4.3.2 Loss Prevention System™ Reporting

Optimization of LPS™ depends upon timely reporting both internally and externally of all types of LPS™ tools (near misses, observations, and incidents). Detailed descriptions of LPS tools™ are discussed in detail in the sections below.

4.3.2.1 Incident Investigation

An incident is any of the following events: first-aid cases, injuries, illnesses, near misses, spills/leaks, equipment and property damage, motor vehicle accidents, regulatory violations, fires and business interruptions. All incidents shall be reported to the PM, the PO and the HSO immediately and investigated within 24 hours. In the event that one of those individuals cannot be contacted, a voice message should be left and the next individual in the chain should be contacted. Follow up with the absent individual should occur as soon as possible.

The purpose of an II is to prevent the recurrence of a similar hazardous event. An II investigates all incidents in the same manner. Using the information gathered during an II, appropriate measures will be taken to protect personnel from the hazard in question. The II form is included in Attachment O.

The flowchart on the following page outlines steps to be taken in the event of an incident or near miss.

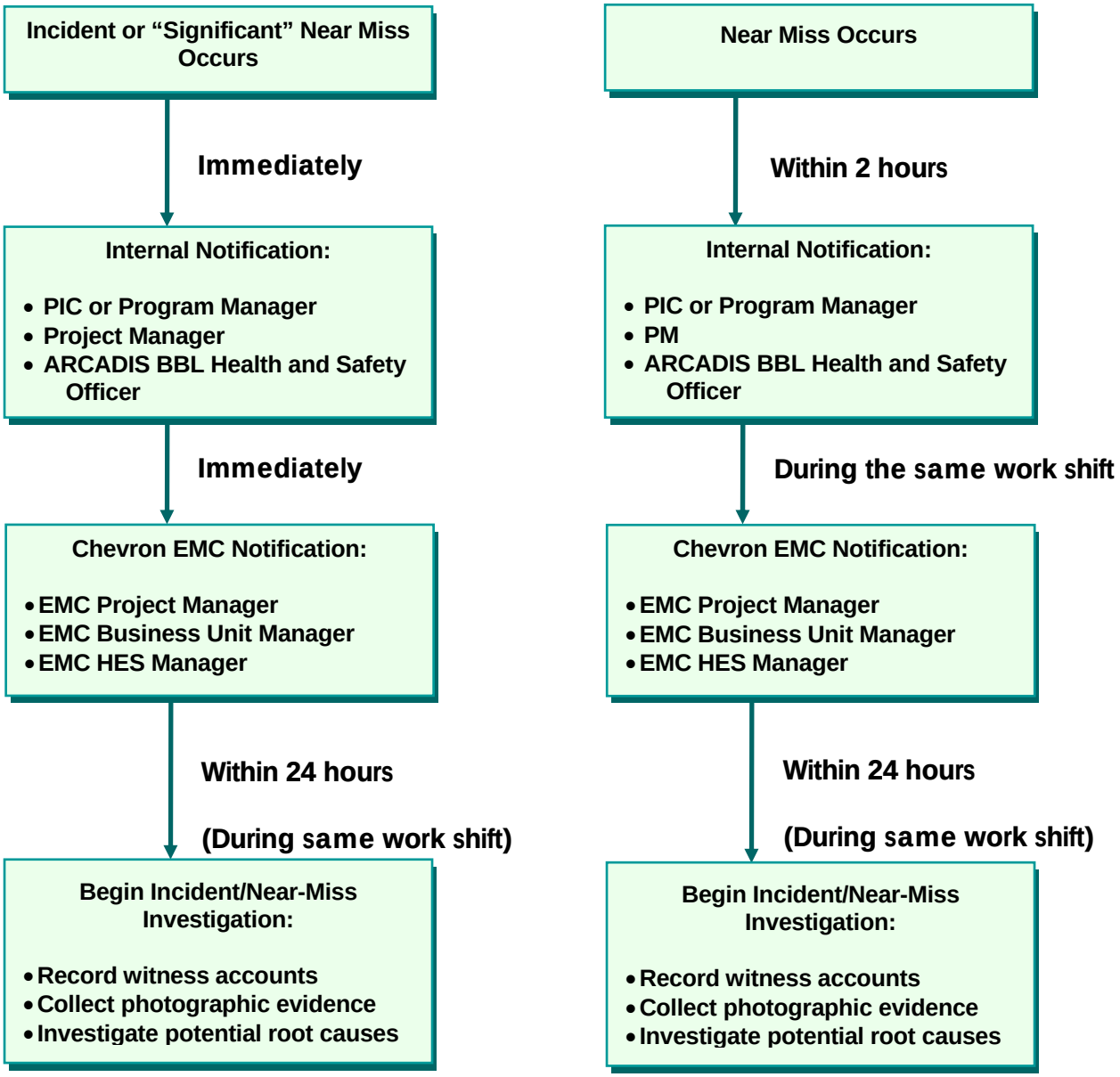
4.3.2.2 Loss Prevention Observation

The HSS or designee will perform the LPO. An LPO form is provided in Attachment P. The purpose of the LPO is to identify and correct potential hazards and to positively reinforce behaviors and practices that are correct. The HSS must identify potential deviations from safe work practices that could possibly result in an incident and take prompt corrective action. A minimum of one observation will be performed per 500 hours for a specific task and one per 200 hours for higher risk tasks. The LPO process steps are:

- Identify tasks that have the greatest potential for hazardous incidents.
- Review the standard procedure for completing the task.

- Discuss with the observed employee the task and the HSS role in observing the task.
- Observe the employee completing the task.
- Reference the LPO form for criteria. Complete the form, documenting positive, as well as areas in need of improvement.
- Discuss the results of the LPO with the employee. Discuss corrective action necessary.
- Implement corrective action.
- Communicate the results of the LPO and corrective action to the PM and the HSO.
- Verify and validate corrective actions are implemented.

Incident and Near-Miss Reporting Process Flowchart



4.3.2.3 Job Safety Analysis

A JSA is a tool used to identify potential hazards and develop corrective or protective systems to eliminate the hazard. A JSA lists all the potential hazards associated with a task or activity and can include site-specific concerns associated with the task or activity. Hazards may be physical, such as lifting hazards or eye hazards, or environmental, such as weather or biological (e.g., stinging insects, snakes). Following the identification of the hazards associated with an activity, control measures are evaluated and protective measures or procedures are then instituted. JSAs are reviewed daily to confirm that the procedures and protective equipment specified for each task or activity are current and technically correct. Any changes in site conditions and/or the scope of work will require a review and modification to the JSA in question. During this review process, comments on the JSA and its procedures should be obtained from personnel associated with the activity being analyzed. At a minimum, a JSA will outline the safety requirements for a corresponding specific task, as detailed in Section 3 of this HASP.

4.4 Contact Lenses

According to NIOSH, wearing contact lenses does not appear to require enhanced eye and face protection. For chemical vapor, liquid or caustic dust hazards, the minimum protection consists of well-fitting nonvented or indirectly vented goggles or full-facepiece respirators. Close-fitting safety glasses with side protection provide limited chemical protection but do not prevent chemicals from bypassing the protection. Workers should wear face shields over other eye protection when needed for additional face protection but they should not wear face shields instead of goggles or safety glasses – regardless of contact lens wear. ARCADIS BBL personnel and subcontractors are permitted to wear contact lens at this site when performing routine tasks identified in this HASP.

4.5 Buddy System

On-site personnel must use the buddy system as required by operations. Use of the buddy system is required during all operations requiring Level C to Level A PPE and, when appropriate, during Level D operations. Crew members must observe each other for signs of chemical exposure and heat or cold stress. Indications of adverse effects include, but are not limited to:

- changes in complexion and skin coloration

- changes in coordination
- changes in demeanor
- excessive salivation and pupillary response
- changes in speech pattern

Crew members must also be aware of the potential exposure to possible safety hazards, unsafe acts or non-compliance with safety procedures.

Field personnel must inform their partners or fellow crewmembers of non-visible effects of exposure to toxic materials that they may be experiencing. The symptoms of such exposure may include, but are not limited to:

- headaches
- dizziness
- nausea
- blurred vision
- cramps
- irritation of eyes, skin or respiratory tract

If protective equipment or noise levels impair communications, prearranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

4.6 Heat Stress

Heat stress is caused by several interacting factors, including environmental conditions, clothing and workload, as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be able to recognize the signs and symptoms of heat-related illnesses. Personnel

must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in themselves and their coworkers.

4.6.1 Heat Rashes

Heat rashes are one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules (bumps) and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

4.6.2 Heat Cramps

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much or too little salt.

Cramps appear to be related to a lack of water replenishment. Excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a sign of the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate electrolyte replacement liquid, such as Gatorade®, is effective in minimizing physiological disturbances during recovery.

4.6.3 Heat Exhaustion

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency or dehydration. Signs and symptoms include:

- pale, cool, moist skin

- heavy sweating
- dizziness
- nausea
- headache
- vertigo
- weakness
- thirst
- giddiness

Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, given fluid replacement and be encouraged to get adequate rest.

4.6.4 Heat Stroke

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails, and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors and its occurrence is difficult to predict.

Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are:

- hot, dry skin

- confusion
- irrational behavior
- loss of consciousness
- convulsions
- a lack of sweating (usually)
- an abnormally high body temperature (e.g., a temperature greater than 104 degrees Fahrenheit [°F]).

If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first-aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

4.6.5 Heat Stress Safety Precautions

Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. Screening criteria for heat stress

exposure are described in Table 4-1 and examples of activities within metabolic rate categories are provided in Table 4-2.

Table 4-1
Work/Rest Schedule

	Acclimatized				Unacclimatized			
Work Demands	**Light**	**Moderate**	**Heavy**	**Very Heavy**	**Light**	**Moderate**	**Heavy**	**Very Heavy**
100% Work	85.1ºF (29.5ºC)	81.5ºF (27.5ºC)	78.8ºF (26ºC)	--	81.5ºF (27.5ºC)	77ºF (25ºC)	72.5F (22.5ºC)	--
75% Work; 25% Rest	86.9ºF (30.5ºC)	83.3ºF (28.5ºC)	81.5ºF (27.5ºC)	--	84.2ºF (29ºC)	79.7ºF (26.5ºC)	76.1ºF (24.5ºC)	--
50% Work; 50% Rest	88.7ºF (31.5ºC)	85.1ºF (29.5ºC)	83.3ºF (28.5ºC)	81.5ºF (27.5ºC)	86ºF (30ºC)	82.4ºF (28ºC)	79.7ºF (26.5ºC)	77ºF (25ºC)
25% Work, 75% Rest	90.5ºF (32.5ºC)	87.8ºF (31ºC)	86ºF (30ºC)	85.1ºF (29.5ºC)	87.8ºF (31ºC)	84.2ºF (29ºC)	82.4ºF (28ºC)	79.7ºF (26.5ºC)

Source: 2004 TLVs and BEIs – TLBs for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: ACGIH, 2004 – page 171.

TABLE 4-2
Example Activities within Metabolic Ranges

Categories	Example Activities
Resting	Sitting quietly
	Sitting with moderate arm movements
Light	Sitting with moderate arm and leg movements
	Standing with light work at machine or bench while using mostly arms
	Using a table saw
	Standing with light or moderate work at machine or bench and some walking about
Moderate	Scrubbing in a standing position
	Walking about with moderate lifting or pushing
	Walking on a level at 6 kilometers per hour while carrying 3 kilograms weight load
Heavy	Carpenter sawing by hand
	Shoveling dry sand
	Heavy assembly work on a noncontinuous basis
	Intermittent heavy lifting with pushing or pulling (e.g., pick-and-shovel work)
Very Heavy	Shoveling wet sand

Source: 2004 TLVs and BEIs – Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: ACGIH, 2004 – page 172

Acclimatization is a set of physiological adaptations that allows the body to react to heat stress conditions. Full-heat acclimatization requires up to 3 weeks of continued physical activity under heat-stress conditions similar to those anticipated for the work. Its loss begins when the activity under those heat stress conditions is discontinued and a noticeable loss occurs after 4 days. With a recent history of heat stress exposures (e.g., 5 of the last 7 days), a worker can be considered acclimatized for the purpose of using the table Screening Criteria for Heat Stress Exposure.

Additionally, one or more of the following control measures can be used to help control heat stress and are mandatory if any site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.
- On-site drinking water will be kept cool (50 to 60°F).
- A work regimen that will provide adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion and heat cramps.
- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Employees should be instructed to monitor themselves and coworkers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area must be provided. All breaks should take place in the shaded rest area.
- Employees must not be assigned to other tasks during breaks.
- Employees must remove impermeable garments during rest periods. This includes white Tyvek™-type garments.

All employees must be informed of the importance of adequate rest, acclimation and proper diet in the prevention of heat stress disorders.

4.7 Cold Stress

Cold stress normally occurs in temperatures at or below freezing, or under certain circumstances in temperatures of 40°F. Extreme cold for a short time may cause severe injury to exposed body surfaces or result in profound generalized cooling, causing death. Body areas that have high surface area-to-volume ratio, such as fingers, toes and ears, are the most susceptible. Two factors influence the development of a cold-weather injury: ambient temperature and wind velocity. For instance, a temperature of 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at 18°F. An equivalent chill temperature chart relating the actual dry-bulb temperature and wind velocity is presented in Table 4-3 below.

Table 4-3
Wind Chill Temperature Chart

Estimated Wind Speed (in mph)	Actual Temperature Reading (ºF)											
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**
	Equivalent Chill Temperature (ºF)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	Little Danger Maximum danger of false sense of security.				Increasing Danger Danger from freezing of exposed flesh within one minute.			Great Danger Flesh may freeze within 30 seconds.				
	Trench foot and immersion foot may occur at any point on this chart.											

(This chart was developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA
[Source: ACGIH TLV Handbook, ACGIH, 2002a]).

Local injury resulting from cold is included in the generic term “frostbite.” There are several degrees of tissue damage associated with frostbite. Frostbite of the extremities falls into the following categories:

- *Frost Nip or Incipient Frostbite* – Characterized by sudden blanching or whitening of skin.
- *Superficial Frostbite* – Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.

- *Deep Frostbite* – Tissues are cold, pale and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. It can be fatal. Its symptoms are usually exhibited in five stages:

- shivering
- apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F
- unconsciousness, glassy stare, slow pulse and slow respiratory rate
- freezing of the extremities
- death

Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first-aid treatment. To avoid cold stress, site personnel must wear protective clothing appropriate for the level of cold and physical activity. In addition to protective clothing, preventive safe work practices, additional training and warming regimens may be used to prevent cold stress.

4.7.1 Cold Stress Safety Precautions

The following safety precautions should be followed to prevent cold stress:

- For air temperature of 0°F or less, mittens should be used to protect the hands. For exposed skin, continuous exposure should not be permitted when air speed and temperature results in a wind chill temperature of -25°F.
- At air temperatures of 36°F or less, field personnel who become immersed in water or whose clothing becomes wet must be immediately provided with a change of clothing and be treated for hypothermia.
- If work is done at a normal temperature or in a hot environment before entering the cold, the field personnel must confirm that their clothing is not wet

as a consequence of sweating. If wet, field personnel must change into dry clothes prior to entering the cold area.

- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work must be modified or suspended until adequate clothing is made available or until weather conditions improve.

Field personnel handling evaporative liquid (e.g., gasoline, alcohol, cleaning fluids) at air temperatures below 40°F must take special precaution to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

4.7.2 Safe Work Practices

The following safe work practices must be employed to prevent cold stress:

- Direct contact between bare skin and cold surfaces (less than 20°F) should be avoided. Metal tool handles and/or equipment controls should be covered by thermal insulating material.

- For work performed in a wind chill temperature at or below 10°F, workers should be under constant protective observation (buddy system). The work rate should be established to prevent heavy sweating that will result in wet clothing. For heavy work, rest periods must be taken in heated shelters and workers should be provided with an opportunity to change into dry clothing if needed.

- Field personnel should be provided the opportunity to become accustomed to cold-weather working conditions and required protective clothing.

- Work should be arranged in such a way that sitting or standing still for long periods is minimized.

During the warming regimen (rest period), field personnel should be encouraged to remove outer clothing to permit sweat evaporation or to change into dry work clothing. Dehydration, or loss of body fluids, occurs insidiously in the cold environment and may increase susceptibility to cold injury due to a significant change in blood flow to the extremities. Fluid replacement with warm, sweet drinks and soups is recommended. The intake of coffee should be limited because of diuretic and circulatory effects.

4.8 Biological Hazards

Biological hazards may include poison ivy, snakes, thorny bushes and trees, ticks, mosquitoes, fire ants, scorpions and other pests.

4.8.1 Tick Borne Diseases

Lyme disease – The disease commonly occurs in summer and is transmitted by the bite of infected ticks.

Erlichiosis – The disease also commonly occurs in summer and is transmitted by the bite of infected ticks.

These diseases are transmitted primarily by the deer tick, which is smaller and redder than the common wood tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull's eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck and swelling and pain in the joints, and eventually, arthritis. Symptoms of erlichiosis include muscle and joint aches, flu-like symptoms, but there is typically no skin rash.

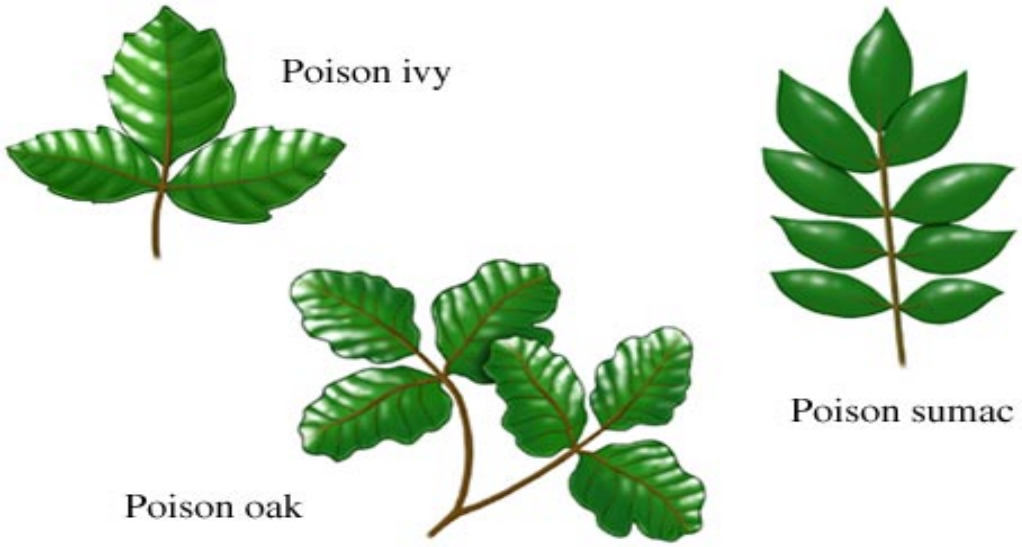
Rocky Mountain Spotted Fever (RMSF) – This disease is transmitted via the bite of an infected tick. The tick must be attached 4 to 6 hours before the disease-causing organism (*Rickettsia rickettsii*) becomes reactivated and can infect humans. The primary symptom of RMSF is the sudden appearance of a moderate-to-high fever. The fever may persist for 2 to 3 weeks. The victim may also have a headache, deep muscle pain and chills. A rash appears on the hands and feet on about the third day and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death, if untreated, but if identified and treated promptly, death is uncommon.

Control – Tick repellant containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pant legs should be tucked into boots. In addition, workers should search the entire body every 3 or 4 hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling

action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

4.8.2 Poisonous Plants

Poisonous plants may be present in the work area. Personnel should be alerted to its presence, and instructed on methods to prevent exposure.



Poison oak has leaves that look like oak leaves, usually with three leaflets but sometimes up to seven leaflets per leaf group. It grows as a vine or a shrub. Poison oak is more common in the western United States, but it is also found in the eastern United States and, rarely, in the Midwest.

Poison sumac has seven to 13 leaflets per leaf stem. All plant parts are poisonous. The leaves have smooth edges and pointed tips. Poison sumac grows as a shrub or small tree. The lack of leaflet glands, “wings” between the leaflets, and teeth on the leaves, in addition to this species' red stems supporting the leaflets and leaves, help to distinguish this plant from similar-looking nonpoisonous species, such as other sumacs and tree-of-heaven. It is found in wooded, swampy areas and in wet, wooded areas in the northern United States.

Poison Oak

Poison Sumac

Control – The main control for poisonous plants is to avoid contact with the plant, cover arms and hands and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated and practice contamination avoidance.

Contact with poisonous plants is very easy to treat ***if*** you identified your contact with the irritating plant within a few hours of the incident. The urushiol oil present in both plants chemically bonds with the proteins in your skin about 30 minutes after contact. Seventy-five percent of the population is affected by contact with urushiol, although immunity to urushiol today does not assure immunity tomorrow, and vice versa. Rash symptoms can appear within a few hours but can take 2 to 5 days to appear. The rash starts as a red, annoyingly itchy area that starts to swell. The area then gets inflamed and will get covered in clusters of tiny pimples, the pimples eventually merge and turn into blisters. The fluid in the blisters turns yellow, dries up and becomes crusty. Left completely untreated, this cycle can last as short as 5 days and in severe cases as long as 5 to 6 weeks.

If you come in contact with a poisonous plant, or an animal exposed to any of these, or tools, gear, or clothing exposed to any of these, you should wash off with hot water (not so hot that it burns) and strong soap as soon as possible. If you can get washed up in the first 6 hours before the first symptoms appear, you have a good chance of avoiding an outbreak, and an even better chance of minimizing the effects if you do have one.

4.8.3 Snakes

The possibility of encountering snakes exists, specifically for personnel working in wooded/vegetated areas. Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties; cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs; defects in coagulation; and effects from local release of substances by enzymatic actions. Other noticeable effects of venomous snakebites include swelling, edema and pain around the bite and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

Control – To minimize the threat of snakebites, all personnel walking through vegetated areas must be aware of the potential for encountering snakes and the need to avoid actions that might cause encounters. To lower the risk of being bitten:

- Leave snakes alone. Many people are bitten because they try to kill a snake or get a closer look at it.
- Stay out of tall grass unless you wear thick leather boots. Snake gators may be needed for work in swampy and/or heavily wooded areas.
- Keep hands and feet out of areas you can not see. Do not pick things up from tall grass, vegetated areas or debris piles without first disturbing the area with a long implement.
- Observe tree limbs and branches before making contact since many snakes live in trees.

If a snake bite occurs, a quick attempt should be made to identify the snake via size and markings. The victim must be transported to the nearest hospital immediately. First aid consists of washing the area around the wound to remove any unabsorbed venom, immobilizing the wounded area and placing it lower than the heart. If medical attention cannot be given within 30 minutes, a band may be applied directly above the wound to restrict the movement of venom – do not apply a tourniquet. The band should be loose enough for a finger to pass beneath it, and should not restrict the flow of blood to the area.

4.8.4 Spiders

Personnel may encounter spiders during work activities.

Two spiders are of concern: the black widow and the brown recluse. Both prefer dark sheltered areas, such as basements, equipment sheds and enclosures and around woodpiles or other scattered debris. The black widow is shiny black, approximately 1-inch-long and found throughout the United States. There is a distinctive red hourglass marking on the underside of the black widow's body. The bite of a black widow is seldom fatal to healthy adults, but effects include respiratory distress, nausea, vomiting and muscle spasms. The brown recluse is smaller than the black widow and gets its name from its brown coloring and behavior. The brown recluse is more prevalent in the southern United States. The brown recluse has a distinctive violin shape on the top of its body. The bite of the brown recluse is painful and the bite site ulcerates and takes many weeks to heal completely.

Control – To minimize the threat of spider bites, all personnel walking through vegetated areas must be aware of the potential for encountering these arachnids. Personnel need to avoid actions that may result in encounters, such as turning over logs and placing hands in dark places, such as behind equipment or in corners of equipment sheds or enclosures. If a spider bite occurs, the victim must be transported to the nearest hospital as soon as possible; first aid consists of applying ice packs and washing the area around the wound to remove any unabsorbed venom.

4.8.5 Mosquitoes

Personnel may be exposed to mosquitoes during work activities.

Typical exposure to mosquitoes does not present a significant hazard. However, if West Nile virus is prevalent in the area exposure to this virus is increased. West Nile virus results in flu-like symptoms and can be serious if not treated or in immune-compromised individuals.

Control – To minimize the threat of mosquito bites, all personnel working outside must be aware of the potential for encountering mosquitoes and implement the basic precautions listed below:

- Avoid working at dawn or dusk when mosquitoes are most active.

- Prevent accumulation of standing water at the work site.
- Apply an insect repellent that contains DEET to exposed skin and to clothing.
- Wear light colored clothes, preferably with long sleeves and full-length pants.
- Do not touch any dead birds or animals that you encounter.

If dead birds are detected near the site, report to the local County Health Department. If flu-like symptoms are present, contact your doctor or the HSO for more information.

4.8.6 Other Stinging Insects

Thousands of other insects are capable of stinging and producing a negative reaction in humans. These insects include bees, wasps, hornets and centipedes. Some insects are more likely than others to cause allergic or toxic reactions.

- A bee leaves the stinger behind and then dies after stinging. Africanized honeybees, the so-called killer bees, are more aggressive than common honeybees and often attack together in great numbers.
- Wasps, including hornets and yellow jackets, can sting over and over. Yellow jackets cause the greatest number of allergic reactions.

Bites and stings are more serious if you develop one or more of the following conditions after an insect bite or sting. These conditions include:

- A toxic reaction.
- A large skin reaction.
- Signs of a skin infection.
- A severe allergic reaction (anaphylaxis).

Anaphylaxis is a sudden, severe allergic reaction. In anaphylactic shock, the most severe form of anaphylaxis, blood pressure drops severely; water rapidly leaves the blood stream, causing severe swelling; and bronchial tissues swell dramatically. This

causes the person to choke and collapse. Anaphylactic shock is fatal if not treated immediately.

Anaphylaxis occurs usually within minutes of exposure to the allergen and almost always within 2 hours. The most severe cases may be fatal just 10 minutes after exposure. If administered in time, an injection of epinephrine (adrenaline) may reverse the condition by quickly constricting blood vessels, increasing the heart rate, stopping the swelling around the face and throat and relaxing smooth muscles in the lungs. Because anaphylaxis can progress so quickly, the first signs of reaction should be taken seriously. Do not wait to see how serious the reaction may become; call for emergency help immediately.

It is recommended that all site workers with known allergies to insects, such as allergies to bees, inform coworkers of their condition and carry the appropriate medication with them into the field.

Control – To minimize the risk of insect bites, long sleeves and full-length pants should be worn, if possible. All personnel working in vegetated areas and/or around debris piles and monitoring wells must be aware of the potential for encountering stinging insects. Personnel should avoid actions that may result in encounters, such as turning over logs and placing hands in dark places, such as behind equipment or in corners of equipment sheds or enclosures. First aid for all stings and bites consist of washing the area around the wound to remove any unabsorbed venom and applying ice packs to minimize swelling.

4.9 Noise

Exposure to noise over the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increases with the greater the intensity and the longer the duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on site. As a general rule, sound levels that cause speech interference at normal conversation distance probably require the use of hearing protection.

Control – All personnel must wear hearing protection with a Noise Reduction Rating (NRR) of at least 20, when noise levels exceed 85 dBA. When it is difficult to hear a coworker at normal conversation distance, the noise level is approaching or exceeding 85 dBA and hearing protection is necessary. All site personnel who may be exposed

to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss. Noise monitoring is discussed in Section 6.2 – Noise Monitoring.

Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, barriers or increased distance will be used to minimize worker exposure to noise, if feasible.

4.10 Spill Control

All personnel must take every precaution to minimize the potential for spills during site operations. All on-site personnel shall immediately report any discharge, no matter how small, to the HSS.

Spill control equipment and materials will be located on site at locations that present the potential for discharge. All sorbent materials used for the cleanup of spills will be containerized and labeled appropriately. In the event of a spill, the HSS will follow the provisions in Section 9 – Emergency Procedures to contain and control released materials and to prevent their spread to off site areas.

4.11 Sanitation

Site sanitation will be maintained according to OSHA requirements.

4.11.1 Break Area

Breaks must be taken in the SZ, away from the active work area after site personnel go through decontamination procedures. There will be no smoking, eating, drinking or chewing gum or tobacco in any area other than the SZ.

4.11.2 Potable Water

The following rules apply to all field operations:

- An adequate supply of potable water will be provided at each project site. Potable water must be kept away from hazardous materials or media and contaminated clothing or equipment.

- Portable containers used to dispense drinking water must be capable of being tightly closed and must be equipped with a tap dispenser. Water must not be consumed directly from the container (drinking from the tap is prohibited) nor may it be removed from the container by dipping.

- Containers used for drinking water must be clearly marked and shall not be used for any other purpose.

- Disposable drinking cups must be provided. A sanitary container for dispensing cups and a receptacle for disposing used cups is required.

4.11.3 Sanitary Facilities

Access to facilities for washing before eating, drinking or smoking, or alternate methods, such as waterless hand-cleaner and paper towels, will be provided.

4.11.4 Lavatory

If permanent toilet facilities are not available, an appropriate number of portable chemical toilets will be provided for projects with greater than a 5-day duration.

This requirement does not apply to mobile crews or to normally unattended site locations so long as employees at these locations have transportation immediately available to nearby toilet facilities.

4.12 Emergency Equipment

Adequate emergency equipment for the activities being conducted on site and as required by applicable sections of 29 CFR 1910 and 29 CFR 1926 will be on site prior to the commencement of project activities. Personnel will be provided with access to emergency equipment, including, but not limited to, the following:

- Fire extinguishers of adequate size, class, number and location, as required by applicable sections of and 29 CFR 1910.38 and 1926.156.

- Industrial first-aid kits of adequate size for the number of personnel on site.

- Emergency eyewash and/or shower, if required by operations being conducted on site.

4.13 Lockout/Tagout Procedures

Only fully qualified and trained personnel will perform maintenance procedures. Before maintenance begins, lockout/tagout procedures per General Industry Safety Orders, Electrical Safety Orders 23.20.4 and OSHA 29 CFR 1910.147 will be followed.

Lockout is the placement of a device that uses a positive means, such as a lock, to hold an energy- or material-isolating device, such that the equipment cannot be operated until the lockout device is removed. If a device cannot be locked out, a tagout system shall be used. Tagout is the placement of a warning tag on an energy- or material-isolating device indicating that the equipment controls may not be operated until the tag is removed by the personnel who attached the tag. Attachment Q presents logout/tagout equipment specific energy control procedures.

4.14 Electrical Safety

Electricity may pose a particular hazard to site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, a qualified electrician must perform it.

General electrical safety requirements include:

- All electrical wiring and equipment must be a type listed by Underwriters Laboratories (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.
- All installations must comply with the National Electrical Safety Code, the National Electrical Code or USCG regulations.
- Portable and semiportable tools and equipment must be grounded by a multiconductor cord having an identified grounding conductor and a multicontact polarized plug-in receptacle.
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double-insulated tools must be distinctly marked and listed by UL or FM.
- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.

- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections or pinching.

- All circuits must be protected from overload.

- Temporary power lines, switchboxes, receptacle boxes, metal cabinets and enclosures around equipment must be marked to indicate the maximum operating voltage.

- Plugs and receptacles must be kept out of water unless of an approved submersible construction.

- All extension cord outlets must be equipped with ground-fault circuit interrupters.

- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.

- Extension cords or cables must be inspected prior to each use and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails or suspended by bare wire.

- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

4.15 Lifting Safety

Using proper lifting techniques may prevent back strain or injury. The fundamentals of proper lifting include:

- Consider the size, shape and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.

- The hands and the object should be free of dirt or grease that could prevent a firm grip.

- Gloves must be used and the object inspected for metal slivers, jagged edges, burrs or rough or slippery surfaces.
- Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.
- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body with the knees bent.
- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.
- A worker should not carry a load that he or she cannot see around or over.
- When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees and the back is straight as the object is lowered.

4.16 Confined Space Entry

Confined space entry by ARCADIS BBL employees is not anticipated on site. In the event that the scope of work changes and confined space entry by ARCADIS BBL employees is required, a HASP addendum will be prepared to address confined space entry requirements. In that case, confined space entry would be performed only by trained personnel using established procedures defined by ARCADIS BBL and included in the appropriate HASP addendum.

4.17 Traffic Safety

The project site is located adjacent to a public roadway where exposure to vehicular traffic is possible. Traffic may also be encountered as vehicles enter and exit the area. To minimize the likelihood of project personnel and activities being affected by traffic, the following procedures will be implemented.

Cones must be placed along the shoulder of the roadway starting 100 feet from the work area to alert passing motorists to the presence of personnel and equipment when

working within a lane of traffic. A “Slow” or “Men Working” sign must be placed at the first cone. Barricades with flashing lights should be placed between the roadway and the work area.

During activities along a roadway, equipment will be aligned parallel to the roadway to the extent feasible, facing into the oncoming traffic so as to place a barrier between the work crew and the oncoming traffic. All crewmembers must remain behind the equipment and the traffic barrier.

All site personnel who are potentially exposed to vehicular traffic must wear an outer layer of orange warning garments, such as vests, jackets or shirts. If work is performed in hours of dusk or darkness, workers will be outfitted with reflective garments in colors of either orange, white (including silver-coated reflective coatings or elements that reflect white light), yellow, fluorescent red-orange or fluorescent yellow-orange.

The flow of traffic into and out of the adjacent business must be assessed, and precautions taken to warn motorists of the presence of workers and equipment. Where possible, vehicles should be aligned to provide physical protection of people and equipment.

If work is to be conducted within a Department of Transportation (DOT) right-of-way, or within 15 feet of a DOT right-of-way, a permit must be obtained from the DOT and a Maintenance of Traffic (MOT) Plan must be prepared and approved by the DOT. The MOT may include placement of cones, barricades and/or “men working” signs. A detailed TCP, including a site map depicting traffic control measures, is included with the JMP in Attachment H.

4.18 Waste Management

The handling and disposal of investigation-derived waste (IDW) material generated at the site during investigative activities will be managed in accordance with ARCADIS BBL’s Standard Operating Procedure (SOP): Handling and Storing Investigation-Derived Waste. This SOP is included as Attachment R. The SOP will be used in accordance with state, local and Chevron guidelines. Additionally, the site-specific requirement for the COCs will be taken into account for the handling of the IDW at this facility.

5. Personal Protective Equipment

5.1 Levels of Protection

PPE is required to safeguard site personnel from various hazards. Varying levels of protection may be required depending on the levels of COCs and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level. A summary of the levels is presented in Table 5-1 in this section.

5.1.1 Level D Protection

The minimum level of protection that will be required of ARCADIS BBL personnel and subcontractors at the site will be Level D, which will be worn when site conditions or air monitoring indicates no inhalation hazard exists. The following equipment will be used:

- work clothing as prescribed by the weather and safety vest
- steel toe and shanked work boots, meeting American National Standards Institute (ANSI) Z41, and puncture resistant insoles, as required by the Site-Specific/Task-Specific JSA
- safety glasses or goggles, meeting ANSI Z87
- outer gloves chosen based on COCs over nitrile surgical gloves (if handling soil or groundwater)
- hard hat, meeting ANSI Z89
- hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used) – see Section 6.2

5.1.2 Modified Level D Protection

Modified Level D will be used when airborne contaminants are not present at levels of concern, but site activities present an increased potential for skin contact with contaminated materials. Modified Level D consists of:

- nitrile gloves worn over nitrile surgical gloves

- steel toe and shanked work boots, meeting ANSI Z41, and puncture resistant insoles as required by the Site-Specific/Task-Specific JSA
- safety glasses or goggles, meeting ANSI Z87
- face shield, in addition to safety glasses or goggles when projectiles or splash hazards exist, as required by the Site-Specific/Task-Specific JSA
- hard hat, meeting ANSI Z89
- hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used) – see Section 6.2
- safety vest and Tyvek® suit (polyethylene coated Tyvek® suits for handling liquids) when physical contact with COC-impacted media is anticipated

5.1.3 Level C Protection

Level C protection will be required when the airborne concentration of COCs reaches one-half of the OSHA Permissible Exposure Limit or ACGIH TLV. The following equipment will be used for Level C protection:

- full-face, NIOSH-approved, air-purifying respirator with cartridges selected for the types of COC present on site
- safety vest and polyethylene-coated Tyvek® suit, with ankles and cuffs taped to boots and gloves
- nitrile gloves worn over nitrile surgical gloves
- steel toe work boots meeting ANSI Z41 with puncture resistant insoles
- chemical resistant boots with steel toes or latex/polyvinyl chloride overboots over steel toe boots
- hard hat, meeting ANSI Z89
- hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)

5.2 Selection of Personal Protective Equipment

PPE will be selected based on the potential for contact, site conditions, ambient air quality and the judgment of supervising site personnel and health and safety professionals. The PPE used will be chosen to be effective against the COCs present onsite.

Specifically, the level of PPE selected will be based on air monitoring of the work environment and an assessment by the HSS of the potential for skin contact with COCs. The PPE selection matrix is presented in Table 5-1 below. This matrix is based on information available at the time this HASP was written. The Airborne Contaminant Action Levels in Table 6-1 (Provided in Section 6) should be used to verify that the PPE prescribed in Table 5-1 is appropriate. Site-specific PPE requirements are discussed in each Site-Specific/Task-Specific JSA.

TABLE 5-1
PPE Selection Matrix

Task	Anticipated Level of Protection
Installation of Groundwater Monitoring Wells	Modified Level D
Groundwater Sampling and Monitoring	Modified Level D
Soil Sampling	Modified Level D
Soil Excavation	Modified Level D
Decontamination	Level D/Modified Level D

5.3 Site Respiratory Protection Program

Respiratory protection is an integral part of employee health and safety at the site due to potentially hazardous concentrations of airborne COCs. Respirator use is not anticipated at this site, but, if air monitoring indicates increased COC concentrations, a respirator will be required. The site respiratory protection program will consist of the following (as a minimum):

- All on-site personnel who may use respiratory protection will have an assigned respirator.
- All on-site personnel who may use respiratory protection will have been fit tested and trained in the use of a full-face air-purifying respirator within the past 12 months.

- All on-site personnel who may use respiratory protection must, within the past year, have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the HSS prior to commencement of site work.

- Only cleaned, maintained, NIOSH-approved respirators will be used.

- If respirators are used, the respirator cartridge is to be properly disposed at the end of each work shift, or when load-up or breakthrough occurs.

- All on-site personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.

- Respirators will be inspected and a negative pressure test performed prior to each use.

- After each use, the respirator will be wiped with a disinfecting, cleansing wipe. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece.

5.4 Using Personal Protective Equipment

Depending upon the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Modified Level D or Level C PPE is used. All personnel entering the EZ must put on the required PPE in accordance with the requirements of this HASP. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of COCs.

5.4.1 Donning Procedures

These procedures are mandatory only if Modified Level D or Level C PPE is used on site:

- Remove bulky outerwear. Remove street clothes and store in clean location.

- Put on work clothes or coveralls.

- Put on the required chemical protective coveralls.
- Put on the required chemical protective boots or boot covers.
- Tape the legs of the coveralls to the boots with duct tape.
- Put on the required chemical protective gloves.
- Tape the wrists of the protective coveralls to the gloves.
- Don the required respirator and perform appropriate fit check (Level C).
- Put hood or head covering over head and respirator straps and tape hood to facepiece (Level C).
- Don remaining PPE, such as safety glasses or goggles and hard hat.

When these procedures are instituted, one person must remain outside the work area to confirm that each person entering has the proper protective equipment.

5.4.2 Doffing Procedures

The following procedures are only mandatory if Modified Level D or Level C PPE is required for the site. Whenever a person leaves the work area, the following decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated materials from the boots or remove contaminated boot covers.
- Clean reusable protective equipment.
- Remove protective garments, equipment, and respirator (Level C). All disposable clothing should be placed in plastic bags, which are labeled with contaminated waste labels.
- Wash hands, face, and neck (or shower if necessary).
- Proceed to clean area and dress in clean clothing.

- Clean and disinfect respirator for next use.

All disposable equipment, including garments and PPE must be bagged in plastic bags and labeled for disposal. See Section 7 – Work Zones and Decontamination for detailed information on decontamination stations.

6. Air Monitoring

6.1 Air Monitoring

Air monitoring will be conducted to determine employee exposure to airborne constituents. The monitoring results will dictate work procedures and the selection of PPE. The frequency for recording air monitoring results will be adjusted based on field readings in accordance with Table 6-1. The monitoring devices to be used are a photoionization detector (PID) with a 10.6 eV lamp, oxygen, LEL, hydrogen sulfide sensors or equivalent. The ARCADIS BBL HSS will be responsible for utilizing the air monitoring results to determine appropriate health and safety precautions for ARCADIS BBL personnel and subcontractors. Air monitoring results should be recorded in field notebooks or on an air monitoring log (Attachment S).

Air monitoring will be conducted continuously with the LEL/oxygen/hydrogen sulfide meter during boring in areas where flammable vapors or gases are suspect. All work activity must stop where tests indicate the concentration of flammable vapors exceeds 10 percent of the LEL at a location with a potential ignition source. Likewise, all work must stop where tests indicate a hydrogen sulfide concentration exceeding 5 parts per million (ppm). Such an area must be ventilated to reduce the concentration to an acceptable level. In areas where petroleum hydrocarbons are suspected, benzene detector tube readings must be taken if PID readings exceed 1.0 ppm sustained for 15 minutes in the breathing zone.

6.2 Noise Monitoring

Noise monitoring may be conducted as required. Hearing protection is mandatory for all employees in noise hazardous areas, such as around heavy equipment. As a general rule, sound levels that cause speech interference at a normal conversation distance should require the use of hearing protection.

6.3 Monitoring Equipment Maintenance and Calibration

All direct-reading instrumentation calibrations should be conducted under the approximate environmental conditions the instrument will be used. Instruments must be calibrated before and after use, noting the reading(s) and any adjustments that are necessary. All air monitoring equipment calibrations, including the standard used for calibration, must be documented on a calibration log or in the field notebook. All

completed health and safety documentation/forms must be reviewed and maintained by the HSS.

All air monitoring equipment will be maintained and calibrated in accordance with the specific manufacturer's procedures. Preventive maintenance and repairs will be conducted in accordance with the respective manufacturer's procedures. When applicable, only manufacturer-trained and/or authorized personnel will be allowed to perform instrument repairs or preventive maintenance.

If an instrument is found to be inoperative or suspected of giving erroneous readings, the HSS must be responsible for immediately removing the instrument from service and obtaining a replacement unit. If the instrument is essential for safe operation during a specific activity, that activity must cease until an appropriate replacement unit is obtained. The HSS will be responsible for confirming that a replacement unit is obtained and/or repairs are initiated on the defective equipment.

6.4 Action Levels

Table 6-1 presents airborne contaminant action levels that will be used to determine the procedures and protective equipment necessary based on conditions as measured at the site.

Table 6-1
Airborne Contaminant Action Levels

Parameter	Reading	Action
Total Hydrocarbons[1]	0 ppm to ≤ 1 ppm	Normal operations; continue hourly breathing zone monitoring
	> 1 ppm to 5 ppm	Increase monitoring frequency to every 15 minutes and use benzene colorimetric tubes to screen for the presence of benzene
	≥ 5 ppm to ≤ 50 ppm	Upgrade to Level C PPE; continue screening for benzene
	> 50 ppm	Stop work; investigate cause of reading, contact HSO/PM
Benzene (colorometric tube)	≥ 02.5 ppm to 5 ppm	Upgrade to Level C PPE
	> 5 ppm	Stop work; investigate cause of reading
Oxygen	≤ 19.5%	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
	> 19.5% to < 23.5%	Normal operations
	≥ 23.5%	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Carbon Monoxide	0 ppm to ≤ 12.5 ppm	Normal operations

Parameter	Reading	Action
	> 12.5 ppm	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Hydrogen Sulfide	0 ppm to ≤ 5 ppm	Normal operations
	> 5 ppm	Stop work, evacuate confined spaces/work area, investigate cause of reading, and ventilate area
Flammable Vapors (LEL)	< 10% LEL	Normal operations
	≥ 10% LEL	Stop work, ventilate area, investigate source of vapors
Particulates	0 mg/m^3 – 1 mg/m^3	Normal operations
	> 1 mg/m^3	Stop work, apply dust control measures

Notes:
1) PID and particulate readings are sustained for a period of 2 minutes at breathing zone height, measured with a calibrated photoionization detector with a 10.6 eV lamp real time particulate monitor.

7. Work Zones and Decontamination

7.1 Work Zones

7.1.1 Authorization to Enter

Only personnel with the appropriate training and medical certifications (if respirators are required) will be allowed to work at the project site. The HSS will maintain a list of authorized persons; only personnel on the authorized persons list will be allowed to enter the site work areas.

7.1.2 Site Orientation and Hazard Briefing

No person will be allowed in the work area during site operations without first being given a site orientation and hazard briefing. This orientation will be presented by the HSS and will consist of a review of this HASP. This review must cover the chemical, physical, and biological hazards; protective equipment; safe work procedures; and emergency procedures for the project. Following this initial meeting, daily safety meetings will be held each day before work begins.

All people entering the site work areas, including visitors, must document their attendance at this briefing, as well as the daily safety meetings on the forms included with this HASP. In addition, all personnel entering site work areas will take a written test that documents their understanding of the site-specific risks.

7.1.3 Certification Documents

A training and medical file may be established for the project and kept on site during all site operations. Specialty training, such as first-aid/cardiopulmonary resuscitation (CPR) certificates, as well as current medical clearances for all project field personnel required to wear respirators, will be maintained within that file. All ARCADIS BBL and subcontractor personnel must provide their training and medical documentation to the HSS prior to starting work.

7.1.4 Entry Log

A log-in/log-out sheet will be maintained at the site by the HSS. Personnel must sign in and out on a log sheet as they enter and leave the work area and the HSS may document entry and exit in the field notebook.

7.1.5 Entry Requirements

In addition to the authorization, hazard briefing and certification requirements listed above, no person will be allowed in any ARCADIS BBL work area unless they are wearing the minimum PPE, as described in Section 5 – Personal Protective Equipment.

7.1.6 Emergency Entry and Exit

People who must enter the work area on an emergency basis will be briefed of the hazards by the HSS. All activities will cease in the event of an emergency. People exiting the work area because of an emergency will gather in a safe area for a head count. The HSS is responsible for confirming that all people who entered the work area have exited in the event of an emergency.

7.1.7 Contamination Control Zones

Contamination control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas. The locations of the contamination control zones will be determined by the HSS based on the specific task or activity to be conducted. Contamination control zones will be determined by the HSS based upon the activity being conducted and the location of the activities at sites.

7.1.7.1 Exclusion Zone

An EZ may consist of a specific work area or may be the entire area of potential contamination. All employees entering an EZ must use the required PPE and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Cones, caution tape or a site diagram will identify the location of each EZ.

7.1.7.2 Contamination Reduction Zone

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment and machinery will be decontaminated in a specific location. The decontamination of all personnel will be performed on site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for

cleaning or disposal. This zone is the only appropriate corridor between the EZ and the SZ.

7.1.7.3 Support Zone

The SZ is a clean area outside the CRZ located to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking may be permitted in the SZ, subject to site requirements.

7.1.8 Posting

Work areas will be prominently marked and delineated using cones, caution tape, barricades, company vehicles or a site diagram.

7.1.9 Site Inspections

The HSS will conduct a daily inspection of site activities, equipment and procedures to verify that the required elements are in place. The Safety Inspection Form in Attachment T may be used as a guide for daily inspections. LPO's will be completed, input into the OTIPS and forwarded to the PM for review per the project schedule.

7.2 Decontamination

7.2.1 Personnel Decontamination

All personnel wearing Modified Level D or Level C protective equipment in the EZ must undergo personal decontamination prior to entering the SZ. The personnel decontamination area will consist of the following stations at a minimum:

- *Station 1:* Personnel leaving the contaminated zone will remove the gross contamination from their outer clothing and boots.

- *Station 2:* Personnel will remove their outer garment and gloves and dispose of it in properly labeled containers. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items are then hand carried to the next station.

- *Station 3:* Personnel will thoroughly wash their hands and face before leaving the CRZ. Respirators will be sanitized and then placed in a clean plastic bag.

7.2.2 Equipment Decontamination

All vehicles that have entered the EZ will be decontaminated at the decontamination pad prior to leaving the zone. If the level of vehicle contamination is low, decontamination may be limited to rinsing of tires and wheel wells with water. If the vehicle is significantly contaminated, steam cleaning or pressure washing of vehicles and equipment may be required.

7.2.3 Personal Protective Equipment Decontamination

Where and whenever possible, single-use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed in properly labeled containers. Reusable protective clothing will be rinsed at the site with detergent and water. The rinsate will be collected for disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves and covers must be thoroughly cleaned at the end of each work shift and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water or by using a spray disinfectant.

7.2.4 Emergency Decontamination

If an injured employee has gross contamination, emergency decontamination may be required prior to transportation to a treatment facility. At this site, the worst case scenario would be an employee who was covered/soaked with COCs containing fuel and fuel byproducts. Steps for emergency decontamination are:

- remove the outer protective layer of clothing (if employee has a suspected neck/back injury, carefully cut the clothing off so as to not cause further injury)

- wipe off any remaining gross contamination with clean clothes/towels

An ARCADIS BBL employee must accompany the injured person to the hospital to provide information to the examining/treating medical professional. The accompanying ARCADIS BBL employee must bring the MSDSs for the COCs involved with site work.

The accompanying employee should be prepared to provide information regarding site conditions, potential exposures and a description of the incident causing the injury or exposure.

7.3 Traffic Control

A JMP will be generated for each facility and updated in accordance with the JMP guidelines. The JMP incorporates a TCP to be implemented at the subject facility; this includes the designation of pedestrian and motor vehicle areas at the site. The HSS may make modifications to the TCP, as needed, to address potential changes is site conditions. A detailed TCP, including a site map depicting traffic control measures is included with the JMP in Attachment H.

8. Training and Medical Surveillance

8.1 Training

8.1.1 General

All on-site project personnel who work in areas where they may be exposed to site contaminants must be trained, as required by OSHA Regulation 29 CFR 1910.120 (HAZWOPER). Field employees also must receive a minimum of 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their initial training more than 12 months prior to the start of the project must have completed an 8-hour refresher course within the past 12 months. The HSS must have completed an additional 8 hours of supervisory training, and must have a current first-aid/CPR certificate.

8.1.2 Basic 40-Hour Course

The following is a list of the topics typically covered in a 40-hour HAZWOPER training course:

- general safety procedures
- physical hazards (fall protection, noise, heat stress, cold stress)
- names and job descriptions of key personnel responsible for site health and safety
- safety, health and other hazards typically present at hazardous waste sites
- use, application and limitations of PPE
- work practices by which employees can minimize risks from hazards
- safe use of engineering controls and equipment on site
- medical surveillance requirements
- recognition of symptoms and signs that might indicate overexposure to hazards

- worker right-to-know (OSHA 1910.1200)
- routes of exposure to contaminants
- engineering controls and safe work practices
- components of a health and safety program and a site-specific HASP
- decontamination practices for personnel and equipment
- confined-space entry procedures
- general emergency response procedures

8.1.3 Supervisor Course

Management and supervisors must receive an additional 8 hours of training, which typically includes:

- general site safety and health procedures
- PPE programs
- air monitoring techniques

8.1.4 Site-Specific Training

Site-specific training will be accomplished by on-site personnel reading this HASP or through a thorough site briefing by the PM or HSS on the contents of this HASP before work begins. The review must include a discussion of the chemical, physical, and biological hazards; the protective equipment and safety procedures; and emergency procedures. In addition, all personnel entering the work areas will take a written test that documents their understanding of the site-specific risks.

8.1.5 Daily Safety Meetings

Twice daily safety meetings will be held to discuss the Task-/Site-Specific JSAs and cover the work to be accomplished, the hazards anticipated, the PPE and procedures required to minimize site hazards, client controlled permit requirements and emergency

procedures. The HSS should present these meetings prior to beginning the day's fieldwork and again within approximately 1 hour after lunch. No work will be performed in an EZ before a safety meeting has been held, the Task-/Site-Specific JSA has been discussed and the Permit-to-Work form has been completed. A safety meeting must also be held prior to new tasks and repeated if new hazards are encountered. The Daily Safety Meeting Log/Permit-to-Work Form is included in Attachment U.

8.1.6 First Aid and CPR

At least one employee current in first aid/CPR will be assigned to the work crew and will be on site during operations. Refresher training in first aid (triennially) and CPR (annually) are required to keep the certificate current. The individual must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

8.1.7 Motor Vehicle Safety Training

ARCADIS BBL's Motor Vehicle Safety Program includes:

- A formal Safe/Defensive Driver Training Program that includes class room training and behind-the-wheel commentary drive.
- A JMP scaled for this site from ARCADIS BBL's office to the site has been prepared and is included in Attachment H. Subcontractors will be responsible to prepare JMP's from the subcontractor's office to the site.
- Review of a Motor Vehicle Report for each employee from ARCADIS BBL's auto insurance provider as a means to monitor driving records. If an employee/potential authorized driver has had three or more incidents in a 3-year period, work-related driving activities may be restricted or revoked or driving courses may be recommended for the employee. Driving records are monitored on a semiannual or annual basis for all employees by our auto insurance provider.
- A Travel Safety SOP, Job Safety Analysis for Driving Passenger Vehicle and Vehicle Pre-Inspection Check List.

8.2 Medical Surveillance

8.2.1 Medical Examination

All personnel who are potentially exposed to site contaminants must participate in a medical surveillance program, as defined by OSHA at 29 CFR 1910.120(f).

8.2.2 Pre-Placement Medical Examination

All potentially exposed personnel must have completed a comprehensive medical examination prior to assignment, and periodically thereafter, as defined by applicable regulations. The pre-placement and periodic medical examinations typically include the following elements:

- medical and occupational history questionnaire
- physical examination
- complete blood count, with differential
- liver enzyme profile
- chest x-ray, at a frequency determined by the physician
- pulmonary function test
- audiogram
- electrocardiogram for persons older than 45 years of age, or if indicated during the physical examination
- drug and alcohol screening, as required by job assignment
- visual acuity
- follow-up examinations, at the discretion of the examining physician or the corporate medical director

The examining physician provides the employee with a letter summarizing his findings and recommendations, confirming the worker's fitness for work and ability to wear a respirator. Documentation of medical clearance will be available for each employee during all project site work.

Subcontractors will certify that all their employees have successfully completed a physical examination by a qualified physician. The physical examinations must meet the requirements of 29 CFR 1910.120 and 29 CFR 1910.134. Subcontractors will supply copies of the medical examination certificate for each on-site employee.

8.2.3 Other Medical Examinations

In addition to pre-employment, annual and exit physicals, personnel may be examined:

- At the employee's request after known or suspected exposure to toxic or hazardous materials.
- At the discretion of the HSO or occupational physician in anticipation of, or after known or suspected exposure to toxic or hazardous materials.

8.2.4 Periodic Exam

Following the placement examination, all employees must undergo a periodic examination, similar in scope to the placement examination. For employees potentially exposed over 30 days per year, the frequency of periodic examinations will be annual. For employees potentially exposed less than 30 days per year, the frequency for periodic examinations will be 24 months.

8.2.5 Medical Restriction

When the examining physician identifies a need to restrict work activity, the employee's supervisor must communicate the restriction to the employee and the HSS. The terms of the restriction will be discussed with the employee and the supervisor.

9. Emergency Procedures

9.1 General

Prior to the start of operations, the work area will be evaluated for the potential for fire, contaminant release or other catastrophic event. Unusual conditions or events, activities, chemicals and conditions will be reported to the HSS immediately.

The HSS will establish evacuation routes and assembly areas for the site. All personnel entering the site will be informed of this route and the assembly area. A map depicting the evacuation route and off-site assembly point is provided in Attachment V. In addition, all personnel entering the work areas will take a written test that documents their understanding of the site-specific risks.

9.2 Emergency Response and Evacuation Procedure

If an incident occurs, the following steps will be taken by the HSS:

- Evaluate the incident and assess the need for assistance and/or evacuation.
- Call for outside assistance, as needed.
- Confirm that the PM is notified promptly of the incident.
- Take appropriate measures to stabilize the incident scene.

Emergency safety drills will be conducted, as directed by the HSS, to evaluate the emergency response procedures and the preparedness of the personnel at the site.

If it is determined by the HSS that evacuation is necessary, all personnel will follow the evacuation route to a designated off-site meeting point. A map of the evacuation route and meeting point is included in Attachment V.

9.2.1 Fire

In the case of a fire at the site, the HSS will assess the situation and direct fire-fighting activities. The HSS will confirm that the PM is immediately notified of any fires. Site personnel will attempt to extinguish the fire with available extinguishers, if safe to do

so. In the event of a fire that site personnel are unable to safely extinguish with one fire extinguisher, the local fire department will be summoned.

9.2.2 Contaminant Release

In the event of a contaminant release, the following steps will be taken:

- notify the HSS immediately
- evacuate immediate area of release
- conduct air monitoring to determine needed level of PPE
- don required level of PPE and prepare to implement control procedures.

The HSS has the authority to commit resources, as needed, to contain and control released material and to prevent its spread to offsite areas. If personnel come into direct contact with the released contaminant, immediate decontamination is required using the decontamination procedures outlined in Section 7.

9.2.3 Earthquake

Earthquakes are one of the nation's most frightening natural phenomena. When an earthquake occurs, the ground will shake perceptibly for a relatively short time. Earthquakes generally last for a few seconds but great earthquakes can last up to a minute.

Procedures to Follow During the Earthquake

1. Try to remain calm and reassure others.
2. If you are indoors, move immediately to a safe place. Get under a table, workbench, stand in an interior doorway or in the corner of a room. Watch out for falling debris or heavy objects. Stay away from windows and heavy objects (such as equipment or tanks) that may topple or slide across the floor.
3. Do not dash for exits; they may be jammed with people. Seek safety where you are at the time of the incident and then leave calmly if evacuation is necessary.

4. If you are outside, get out in to an open spot away from buildings, trees, power lines, and overpasses and then duck, cover and hold until the shaking stops.

5. If you are in an automobile, drive away from underpasses/overpasses, and stop in the safest place possible and stay there until the shaking stops.

6. Do not be surprised if the electricity goes out, or if fire and burglar alarms start ringing, or if sprinkler systems go on. Expect to hear noise from breaking glass, cracks in walls, and falling objects.

7. Do not be surprised if you feel more than one shock. After the first motion is felt, there may be a temporary decrease in the motion followed by another shock (this phenomenon is merely the arrival of different seismic waves from the same earthquake). Also, aftershocks may occur; these are separate quakes that follow the main shock. Aftershocks may occur several minutes, several hours, or even several days afterwards. Sometimes aftershocks will cause damage or collapse of structures that were already weakened by the main earthquake.

Procedures to Follow After the Earthquake

When the shaking stops, there may be considerable damage and people may be injured. It is especially important that everyone remain calm and begin the task of taking care of one another. The first concern is for those who are hurt and the next concern is to prevent fires. After that, damage can be assessed and remedial measures begun. Here are some safety guidelines to follow:

1. Remain calm and take time to assess the situation.

2. The HSS will seek medical help for those who need it and cover injured persons with blankets to keep them warm.

3. The HSS will check for fires and fire hazards and put out fires immediately if possible.

4. The HSS will check for damage to utilities and appliances and shut off electricity if there is any chance of damage to wiring.

5. The HSS will shut off water mains if breakage has occurred. In due time, report utility damage to the utility companies and follow their instructions.

6. Do not light matches, use any open flames or turn on electrical switches or appliances until you are certain there are no gas leaks.

7. Do not touch power lines, electric wiring or objects in contact with them.

8. Do not use the telephones except to call for help or to report serious emergencies (medical, fire, or criminal) or to perform some essential service. Jammed telephone lines interfere with emergency services and it is thoughtless to use the phone for personal reasons or to satisfy curiosity. (When the emergency is clearly over, contact relatives and friends so they will know you are safe and where you are.)

9. Be certain that sewer lines are not broken before resuming regular use of toilets.

10. The HSS' are to clean up and warn others of any spilled materials that are dangerous, including, but not limited to chemicals and gasoline.

11. Listen to the radio for information about the earthquake and disaster procedures.

12. Be prepared to experience aftershocks. They often do additional damage to buildings weakened by the main shock.

13. Use great caution when entering or moving about in a damaged building. Collapses can occur without much warning, and there may be dangers from, including, but not limited to, gas leaks, electric wiring, and broken glass. There are no rules that can eliminate all earthquake danger. However, damage and injury can be reduced by following the above precautions.

9.3 Medical Emergency

Survey the scene. Determine if it is safe to proceed. Try to determine if the conditions that caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.

- Do a primary survey of the victim. Check for airway obstruction, breathing, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.

- Phone Emergency Medical Services (EMS). Give the location, telephone number used, caller's name, what happened, number of victims, victim's condition and help being given.

- Maintain airway and perform rescue breathing as necessary.

- Perform CPR as necessary.

- Do a secondary survey of the victim. Check vital signs and do a head-to-toe exam.

Treat other conditions as necessary. If the victim can be moved, take him/her to a location away from the work area where EMS can gain access.

All employee injuries must be promptly reported to the HSS, who will:

- Confirm that the injured employee receives prompt first aid and medical attention.

- In emergency situations, the worker is to be transported by appropriate means to the nearest urgent care facility (normally a hospital emergency room).

- If the injured person is an ARCADIS BBL employee, notify ARCADIS BBL Human Resources at 315.446.9120, ext. 19336 as soon as possible after the injured person has been safely evacuated from the scene.

9.4 First Aid – General

All persons must report any injury or illness to their immediate supervisor or the HSS. Trained personnel will provide first aid. Injuries and illnesses requiring medical treatment must be documented. The HSS must conduct an II as soon as emergency conditions no longer exist and first aid and/or medical treatment have been confirmed. IIs must be completed and submitted to the PM within 24 hours after the incident.

If first-aid treatment is required, first-aid kits are kept at the CRZ. If treatment beyond first aid is required, the injured person(s) should be transported to the medical facility. If the injured person is not ambulatory, or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance/paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

9.4.1 First Aid – Inhalation

Any employee complaining of symptoms of chemical overexposure, as described in Section 4, will be removed from the work area and transported to the designated medical facility for examination and treatment.

9.4.2 First Aid – Ingestion

Call EMS and consult a poison control center for advice. If available, refer to the MSDS for treatment information. If the victim is unconscious, keep them on their side and clear the airway if vomiting occurs.

9.4.3 First Aid – Skin Contact

Project personnel, who have had skin contact with contaminants will, unless the contact is severe, proceed through the CRZ, to the wash area. If it is impractical to move the personnel to the CRZ, then emergency decontamination may take place in the EZ at their location by moving the decontamination equipment to their area and conducting decontamination procedures in accordance with Section 7. Personnel will remove any contaminated clothing and then flush the affected area with water for at least 15 minutes. The worker should be transported to the medical facility if he/she shows any sign of skin reddening, irritation, or if he/she requests a medical examination.

9.4.4 First Aid – Eye Contact

Project personnel who have had contaminants splashed in their eyes or who have experienced eye irritation while in the EZ must immediately proceed to the eyewash station in the CRZ. If it is impractical to move the personnel to the CRZ, then emergency decontamination may take place in the EZ at their location by moving the decontamination equipment to their area and conducting decontamination procedures in accordance with Section 7. Do not decontaminate prior to using the eyewash.

Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

9.5 Reporting Injuries, Illnesses and Near-Miss Incidents

Injuries and illnesses, however minor, will be reported to the HSS immediately. The HSS will complete an injury report and submit it to the HSO, client, PO, the PIC and the PM within 24 hours.

Near-miss incidents are situations in which no injury or property damage occurred, but under slightly different circumstances an injury or property damage could have occurred. Near misses are caused by the same factors as injuries; therefore, they must be reported and investigated in the same manner. An SPSA must be done immediately after an injury, illness, near miss or other incident to determine if it is safe to proceed with the work.

9.6 Off-Site Emergencies

Off-site emergencies may include vehicle crashes, off-site fires, medical responses or security incidences. In the event of an offsite emergency, the HSS will determine the need to stop work and evacuate employees to the SZ or other safe area deemed appropriate by the HSS. At the SZ, the HSS will conduct an SPSA and determine if additional action is required.

9.7 Emergency Information

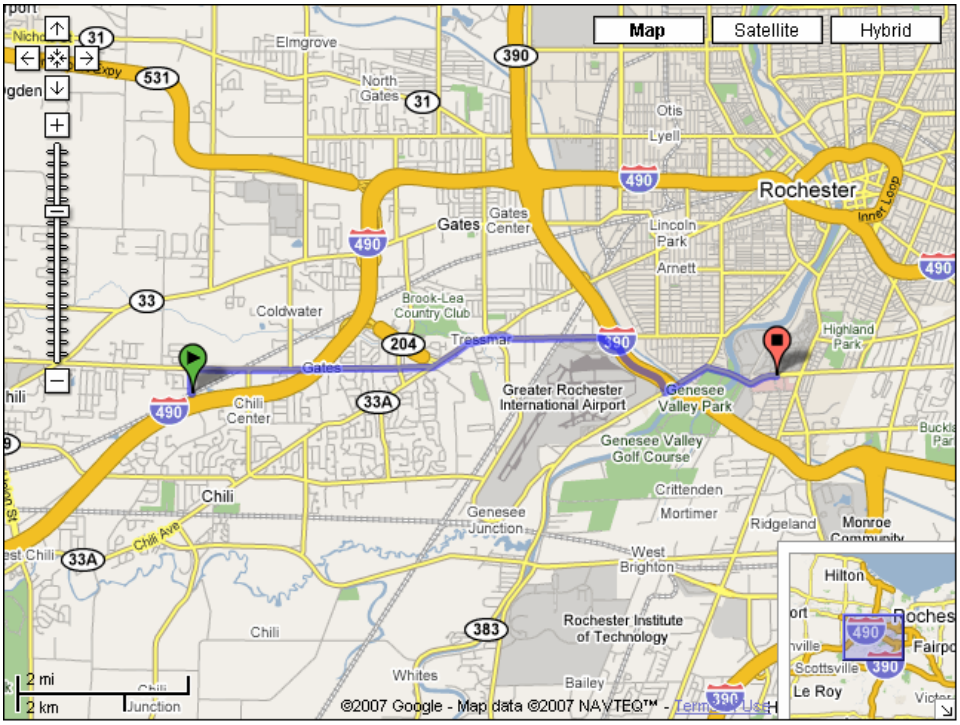
The means to summon local public response agencies such as police, fire and ambulance will be reviewed in the daily safety meeting.

Table 9-1
Emergency Contacts

Agency/Contact	Telephone Number
Monroe County Sherriff Department	911 or (585) 753-4470 (non-emergency)
New York State Police	911 or (585) 293-2444 (non-emergency)
Chili Fire Department	911 or (585) 889-3760 (non-emergency)
Chili Ambulance	911 or (585) 889-2873 (non-emergency)
Strong Memorial Hospital Emergency Room	(585) 275-4551
Poison Control Center	1-800-282-3171
Emergency Chevron, Inc. Contact: Denise Dixon	(770) 984-3165
ARCADIS BBL Project Manager: Dave Kingsley	(585) 233-7046

HOSPITAL:
Name: Strong Memorial Hospital
Address: 601 Elmwood Avenue
City, State: Rochester, NY
Telephone Number: 585.275.2100 (main #), 585.275.4551 (emergency room #)

Map to hospital with written directions is included in Attachment V.



Summary: 7.8 miles (17 minutes)

Mile	Instruction	For	Toward
0.0	Head NORTH on Golden Road	0.3 mi	Stone Barn Road
0.3	Turn RIGHT at Westside Drive	2.8 mi	
3.1	Turn LEFT at Chili Avenue / RT-33A	0.9 mi	
4.0	Turn RIGHT at Brooks Avenue / RT-204	1.2 mi	
5.2	Take the ramp onto I-390 SOUTH	0.9 mi	
6.1	Take the Scottsville Road / RT-383 – EXIT 17	0.2 mi	
6.3	Turn LEFT at RT-383 / Scottsville Road	0.6 mi	
6.9	Slight RIGHT at Elmwood Avenue	0.9 mi	
7.8	End at 601 Elmwood Avenue		

SUMMARY

Driving distance: 7.8 miles

Trip duration: 17 minutes

Driving time: 17 minutes

Table 10
Maximum Concentrations Detected of Chemicalsof Concern
Golden Road Disposal Site
189 Golden Road, Chili, New York

Chemical of Concern	Sample ID	Medium	Detected Concentration
Acetone	GR-SS-2	Soil	490 µg/L
Pentachlorophenol	GR-SS-2	Soil	360,000 µg/L
Benzo(a)anthracene	GR-SS-9	Soil	2,700 µg/L
Chrysene	GR-SS-9	Soil	3,800 µg/L
Benzo(b)fluoranthene	GR-SS-9	Soil	5,000 µg/L
Benzo(k)fluoranthene	GR-SS-9	Soil	3,000 µg/L
Benzo(a)pyrene	GR-SS-9	Soil	3,700 µg/L
Indeno(1,2,3-cd)pyrene	GR-SS-9	Soil	5,000 µg/L
Aluminum	GR-SS-6	Soil	97,700 µg/L
Antimony	GR-SS-6	Soil	27.9 µg/L
Arsenic	GR-SS-6	Soil	26.8 µg/L
Barium	GR-SS-6	Soil	361 µg/L
Beryllium	GR-SS-6	Soil	1.9 µg/L
Chromium	GR-SS-3	Soil	263 µg/L
Cobalt	GR-SS-2	Soil	295 µg/L
Copper	GR-SS-6	Soil	5,380 µg/L
Lead	GR-SS-2	Soil	2,680 µg/L
Manganese	GR-SS-2	Soil	2,100 µg/L
Mercury	GR-SS-6	Soil	0.14 µg/L
Nickel	GR-SS-7	Soil	425 µg/L
Selenium	GR-SS-6	Soil	4.3 µg/L
Zinc	GR-SS-6	Soil	2,250 µg/L

Notes:
µg/L – micrograms per liter

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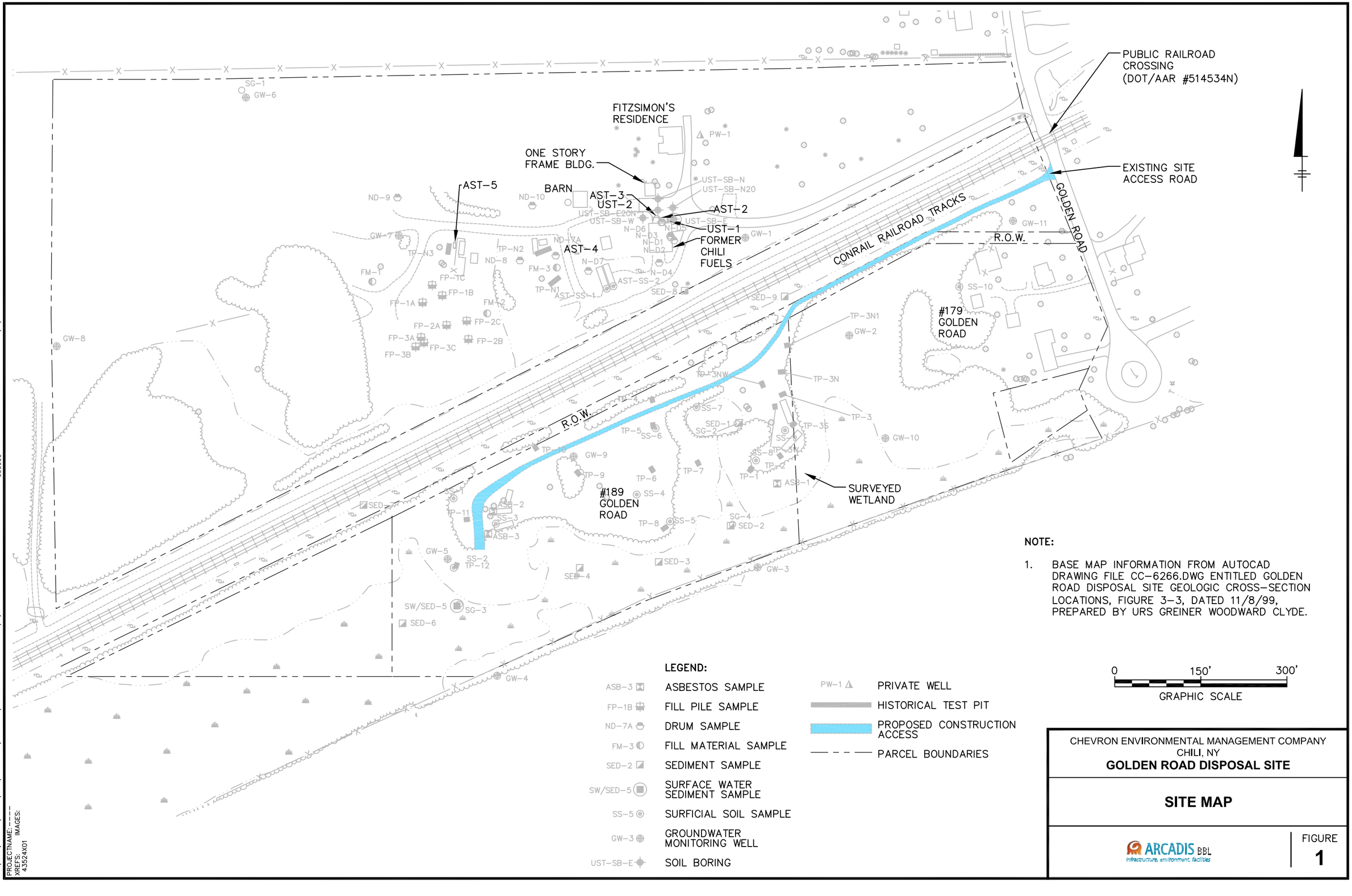
Attachment A

Site Map



NOTE:

1. BASE MAP INFORMATION FROM AUTOCAD DRAWING FILE CC-6266.DWG ENTITLED GOLDEN ROAD DISPOSAL SITE GEOLOGIC CROSS-SECTION LOCATIONS, FIGURE 3-3, DATED 11/8/99, PREPARED BY URS GREINER WOODWARD CLYDE.

LEGEND:

ASB-3	ASBESTOS SAMPLE
FP-1B	FILL PILE SAMPLE
ND-7A	DRUM SAMPLE
FM-3	FILL MATERIAL SAMPLE
SED-2	SEDIMENT SAMPLE
SW/SED-5	SURFACE WATER SEDIMENT SAMPLE
SS-5	SURFICIAL SOIL SAMPLE
GW-3	GROUNDWATER MONITORING WELL
UST-SB-E	SOIL BORING
PW-1	PRIVATE WELL
	HISTORICAL TEST PIT
	PROPOSED CONSTRUCTION ACCESS
	PARCEL BOUNDARIES

0 150' 300'

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
CHILI, NY

GOLDEN ROAD DISPOSAL SITE

SITE MAP

ARCADIS BBL
Infrastructure, environment, facilities

FIGURE
1

ARCADIS BBL

Attachment B

Addendums and Changes to HASP Log

Changes to HASP Log
Golden Road Disposal Site
189 Golden Road
Chili, New York

Date	ARCADIS BBL Responsible Person	Chevron PM Acceptance	Change

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Attachment C

Site-Specific HASP and Visitors Tests

Name/Company:_____ Date:_____

Health and Safety Plan Written Test

Golden Road Disposal Site – Chili, NY

Please answer all the following questions.

1) What is the address of the site?

2) If working conditions or behaviors are considered unsafe, what is your responsibility to do?

3) Where is the HASP located?

4) Name 3 tools used in the LPS Program.

5) Where is the support zone?

6) Where is the exclusion zone?

7) Where are the emergency equipment kept (e.g. fire extinguishers, first aid kits, etc)?

8) What are the components of the Safe Performance Self Assessment?

9) Have you read the Journey Management Plan?

10) What section summarizes emergency procedures and presents directions to the nearest hospitals and emergency telephone numbers?

11) What LPS tool should you use every time before you perform a new activity?

12) If a near miss occurs, who should you notify…and when?

13) After leaving the exclusion zone, before eating, drinking, smoking, or using the toilet facilities, what must you do?

14) Who is the BBL Site Health and Safety Supervisor?

15) Where is the evacuation assembly point?

Name/Company:_____ Date:_____

Visitor Written Test

Golden Road Disposal Site – Chili, NY

Please answer all the following questions.

16) What is the address of the site?

17) Who is the BBL Site Health and Safety Supervisor?

18) Who is responsible for escorting you at all times while on site?

19) In the event of an on-site emergency where should everyone meet?

20) Where is the nearest phone located?

21) What is the local emergency number?

22) Where is the location of first aid equipment and fire extinguisher?

23) What allergies or medical conditions do you have that may require attention in the event of an emergency?

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Attachment D

Management of Change Form

Management of Change Form

ChevronTexaco	**Management of Change Report Form** **Attach additional pages if needed.** **See ESH 505 for information or suggestions for each section.** **Note: All date formats are M/DD/YYYY**	
INTRODUCTION	Originator:	Affected Location(s) or Operation(s):
MOC #:	Type of Change:	Date Submitted:
Reason for Change:	Operational Excellence	
Describe the Change:		

TASKS	List the work tasks requred to complete the Change. List the responsible party and the due date. See ESH 505 Task Section for potential tasks for each type of change. Insert additional lines as needed.		
MOC Tasks:	Responsible	Due Date	Completed

RISKS	Calculate the risk by completing a Risk Assessment. If the risk warrants, complete a PHA. Identify associated risks and how they are to be mitigated. List the responsible party and the due date.		
Is Process Hazard Analysis required? ☐Yes If not, uncheck this box. If Yes, attach the completed Risk Assessment Guideline Form (Appendix D). If Yes, add PHA to tasks list and add identified risks and mitgation steps below.			
MOC Risks: See ESH 505 Risk Section for potential risks for each type of change.	Responsible	Due Date	Completed

COMMUNICATION	**Who needs to know about the Change and how will you communicate the Change to them? Insert additional lines as needed.**

COMMUNICATION	Who needs to know about the Change and how will you communicate the Change to them? Insert additional lines as needed.

APPROVALS	Who needs to approve of the Change at the Local, Area, and Corporate level. Include all departments responsible for, or affected by, the Change. Remember, High Risk or select changes require Area or Departmental Manager approval.

Initial MOC Plan Authorized by: RTBU Area Manager				Date Authorized:		
	Title	**Signature**	**Title**	**Signature**	**Title**	**Signature**
Local:						
Area:						
Corporate:						
MOC Completion: RTBU Area Manager				**Date**:		

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Attachment E

Management of Change Tracking Log

Management of Change Tracking Form

MOC #	Date Submitted	Description of Change	Date of Completion

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Attachment F

Short Service Employee (SSE) Form

EMC's Short Service Employee (SSE) Form

Contractor must complete and submit form to the EMC Project Manager for approval at least 24 hours prior to arrival on location. The EMC Project Manager must approve the individual SSE before he/she arrives on location.

Contractor Company Name:_____ Request Date:_____

Chevron Site and Number:_____

Chevron Site Address:_____

SSE Name:_____

Date of Employment:_____ Years Experience:_____

Current Job Title:_____ Experience in Present Position:___Yrs____Mos

1. Is this employee in compliance with your Substance Abuse Program?_____Yes____No
2. Has EMC and Contractor HES policies been reviewed with SSE?_____Yes____No
   By Whom?_____
3. Who has been assigned as the SSE Mentor?_____
   Mentor's experience in present position (yrs & mos.):_____
4. List all of the training you provided for the SSE: List previous special training:

_____ _____

_____ _____

_____ _____

SSE(s) is identified by: Hi Vis Orange Hard Hat CVX OPCO Approved Visitor Color Hard Hat
SSE Orange Baseball Cap (Must Comply With EMC SSE Expectation)

SSE Crew Makeup Requirements:

Choose one below:

Single person crew - can not be a SSE _____
Site/Location Contractor Supervisor

2 – 4 person crew - no more than 1 SSE per crew _____
Site/Location Contractor Supervisor

5 or more person crew - no more than 20% per crew _____
Site/Location Contractor Supervisor

Exceeding 20% per crew _____
Site/Location Contractor Supervisor

Approved Variance Form by EMC Business Unit Manager Attached

Date Variance Form approved:_____

SSE Review and Approval:

_____ Date:_____
Contractor's Management

_____ Date:_____
EMC Project Manager

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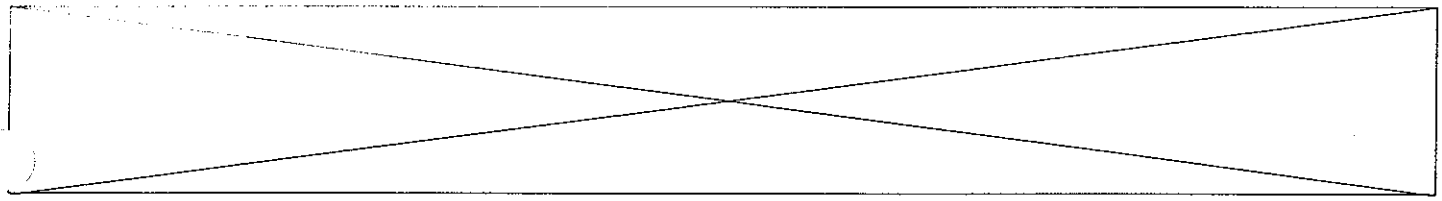
Attachment G

Task-/Site-Specific Job Safety Analysis Forms



JSA

*** The LPS system is designed to be used with Internet Explorer 6.0 or higher ***

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SECTION 1

JSA Type: Driving and Motor Vehicles
JSA No: JSA000215 **Status:** Closed **Version:** Current
Date: 12/28/05
Work Type: Driving - Passenger Vehicle
Work Activity:
Project No: 000000100000 - GENERAL OVERHEAD (GENERAL OVERHEAD)

SECTION 2

Development Team	Position/Title	PC	Reviewed By	Position/Title	Date
Burgess, Thomas G			Burgess, Thomas G		1/26/06
Haggerty, Ellen M		☑	Haggerty, Ellen M		12/28/05
Sterner, Lora E			Sterner, Lora E		12/28/05

SECTION 3

No	Job Step	Potential Hazard(s)	Critical Action(s)	SOP Reference
1	PRE-TRIP - Review SPSA Card	Worst case outcome of vehicle operation (blowout, breakdown, collision, injury or death).	Assess the potential hazards. Review weather and road conditions/closures before departing. Plan travel route and select alternate routes in case main roads are closed. Notify someone of your departure time/route/and ETA. Pack emergency supplies. Analyze how to reduce the risk. In icy conditions get into the vehicle slowly and consciously, keep legs close to vehicle and hold on to handle or door. Act to ensure safe operation of the vehicle. Recognize SWA.	
2	Assess the potential hazards. Review weather and road conditions/closures before departing. Plan travel route and select alternate routes in case main roads are closed. Notify someone of your departure time/route/and ETA. Pack emergency supplies. Analyze how to reduce the risk. In icy conditions get into the vehicle slowly and consciously, keep legs close to vehicle and hold on to handle or door. Act to ensure safe operation of the vehicle. Recognize SWA.	Flat tire, blowout, impaired vision, obstacles, collision, injury or death.	Assure tires are properly inflated and there is sufficient tread. Assure there are no cuts or bulges in the sidewalls. Assure windshield and window glass is clean. Lift wiper arms and check wiper blades for damage or deterioration. Check behind vehicle for obstructions. Check under vehicle engine for evidence of fluid leaks.	
3	Check and adjust seat, mirrors, head lamps, turn signals, washer/wipers.	Back or body strain. Blind spots. Inability to signal intentions. Streaking windshield, impaired vision.	Adjust seat so back is fully supported, upper arms close to body, pedals within easy reach. Adjust head restraint so that it is 2 to 6cm from the top of your head. Lower steering wheel so hands are below shoulders and shoulders are relaxed. Check mirror adjustments each time vehicle is re-started. Test operations of of front and rear turn signals. Locate and test operation of head lamps, wiper and washer switches.	
4	Fasten seat belts.	Increased risk of more serious injury or death in collision.	Assure seat belt is in good condition and fastened. Assure all passenger seat belts are in good condition and fastened.	
		Ejection from		

5	Lock doors.	vehicle in collision. Unwanted intrusion.	Lock all doors to vehicle.
6	Start engine.	Unexpected movement.	Assure that transmission is in 'Park' and that parking brake is set.
7	Check gauges and warning lights.	Overheated engine or break-down due to lack of critical fluids.	Assure there is sufficient gas, oil and other critical fluids.
8	Pull out of parking space.	Collision with other vehicles, pedestrians, or stationary objects.	Check mirrors and over shoulder in all directions prior to pulling out of parking space. Signal if parallel parked along a street. Use spotter if not pulling forward out of spot.
9	DURING TRIP - Keep your eyes moving,aim high in steering, leave yourself an out, get the big picture, make sure other drivers see you. Pay attention to driving at all times	Collision, injury or death to occupants or other parties.	Move eyes at least every 2 seconds. Scan major and minor intersections before entry (left-right-left). Check mirrors when slowing or stopping vehicle. Scan mirrors frequently, at least one mirror every 5-8 seconds. Avoid staring while evaluating road conditions. No use of cell phones or radios while driving in a vehicle on streets or on site. Maintain 15 second eye lead time (1 1/2 blocks in city traffic, 1/4 mile in highway traffic). Assess condition of traffic lights (fresh vs. stale). Assess information from distant objects. Adjust eye lead distance to speed. Maintain safety cushion around vehicle (front, sides, rear). Adjust vehicle space and speed to avoid unsafe intrusion by other drivers. At signal controlled intersections, stop 10 ft. behind crosswalks or behind other vehicles. At stop sign controlled intersections, approach stop sign cautiously and ascertain if cross traffic has to stop. Stop at or just behind limit line or crosswalk. When stopped, allow vehicle in front to move for 2 seconds before accelerating. Observe approaching merge areas and choose lane of least resistance. Cede right of way and allow other vehicles to merge, change lanes, make turns, etc. Avoid being unnecessarily boxed in. Avoid sudden acceleration and deceleration. Maintain a minimum 4 second following distance, adjust speed to traffic conditions, scan immediate and adjacent lanes before merging. Seek eye contact with other drivers. Cover or use horn when conditions warrant. Before changing lanes, signal well in advance, check mirrors and over shoulder, and allow adequate space before changing lanes. Break early to activate brake lights. Stay out of blind spots. Gently sound horn or flash lights if unsure other driver sees you. Turn on head lamps in high traffic areas, at dusk, and in inclement weather. In inclement weather decrease speed and increase following distance, use low gears to enhance traction and do not use cruise control or overdrive, break gently to avoid skidding. If the wheels begin locking up ease off breaks. Apply steady pressure if ABS is present, do not pump breaks. If your rear wheels skid take foot off accelerator and steer in the direction you want the front wheels to turn. If front wheels skid take foot of the accelerator and shift to neutral, do not steer immediately, as traction returns steer in the direction you want to go and put the transmission in drive. If the vehicle gets stuck turn wheels from side to side moving snow away from tires, use shovel to remove snow from tires, and pour sand, cat litter etc.. to wheel path. Always focus on driving. Stop driving if you become distracted. Refrain from conducting involved or emotional discussions while driving - end the conversation or pull over to the side of the road if it becomes difficult to concentrate on driving while conversing with your passengers.
10	Backing up.	Collision, injury or death to occupants or other parties.	Make all backing maneuvers slowly and cautiously. Check mirrors and over shoulders. When parking, look for pull-through parking to avoid backing. Use spotter when necessary.
11	Parking.	Collision, injury or death to occupants or other parties.	Park away from other cars. Back into parking spot when possible and safe. Maintain cushion of safety from fixed objects. Set parking brake. If it is safe to do so, park so the first movement is forward. If parking on road place vehicle as barrier to oncoming traffic and use barricades/warning devices or cones.
12	POST-TRIP - Report maintenance or mechanical problems upon returning vehicle.	Conditions worsen leading to mechanical failure resulting in accident, injury or death.	When exiting vehicle in icy conditions test the surface before putting all of your weight down, keep legs close to vehicle and hold on to handle or door. Report vehicle problems immediately to company representative or rental car agency. Review JSA again to ensure best practices have been followed.

SECTION 4

Personal Protective Equipment (PPE)

there is currently no personal protective equipment for this JSA.

Required and/or Recommended Equipment and Supplies:

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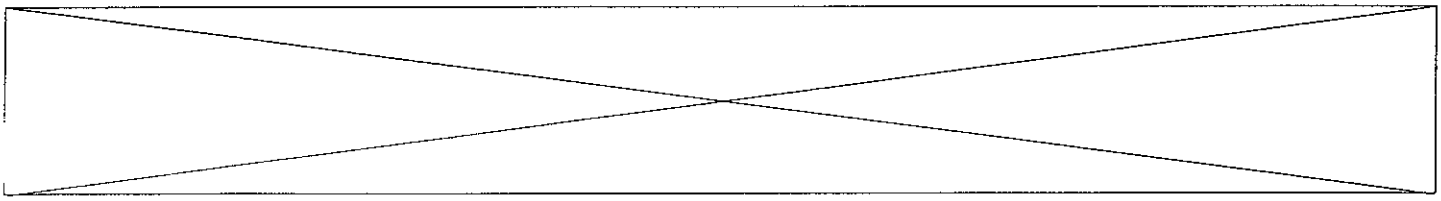
Last updated on 02/24/2006 at 10:27:17 by bloomis



JSA

*** The LPS system is designed to be used with Internet Explorer 6.0 or higher ***

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SECTION 1

JSA Type: Field Work
JSA No: JSA000423 **Status:** Closed **Version:** Current
Date: 10/26/06
Work Type: Environmental - Excavation
Work Activity:
Project No: B00872430000 - IMPLEMENTATION OF RAWPs (IMPLEMENTATION OF RAWPs)

SECTION 2

Development Team	Position/Title	PC	Reviewed By	Position/Title	Date
Richardson, Aaron D		☑	Kingsley, David R		10/27/06

SECTION 3

No	Job Step	Potential Hazard (s)	Critical Action(s)	SOP Reference
1	Prepare area for excavation	1. Underground and overhead utilities. 2. Uncontrolled access by unauthorized personnel	1. Initiate 1 call system for identification of utilities. Inspect the area for obvious signs of utilities. 2. Clearly mark work areas. Depending on location and surroundings, restrict access through the use of warning tape, construction fence or temporary chain link. Ingress and egress to the work area should be limited to a single location. All activity will stop if the general public or unauthorized personnel enter the work zone.	
2	Inspect machinery	1. malfunctioning safety features or damaged equipment	1. Check all fluids at the start of a work shift. Visually inspect hydraulic lines for damage. Inspect all safety apparatus. If any damage is noted that will affect the safe operation of the machine, it is to be taken out of service until repairs are made.	
3	Excavate soil	1. Injury while entering or exiting the machine. 2. Striking Utilities. 3. Struck by, pinned against hazards. 4. Dust. 5. Cave ins	1. The operator will utilize 3 points of contact when entering or exiting the machine. 2. The operator must review and familiarize himself with the location of all utilities identified in job step 1. In areas of known underground utilities, a spotter will be utilized to hand excavate to determine depth and alignment. In areas of above grade utilities/structures, visual aids such as bright flags are to be installed for better visibility by the operator. 3. Keep unauthorized personnel away from the excavation area. If a spotter is utilized, the spotter must maintain eye contact with the operator. The excavator will be positioned such that the counterweight cannot come in contact with any site features. When tracking the machine, the operator will assure clear path before traveling. The operator will not swing the bucket over any personnel or cab of vehicles being loaded. 4. Dust will be controlled by wetting or other controls described in the work plan. 5. All excavations will be sloped, benched or sheeted as detailed in the work plan or as directed by a competent person. Use the appropriate size of equipment relative to the size of the excavation area and proximity of structures.	
4	Demobilize from the area	1. open excavation and unauthorized entry. 2. property damage.	1. If an excavation will not be back filled, provisions MUST be made to prevent unauthorized or accidental entry. Methods to be utilized should take into account the surrounding area(residential vs. industrial). Measures range from demarcation tape to 24 hr security and should be decided upon prior to excavation activities. 2. At the end of the work shift, keys are to be removed from the machine to prevent unauthorized use.	

SECTION 4

Personal Protective Equipment (PPE)

Level D

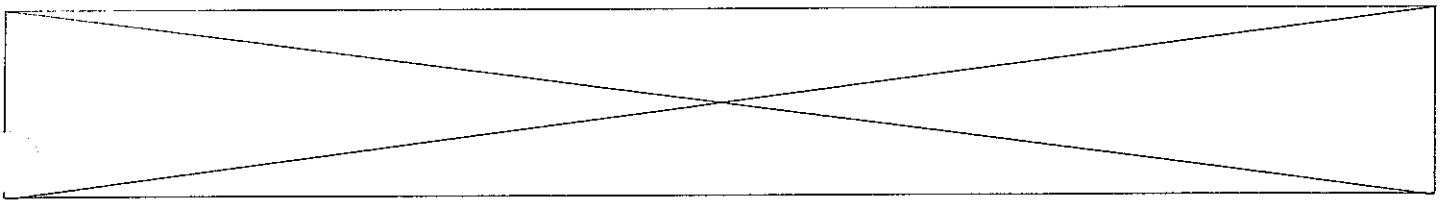
Safety Shoes

Required and/or Recommended Equipment and Supplies:

---

comments | copy | revise | print

Last updated on 10/27/2006 at 03:33:30 by DKINGSLEY



JSA

*** The LPS system is designed to be used with Internet Explorer 6.0 or higher ***

comments | copy | revise | print

SECTION 1

JSA Type: Soil Sampling
JSA No: JSA000508 **Status:** Closed **Version:** Current
Date: 1/22/07
Work Type: Environmental - Surface Soil Sampling
Work Activity:
Project No: B00872210000 - SOIL MGMT EVALUATIONS (SOIL MGMT EVALUATIONS)

SECTION 2

Development Team	Position/Title	PC	Reviewed By	Position/Title	Date
Lansing, Jennifer L		☑	Braun, Gregory J		2/6/07
			Lansing, Jennifer L		3/13/07
			Larsen, Cory G		1/24/07
			Robbins, Kiersten B		1/22/07

SECTION 3

No	Job Step	Potential Hazard(s)	Critical Action(s)	SOP Reference
1	Load equipment and supplies into vehicle.	Lifting hazards and back strain. Pinch points. Breaking glass in coolers. Spilling decontamination chemicals.	Use proper lifting technique. Request assistance when lifting heavy equipment. Use dolly to transport coolers, if necessary. Load coolers and decontamination materials so they will not shift during transport.	
2	Mobilize. Drive to the site.	Vehicle accident. Loss of equipment/supplies from moving vehicle.	Follow safe driving procedures (inspect vehicle prior to driving, safe following distances, headlights, safety belts, etc.). Do not use cell phone when driving. Properly secure all equipment and supplies before operating vehicle.	
3	Property Access	Vehicle traffic pedestrian traffic.	Be aware of vehicle traffic on-site and surroundings. Follow site traffic regulations (speed limit, right-of-way). Be aware of pedestrians.	
4	Working Outdoors	Temperature-related illnesses (heat-stress, cold-stress). Weather. Biological hazards (wasps, spiders, animals, vegetation, etc.).	Drink plenty of fluids, take breaks as needed to avoid overheating, frostbite, etc., dress appropriately for weather conditions. Use sunscreen as appropriate, monitor changes in weather, postpone work if lightning is observed or expected. Wasps, spiders, bee, etc. may be present.	
5	Tailgate Safety Meetings/TRACK (SPSA)	Injury or property damage due to unknown or known hazards present.	Discuss work to be performed and associated hazards. Open communication among team members. Have all team members sign safety meeting form and JSA. SPSA (Assess, Analyze, and Act) prior to starting new work. Discuss any new or unknown hazard identified from SPSA.	
6	Access to soil (soil pile, drums, roll off)	Traffic hazards, pinch points, tripping hazards.	If soil near a traffic area wear safety vest, place cones to delineate work area. When possible, position vehicle to protect from oncoming traffic. Wear work gloves when opening drums. Wear work gloves and safety goggles when loosening straps on roll off. Be cautious of pinch points on drums (hands and toes). Be cautious roll off straps (hands and eyes). Communicate to others when opening drum or loosening roll off straps so they are clear.	
7	Collecting soil samples	Exposure to site constituents of concern. Back strain. Slips, trips, falls.	Wear sampling/ nitrile gloves. Decontaminate non-disposable sampling equipment between each sampling run. Keep samples stored in proper containers, on ice, and away from work area. Be cautious of footing on soil piles (hidden objects under plastic, slippery, unstable footing). Bring step ladder or long auger to sample roll off without leaning over edge of roll-off (back and rib strain).	
8	Packaging samples to be picked up or shipped to the lab.	Bottle breakage, back strain, sample cross contamination.	Pack coolers to minimize sample jar movement inside. Use paper, cardboard or foam. Use proper lifting techniques.	

9	Demobilize. Driving back from site.	Slips, trips, and falls. Lifting hazards and back strain. Vehicle accident. Loss of equipment /supplies from moving vehicle.	Leave site clean of refuse and debris. Use proper lifting technique. Request assistance when lifting heavy equipment. Use dolly to transport equipment, if needed. Properly secure all equipment and supplies before before operating vehicle. Follow safe driving procedures (safe following distances, headlights, safety belts, etc..). Do not use cell phone when driving.

SECTION 4

Personal Protective Equipment (PPE)

Hard Hat

orange traffic safety vest

Protective Gloves - nitrile for sampling, leather for accessing soil in drums and roll-offs

Safety Glasses

Safety Shoes

Required and/or Recommended Equipment and Supplies:

---

comments copy revise print

Last updated on 03/13/2007 at 08:13:32 by JLANSING

ARCADIS BBL

Attachment H

Journey Management Plan/Traffic Control Plan

ARCADIS BBL Journey Management Plan
Chevron EMC R&T Field Operations

Job Name: Golden Road Disposal Site
Location: 189 Golden Road, Chili, NY

PURPOSE

The purpose of this Journey Management Procedure (JMP) is to prevent losses associated with motor vehicle related incidents including: injuries to drivers, passengers and pedestrians, damage to motor vehicles, and damage to third party property. By communicating potential safety risks before mobilizing to a site, a motor vehicle operator will be able to prepare for and avoid potential hazards.

SPECIAL NOTE

Because the site, weather, and traffic conditions may change frequently the JMP shall be maintained and updated separate from the Site Health and Safety Plan.

Responsibilities

Contract Project Manager

The contract project manager is responsible to ensure that the site has a current Journey Management Plan.

Vehicle Operator and Project Manager

The vehicle operator, with assistance from the project manager, is responsible to create and keep current a JMP that is appropriate for the site conditions. It is also the vehicle operator's and project manager's role to ensure each vehicle operator has a JMP that describes the conditions for his vehicle and equipment prior to mobilizing to the site. A common JMP may be used for several vehicles or as conditions dictate a separate JMP may be specific or unique to an individual vehicle.

The assigned vehicle operator shall not mobilize to the site without first receiving the JMP. It is also the vehicle operator's responsibility to read and become familiar with the description and stipulations of the JMP prior to mobilizing to the site. DO NOT mobilize to the site to get clarification to the JMP. Because driving conditions may vary, vehicle operators shall also notify the field manager of any hazards not identified on the JMP so that the field manager can update the JMP. Because traffic conditions may change frequently on a project, the JMP shall be maintained and updated separate from the Site Health and Safety Plan.

ARCADIS BBL Journey Management Plan
Chevron EMC R&T Field Operations

Job Name: Golden Road Disposal Site
Location: 189 Golden Road, Chili, NY

Scope of this JMP

This JMP shall include the operation and use of the following vehicles and equipment: BBL vehicles used to transport personnel to and from the site, support equipment such as trailers and other equipment. All vehicle operators shall be responsible for ensuring their vehicles are maintained and being familiar with and obeying all laws related to vehicle operation.

General Hazards

It is the vehicle operator's sole responsibility to read and become familiar with the description and stipulations of this JMP prior to mobilizing to the site. All drivers will avoid distractions including but not limited to using cell phones.
Much of the vehicle use hazard comes from travel to and from the site. The driver should anticipate hazards, maintain a safety cushion around the vehicle, and adjust their driving speed. Weather conditions will be monitored throughout the day and prior to mobilization It is mandatory that workers cross streets at the cross walks. Workers should attempt to face traffic while working, in order to see cars coming toward them. Reduce speed accordingly so that stopping can be made safely. Obey posted speed limits. Weather: Rain or mist reduces visibility and wet pavement reduces traction. Turn headlights on to increase visibility regardless of weather conditions. Make sure windshield wipers are in proper working condition.

Site Specific Hazards

There is an active railroad located immediately north of the site. All vehicles entering or exiting the site must cross the railroad at the public railroad crossing on Golden Road.

The access from Golden Road to the site is a temporary, stone construction road. The road is one single lane wide for approximately 500 feet long.

Pedestrian traffic at the site will be limited to personnel associated with the remedial activities.

Directions: Access to the Site

Site access is only available to the east of the site via an access road from Golden Road.

Directions: Leaving the Site

Golden Road to the east of the site is the only available route to exit the site.

Site Specific Restrictions and Controls

All vehicles with limited vision shall not be positioned into place or backed without a spotter to assist the vehicle operator.

All vehicles must come to a complete stop prior to crossing the railroad crossing. The driver shall look both ways to confirm that no trains are approaching before proceeding across the tracks.

All vehicles using the access road must come to a complete stop prior to turning onto the access road. The driver shall then visually confirm that no other trucks are already using the access road. If another vehicle is already on the road, the stopped vehicle must yield to the vehicle that is already on the road.

ARCADIS BBL Journey Management Plan
Chevron EMC R&T Field Operations

Job Name: Golden Road Disposal Site
Location: 189 Golden Road, Chili, NY

Project Manager : Bill McCune	Cell: 315-420-4348

Contract Project Manager: Dave Kingsley	Cell: 585-233-7046

CHANGES TO THE JOURNEY MANAGEMENT PLAN

Date	Name	Change/Comment (be specific)

This Journey Management Plan is approved for use:

From:	Time:	To:	Time:

Journey Management Plan Created and Maintained by:

Directions to Fairport, NY

YAHOO! LOCAL Maps

Summary and Notes

START **A Blasland Bouck & Lee Incorporated**
(585) 385-0090
295 Woodcliff Dr, Fairport, NY

B 189 Golden Rd, Chili, NY

FINISH **C Blasland Bouck & Lee Incorporated**
(585) 385-0090
295 Woodcliff Dr, Fairport, NY

Total Distance: 45.8 miles, Total Time: 55 mins (approx.)

Add your notes here...

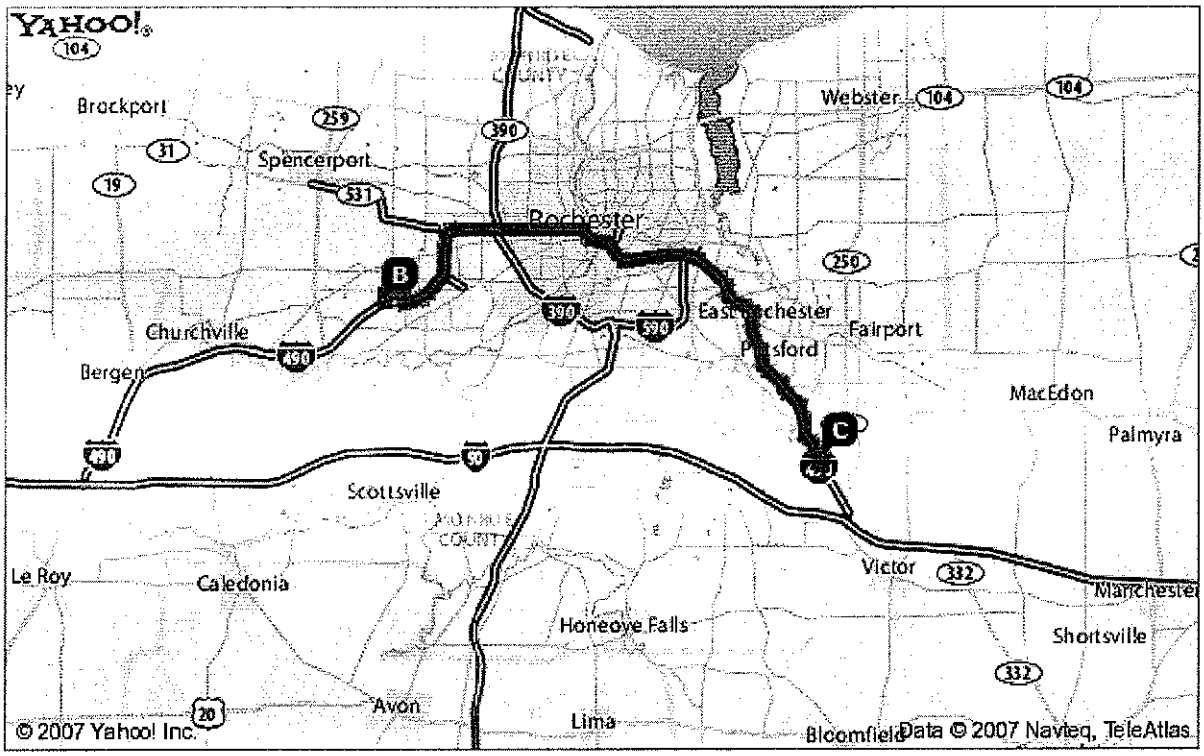
	Distance
A 295 WOODCLIFF DR, FAIRPORT, NY	
1. Start at **295 WOODCLIFF DR, FAIRPORT** going toward **PITTSFORD VICTOR RD**	go **0.3** mi
2. Turn **R** on **PITTSFORD VICTOR RD(RT-96)**	go **0.2** mi
3. Take ramp onto **I-490 W**	go **20.9** mi
4. Take exit **#5/CHILI CENTER**	go **0.2** mi
5. Turn **R** on **CHILI CENTER COLDWATER RD(RT-386)**	go **0.3** mi
6. Turn **L** on **WESTSIDE DR(CR-119)**	go **0.7** mi
7. Turn **L** on **GOLDEN RD**	go **0.3** mi
8. Arrive at **189 GOLDEN RD, CHILI**, on the **R**	
B 189 GOLDEN RD, CHILI, NY	

Distance: 22.9 miles, Time: 27 mins

B 189 GOLDEN RD, CHILI, NY	
1. Start at **189 GOLDEN RD, CHILI** going toward **STONE BARN RD**	go **0.3** mi
2. Turn **R** on **WESTSIDE DR(CR-119)**	go **0.7** mi
3. Turn **R** on **CHILI CENTER COLDWATER RD(RT-386)**	go **0.3** mi
4. Turn **L** to take ramp onto **I-490 E**	go **20.8** mi
5. Take exit **#28/RT-96** onto **PITTSFORD VICTOR RD(RT-96)** toward **RT-96 S**	go **0.6** mi
6. Turn **L** on **WOODCLIFF DR**	go **0.3** mi
7. Arrive at **295 WOODCLIFF DR, FAIRPORT**, on the **L**	
C 295 WOODCLIFF DR, FAIRPORT, NY	

Distance: 22.9 miles, Time: 28 mins

Total Distance: 45.8 miles, Total Time: 55 mins (approx.)



When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

Directions to Rochester, NY

YAHOO! LOCAL Maps

Summary and Notes

START A **A Royal Environmental Incorporated**
(585) 254-1840
720 Lexington Ave, Rochester, NY

B **189 Golden Rd, Chili, NY**

FINISH C **A Royal Environmental Incorporated**
(585) 254-1840
720 Lexington Ave, Rochester, NY

Total Distance: 18.7 miles, Total Time: 32 mins (approx.)

Add your notes here...

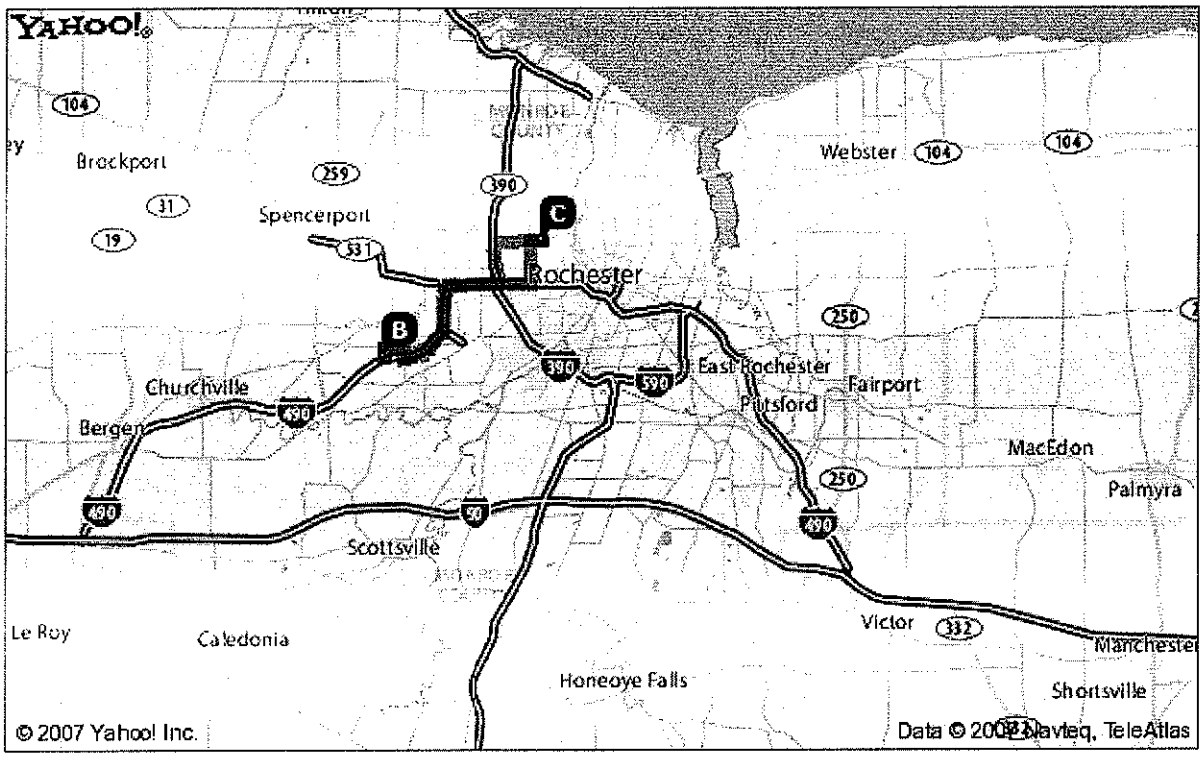
	Distance
A 720 LEXINGTON AVE, ROCHESTER, NY	
1. Start at **720 LEXINGTON AVE, ROCHESTER** going toward **NORMAN ST**	go **0.5** mi
2. Turn **L** on **MT READ BLVD**	go **1.5** mi
3. Turn **R** to take ramp onto **I-490 W**	go **5.9** mi
4. Take exit **#5/CHILI CENTER**	go **0.2** mi
5. Turn **R** on **CHILI CENTER COLDWATER RD(RT-386)**	go **0.3** mi
6. Turn **L** on **WESTSIDE DR(CR-119)**	go **0.7** mi
7. Turn **L** on **GOLDEN RD**	go **0.3** mi
8. Arrive at **189 GOLDEN RD, CHILI**, on the **R**	
B 189 GOLDEN RD, CHILI, NY	

Distance: 9.3 miles, Time: 16 mins

B 189 GOLDEN RD, CHILI, NY	
1. Start at **189 GOLDEN RD, CHILI** going toward **STONE BARN RD**	go **0.3** mi
2. Turn **R** on **WESTSIDE DR(CR-119)**	go **0.7** mi
3. Turn **R** on **CHILI CENTER COLDWATER RD(RT-386)**	go **0.3** mi
4. Turn **L** to take ramp onto **I-490 E**	go **4.6** mi
5. Take **L** exit **#9A/GREECE** onto **RT-390 N**	go **1.6** mi
6. Take exit **#22/LEXINGTON AVE**	go **0.2** mi
7. Turn **R** on **LEXINGTON AVE**	go **1.7** mi
8. Arrive at **720 LEXINGTON AVE, ROCHESTER**, on the **L**	
C 720 LEXINGTON AVE, ROCHESTER, NY	

Distance: 9.4 miles, Time: 16 mins

Total Distance: 18.7 miles, Total Time: 32 mins (approx.)



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Directions to Rochester, NY

YAHOO! LOCAL Maps

Summary and Notes

START A **146 Lake Ave, Rochester, NY**

B **189 Golden Rd, Chili, NY**

FINISH C **146 Lake Ave, Rochester, NY**

Total Distance: 20.2 miles, Total Time: 35 mins (approx.)

Add your notes here...

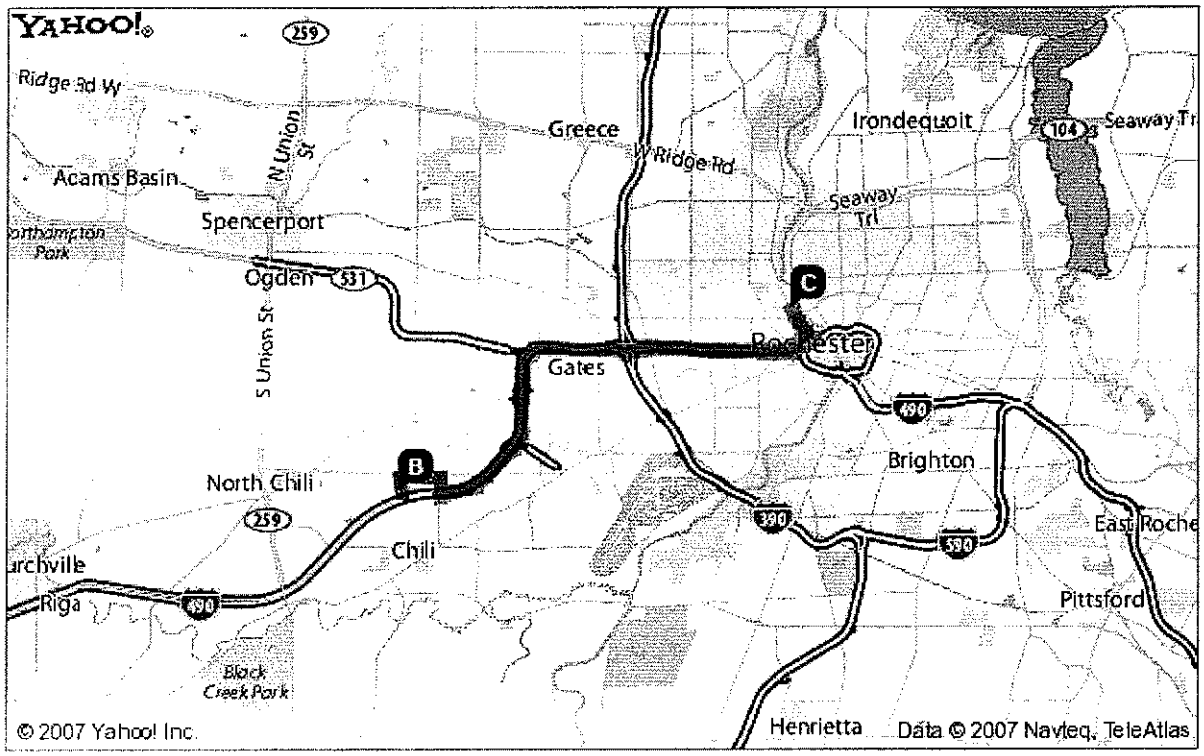
	Distance
A 146 LAKE AVE, ROCHESTER, NY	
1. Start at **146 LAKE AVE, ROCHESTER** going toward **SPENCER ST**	go **0.2** mi
2. Continue on **STATE ST**	go **0.2** mi
3. Turn R on **BROWN ST**	go **0.4** mi
4. Bear R on **CAMPBELL ST**	go **0.1** mi
5. Take L ramp onto **I-490 W**	go **7.5** mi
6. Take exit **#5/CHILI CENTER**	go **0.2** mi
7. Turn R on **CHILI CENTER COLDWATER RD(RT-386)**	go **0.3** mi
8. Turn L on **WESTSIDE DR(CR-119)**	go **0.7** mi
9. Turn L on **GOLDEN RD**	go **0.3** mi
10. Arrive at **189 GOLDEN RD, CHILI**, on the R	
B 189 GOLDEN RD, CHILI, NY	

Distance: 10.0 miles, Time: 17 mins

B 189 GOLDEN RD, CHILI, NY	
1. Start at **189 GOLDEN RD, CHILI** going toward **STONE BARN RD**	go **0.3** mi
2. Turn R on **WESTSIDE DR(CR-119)**	go **0.7** mi
3. Turn R on **CHILI CENTER COLDWATER RD(RT-386)**	go **0.3** mi
4. Turn L to take ramp onto **I-490 E**	go **7.6** mi
5. Take exit **#12/BROAD ST/BROWN ST**	go **0.1** mi
6. Continue on **ALLEN ST**	go **0.2** mi
7. Continue on **PLATT ST**	go **0.3** mi
8. Continue on **MORRIE SILVER WAY**	go **0.1** mi
9. Turn L on **STATE ST**	go **0.4** mi
10. Continue on **LAKE AVE**	go **0.2** mi
11. Arrive at **146 LAKE AVE, ROCHESTER**, on the R	
C 146 LAKE AVE, ROCHESTER, NY	

Distance: 10.2 miles, Time: 18 mins

Total Distance: 20.2 miles, Total Time: 35 mins (approx.)



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Directions to Rochester, NY

YAHOO! LOCAL Maps

Summary and Notes

START (A) **Passero, Gary - Passero Associates**
(585) 325-1000
100 Liberty Pole Way, Rochester, NY

(B) **189 Golden Rd, Chili, NY**

FINISH (C) **Passero, Gary - Passero Associates**
(585) 325-1000
100 Liberty Pole Way, Rochester, NY

Total Distance: 21 miles, Total Time: 34 mins (approx.)

Add your notes here...

	Distance
(A) 100 LIBERTY POLE WAY, ROCHESTER, NY	
1. Start at **100 LIBERTY POLE WAY, ROCHESTER** going toward **ANDREWS ST**	go **0.1** mi
2. Bear (L) on **ANDREWS ST**	go **0.2** mi
3. Bear (R) on **BITTNER ST**	go **0.1** mi
4. Continue on **ST PAUL ST**	go **< 0.1** mi
5. Turn (L) to take ramp onto **INNER LOOP** toward **INNER LOOP WEST**	go **0.5** mi
6. Take the **BUFFALO** exit onto **I-490 W**	go **8.1** mi
7. Take exit **#5/CHILI CENTER**	go **0.2** mi
8. Turn (R) on **CHILI CENTER COLDWATER RD(RT-386)**	go **0.3** mi
9. Turn (L) on **WESTSIDE DR(CR-119)**	go **0.7** mi
10. Turn (L) on **GOLDEN RD**	go **0.3** mi
11. Arrive at **189 GOLDEN RD, CHILI**, on the (R)	
(B) 189 GOLDEN RD, CHILI, NY	

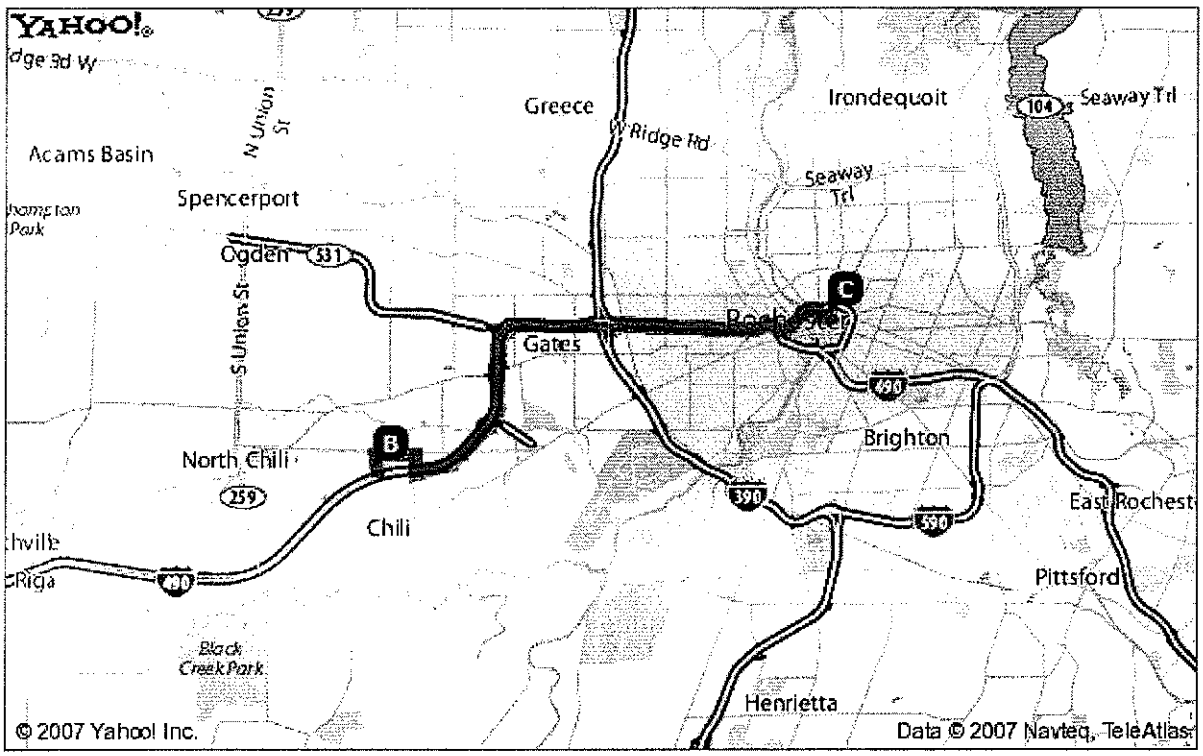
Distance: 10.5 miles, Time: 17 mins

(B) 189 GOLDEN RD, CHILI, NY	
1. Start at **189 GOLDEN RD, CHILI** going toward **STONE BARN RD**	go **0.3** mi
2. Turn (R) on **WESTSIDE DR(CR-119)**	go **0.7** mi
3. Turn (R) on **CHILI CENTER COLDWATER RD(RT-386)**	go **0.3** mi
4. Turn (L) to take ramp onto **I-490 E**	go **7.9** mi
5. Take (L) exit **#13/DOWNTOWN/INNER LOOP/PLYMOUTH AVE** onto **INNER LOOP**	go **0.8** mi
6. Take the **DOWNTOWN/ST PAUL/CLINTON** exit	go **< 0.1** mi
7. Continue on **CUMBERLAND ST**	go **< 0.1** mi
8. Bear (R) on **BITTNER ST**	go **0.1** mi

9. Bear L on **ANDREWS ST**	go **0.2** mi
10. Bear R on **LIBERTY POLE WAY**	go **0.1** mi
11. Arrive at **100 LIBERTY POLE WAY, ROCHESTER,** on the L	
C **100 LIBERTY POLE WAY, ROCHESTER, NY**	

Distance: 10.5 miles, Time: 17 mins

Total Distance: 21 miles, Total Time: 34 mins (approx.)



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Directions to East Syracuse, NY

YAHOO! LOCAL Maps

Summary and Notes

START **A Blasland Bouck & Lee Incorporated**
(315) 446-9120
6723 Towpath Rd, East Syracuse, NY

B 189 Golden Rd, Chili, NY

FINISH **C Blasland Bouck & Lee Incorporated**
(315) 446-9120
6723 Towpath Rd, East Syracuse, NY

Total Distance: 202.5 miles, Total Time: 3 hours 17 mins (approx.)

Add your notes here...

	Distance
A 6723 TOWPATH RD, EAST SYRACUSE, NY	
1. Start at **6723 TOWPATH RD, EAST SYRACUSE** going toward **WIDEWATERS PKY**	go **0.2** mi
2. Turn **R** on **WIDEWATERS PKY**	go **0.5** mi
3. Turn **R** on **BRIDGE ST**	go **0.4** mi
4. Turn **L** to take ramp onto **I-690 W** toward **THOMPSON RD SOUTH/SYRACUSE**	go **12.9** mi
5. Take exit **#1/THRUWAY** onto **I-90 W** toward **THRUWAY/BUFFALO** (Toll applies)	go **62.0** mi
6. Take exit **#45/ROCHESTER** (Portions toll)	go **0.5** mi
7. Bear **L** on **I-490 W**	go **23.2** mi
8. Take exit **#5/CHILI CENTER**	go **0.2** mi
9. Turn **R** on **CHILI CENTER COLDWATER RD(RT-386)**	go **0.3** mi
10. Turn **L** on **WESTSIDE DR(CR-119)**	go **0.7** mi
11. Turn **L** on **GOLDEN RD**	go **0.3** mi
12. Arrive at **189 GOLDEN RD, CHILI**, on the **R**	
B 189 GOLDEN RD, CHILI, NY	

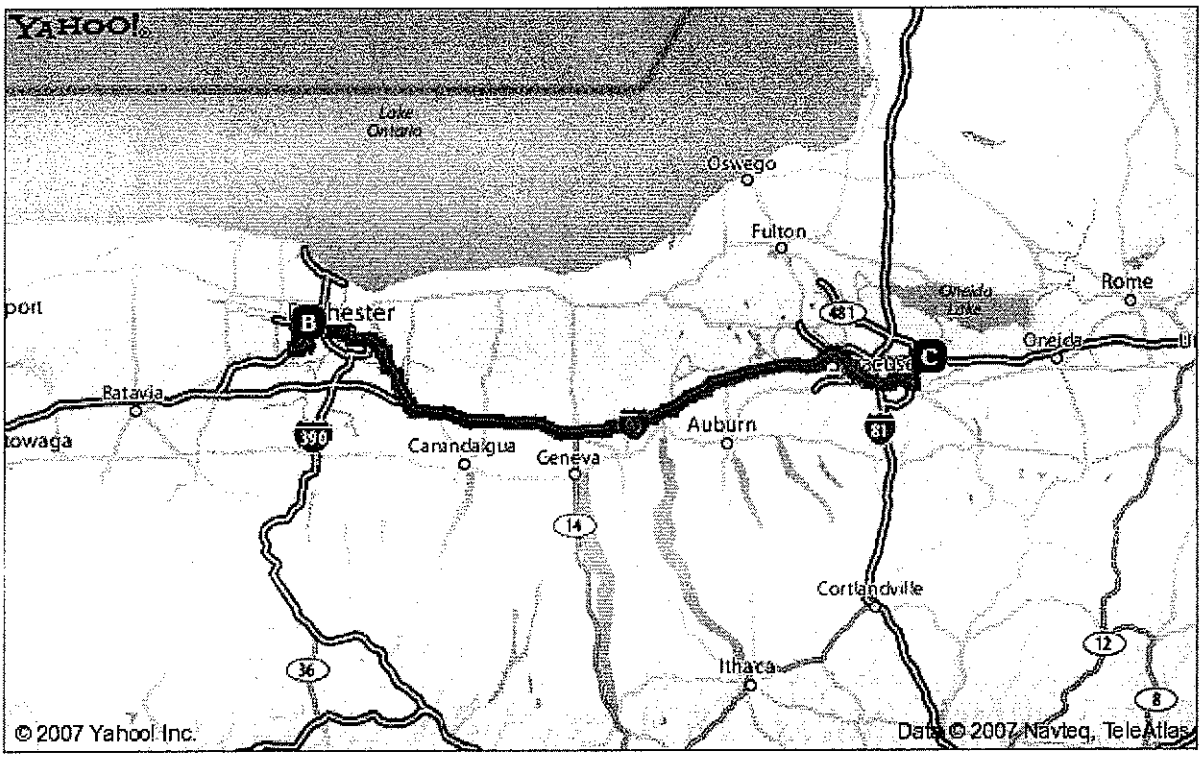
Distance: 101.1 miles, Time: 1 hour38 mins

B 189 GOLDEN RD, CHILI, NY	
1. Start at **189 GOLDEN RD, CHILI** going toward **STONE BARN RD**	go **0.3** mi
2. Turn **R** on **WESTSIDE DR(CR-119)**	go **0.7** mi
3. Turn **R** on **CHILI CENTER COLDWATER RD(RT-386)**	go **0.3** mi
4. Turn **L** to take ramp onto **I-490 E** (Portions toll)	go **23.5** mi
5. Take the **ALBANY L** exit onto **I-90 E** (Toll applies)	go **61.5** mi
6. Take exit **#39/SYRACUSE/FULTON** onto **I-690 E** toward **SYRACUSE/FAIRGROUNDS** (Portions toll)	go **13.1** mi

7. Take exit **#16-17/THOMPSON RD/BRIDGE ST/EAST SYRACUSE** onto **BRIDGE ST** toward **17/BRIDGE ST**	go **1.4** mi
8. Turn L on **WIDEWATERS PKY**	go **0.5** mi
9. Turn L on **TOWPATH RD**	go **0.2** mi
10. Arrive at **6723 TOWPATH RD, EAST SYRACUSE**, on the L	
C **6723 TOWPATH RD, EAST SYRACUSE, NY**	

Distance: 101.4 miles, Time: 1 hour39 mins

Total Distance: 202.5 miles, Total Time: 3 hours 17 mins (approx.)



When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

ARCADIS BBL Traffic Control Plan
Chevron EMC R&T Field Operations

Job Name: Golden Road Disposal Site
Location: 189 Golden Road, Chili, New York

PURPOSE

The purpose of this Traffic Control Plan (TCP) is to prevent losses associated with motor vehicle and pedestrian related incidents including injuries to drivers, passengers and pedestrians, damage to motor vehicles, and damage to third party property. By communicating potential safety risks to before mobilizing to a site, the employee will be able to prepare for and avoid potential hazards.

SPECIAL NOTE

Because the site, weather, and traffic conditions may change frequently the TCP shall be maintained and updated separate from the Site Health and Safety Plan.

Responsibilities

Contract Project Manager

The contract project manager is responsible to ensure that the site has a current Traffic Control Plan.

Vehicle Operator and Project Manager

The field personnel, with assistance from the project manager, are responsible to create and keep current a TCP that is appropriate for the site conditions. It is also the field personnel and project manager's role to read and become familiar with the description and stipulations of the TCP prior to mobilizing to the site.

All assigned vehicle operators shall not mobilize to the site without first receiving the TCP. It is the responsibility of all project personnel to read and become familiar with the description and stipulations of the TCP prior to mobilizing to the site. DO NOT mobilize to the site to get clarification to the TCP. Because driving and field conditions may vary or change, field personnel shall notify the field manager of any hazards not identified on the TCP so that the field manager can update the TCP.

SCOPE OF WORK & TRAFFIC CONTROL PLAN

The scope of work includes the delineation and excavation of soil from an inactive hazardous waste site, possible groundwater management, the loading and transportation of impacted soil off site for proper disposal, and restoration of the site. The excavation of soil will be performed at two separate locations at the site. This TCP includes details of site operations, the hazards associated with them, and how to protect against incidents using exclusion zones, safety equipment, and safety procedures.

Job Name: Golden Road Disposal Site
Location: 189 Golden Road, Chili, New York

SITE SPECIFIC HAZARDS

The site is an inactive hazardous waste site with a single access to the site from Golden Road to the east of the site. The site is situated south of an active railroad and north of an active interstate highway.

There is an active railroad located immediately north of the site. All vehicles entering or exiting the site must cross the railroad at the public railroad crossing on Golden Road.

The access from Golden Road to the site is a temporary, stone construction road. The road is one single lane wide for approximately 500 feet long.

Pedestrian traffic at the site will be limited to personnel associated with the remedial activities.

IMPLEMENTATION OF TRAFFIC CONTROL MEASURES

To minimize the likelihood of project personnel and activities being affected by traffic, the following procedures are implemented:

1) Be careful to face flow of vehicle traffic as much as possible when working outside of the fenced off exclusion zone and while setting up the exclusion zone.
2) Use A-frame barricades, lighted barrel barricades, safety fence, and vehicle blocking as needed to set up exclusion zone.
3) Signs designating work areas will be used throughout the project to notify the public and project personnel of those designated areas.
4) Flag-people will be used as necessary to coordinate the arrival and departure of equipment, including dump trucks, at the site.
5) The excavation and restoration work will be conducted in a manner that will produce the least amount of movement on site and into and out of the site.
6) Cones must be placed along the shoulder of the roadway starting 100 feet from the work area when working near adjacent roads and entrances to alert passing motorists to the presence of personnel and equipment. Barricades with flashing lights should be placed between the roadway and the work area.
7) During activities along the roadway, equipment will be aligned parallel to the roadway to the extent feasible so as to place a barrier between the work crew and the roadway traffic. All project personnel, with the exception of flag-people, must remain behind the equipment and traffic barriers when working adjacent to the roadways.
8) All site personnel must wear an outer layer of orange or yellow fluorescent, reflective safety garments, such as vest jackets or shirts and other necessary PPE (hard hats and steel-toed boots) at all times while walking about the site. If work is performed in the hours of dusk or darkness, workers will be outfitted with reflective garments of a highly visible color (such as orange or yellow fluorescent) which will include reflective coatings or elements that reflect light. Temporary lighting will also be used if necessary, if site work will occur during low-light conditions.

ARCADIS BBL Traffic Control Plan
Chevron EMC R&T Field Operations

Job Name: Golden Road Disposal Site
Location: 189 Golden Road, Chili, New York

Project Manager : Bill McCune	Cell: 315-420-4348

Contract Project Manager: Dave Kingsley	Cell: 585-233-7046

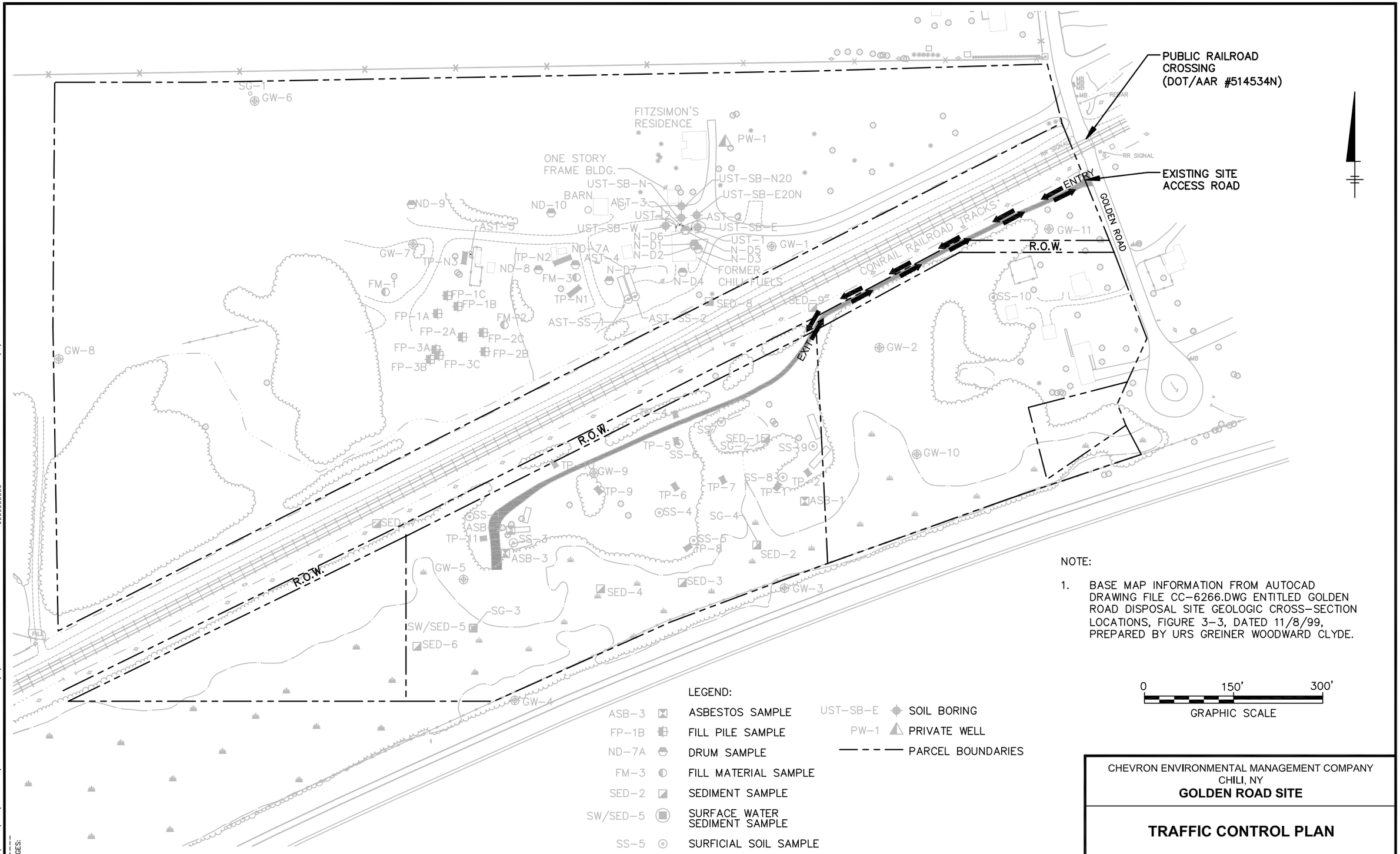
CHANGES TO THE TRAFFIC CONTROL PLAN

Date	Name	Change/Comment (be specific)

This Traffic Control Plan is approved for use:

From:	Time:	To:	Time:

Traffic Control Plan Created and Maintained by: David Kingsley - BBLES



NOTE:

1. BASE MAP INFORMATION FROM AUTOCAD DRAWING FILE CC-6266.DWG ENTITLED GOLDEN ROAD DISPOSAL SITE GEOLOGIC CROSS-SECTION LOCATIONS, FIGURE 3-3, DATED 11/8/99, PREPARED BY URS GREINER WOODWARD CLYDE.

LEGEND:

ASB-3	ASBESTOS SAMPLE	UST-SB-E	SOIL BORING
FP-1B	FILL PILE SAMPLE	PW-1	PRIVATE WELL
ND-7A	DRUM SAMPLE		PARCEL BOUNDARIES
FM-3	FILL MATERIAL SAMPLE		
SED-2	SEDIMENT SAMPLE		
SW/SED-5	SURFACE WATER SEDIMENT SAMPLE		
SS-5	SURFICIAL SOIL SAMPLE		
GW-3	GROUNDWATER MONITORING WELL		

0 150' 300'

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
CHILI, NY
GOLDEN ROAD SITE

TRAFFIC CONTROL PLAN

ARCADIS BBL
infrastructure, environment, facilities

SYR-85-CHS GMS RCB LAYER: ON=*; OFF=REF
G:\CAD\ACTIVE\-DWG\ACT\45852003\45852B02.DWG SAVED:11/2/2007 2:47 PM LAYOUT:1 PAGESETUP:######## PENTABLE:PLTFULL.CTB PRINTED:11/2/2007 2:47 PM BY:RBASSETT
PROJECTNAME:----
XREFS: IMAGES:

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Attachment I

Underground/Overhead Utilities Checklist and Chevron Guidance Document

ARCADIS BBL
Infrastructure, environment, facilities

Underground / Overhead Utility Checklist

Project Name:	**Date:**
Project Number:	**Location:**
Prepared By:	**Project Manager:**

This checklist must be completed for any intrusive subsurface work such as excavation or drilling. It documents that overhead and underground utilities in the work area are identified and located. The Project Manager shall request utility markouts before the start of field operations to allow the client and utility companies sufficient time to provide them. If complete information is not available, a magnetometer or other survey shall be performed to locate obstacles prior to intrusive subsurface activities.

Procedure: A diagram of the work area depicting the proposed location of intrusive subsurface work sites (i.e., boring locations, excavation locations) must be attached to this form. The diagram must clearly indicate the areas checked for underground structures / utilities, and overhead power lines. This form and the diagram must be signed by the BBL Project Manager (if present), the BBL Site Supervisor, and the client representative.

Type of Structure	Present	Not Present	Method of Markout
Electric Power Line			
Natural Gas Line			
Telephone Line			
Water Line			
Product Line			
Sewer Line			
Steam Line			
Drain Line			
Underground Tank			
Underground Cable			
Overhead Power Line			
Overhead Product Line			
Other (Specify)			

Reviewed By		
Name	Job Title	Date
	Client Representative	
	BBL Project Manager	
	BBL Site Supervisor	

Procedures for Identification of Underground Utilities at ChevronTexaco Facilities

ChevronTexaco

November 2002

Procedures for Identification of Underground Utilities at ChevronTexaco Facilities

Utility Mark-out Strategy for Drilling Operations at ChevronTexaco Facilities – LPS Program Action Item

I. Introduction

The accurate identification of underground utilities at all ChevronTexaco facilities prior to intrusive operations (e.g., drilling or excavating) is of paramount importance to protect the health and safety of employees, subcontracted personnel, the general public, and the integrity of the property and infrastructures of the site undergoing investigation. The following procedures provide a strategy for the identification and mark-out of underground utilities, as well as guidance for intrusive activities at high-risk sites.

The overall goal of this document is to provide a procedural outline for utility clearance that can be applied to all facility investigations, and to minimize, if not eliminate, potential for damage caused by hitting utilities during intrusive operations. The following sections present the Planning Procedures and Field Utility Clearance Activities that will be performed prior to all intrusive investigations.

II. Planning Procedures

Prior to the commencement of intrusive activities, the locations will be cleared for underground utilities by contacting the appropriate statewide organization (e.g., Underground Facility Protection Organization (UFPO) for New York) to have appropriate utilities representatives mark the location of underground lines. Most states have a central organization established for marking utilities that can be reached by calling a toll-free number. Table 1 provides a list of states, contact numbers, and requirements for calling in a utility mark-out. If possible, the responsibility of arranging a utility mark-out should be the subcontractor performing the drilling program. The verification of the utility mark-out will be performed on-site by the ChevronTexaco project representative.

Private utilities may be delineated by field personnel using appropriate devices (e.g., ground penetrating radar) and/or by a private utility locating contractor (if necessary). This contractor/site representative will survey the project area to determine the presence of known, as well as unknown, utilities/underground piping at the project area, especially in proposed drilling areas.

An underground/overhead utility checklist (Attachment 1) will be performed at each facility prior to beginning the drilling program. The checklist will be approved by the facility supervisor and the BBL site supervisor.

III. Field Procedures

Do not begin drilling or excavating until you have confirmed that all notified utilities have either responded to or cleared the worksite. The presence of some utility markings does NOT mean that all of the underground lines have been located, as there may be more than one telephone company (i.e. long distance and fiber carriers, etc.), the locator may not have finished marking, or someone may have arbitrarily painted something with that color. Always be certain that these utilities have all responded to (or cleared) your worksite before you begin. If an underground facility has been staked, marked, or otherwise designated within a proposed work area, and if the area of an underground facility overlaps with any part of the work area, or the projected line of a bore/directional drill intersects the path of an underground facility, the site supervisor will identify the precise location, type, size, direction of run and depth of such

underground utility. Verification may be completed before the drilling program is commenced or may be performed as the work progresses.

The verification of underground utilities shall be accomplished by exposing the underground facility or its encasement to view by means of hand dug test holes at one or more points where the work area and tolerance zone overlap, or more points as designated by the operators of such facilities. Hand-dug or hand-augered borings will be spaced to overlap the largest outer dimensions of the auger being used for the drilling operation. Powered or mechanized equipment may be used for removal of pavement or masonry, but only to the depth of such pavement or masonry.

If available, additional methods may be used instead, or in combination with hand digging or hand augering test holes to expose an underground utility. These methods may include surface geophysical methods (e.g., ground penetrating radar), utility tracing equipment (radio frequency detection), or soil vacuum methods (e.g., air knife). Descriptions of the use and limitations of these methods are provided below.

Ground penetrating Radar (GPR)

The GPR system transmits high frequency electromagnetic waves into the ground and detects the energy reflected back to the surface. Energy is reflected along boundaries that possess different electrical properties. Reflections typically occur at lithologic contacts or where subsurface materials have high electrical contrasts, including metal objects such as USTs, drums and utility pipes. These reflections are detected by the antenna and are processed into an electrical signal that can be used to image the subsurface feature. The GPR data will be reviewed in the field to assist in the delineation of potential piping.
The detection of piping located at the site will depend on the electrical properties of the soil and the pipe's depth, diameter and composition. GPR is limited the detection of smaller diameter pipes with depth. Generally, a pipe must increase in diameter by one inch for each foot in depth to be seen using GPR. Also, plastic piping is more difficult to detect than metal piping using GPR, and caution should be used if plastic utility lines are suspected.

Radio Frequency Detection (RFD)

This instrument operates on the principle of radio frequency transmission and detection. The transmitter applies a known frequency to the pipe and the receiver is able to detect this frequency along the length of the pipe. The success of RFD in tracing underground utilities is based on the composition of the pipe (metal or plastic) and the ability to accurately position the transmitter unit so that it can be attached to, or placed directly over the pipe. RFD should only be used to verify the location of utility mark-outs, and not as the primary method of utility identification.

Soil Vacuum Excavation

This method uses nondestructive vacuum excavation methods to create a visual test hole allowing the confirmation of buried utilities. This method is very accurate and can be performed prior to or during the drilling program. The limiting factors for this method are cost and availability. The cost of an appropriate soil vacuum truck and crew can be up to $1,500/day. As with specialty drilling methods, a limited number of firms have the equipment to perform vacuum excavation.

Consider the location to be cleared relative to the source and depth of impacted soil or groundwater. If the zone to be cleared is known not to contain hazardous vapors or petroleum hydrocarbons via previous testing, implement continuous air monitoring using a lower explosive level (LEL)/O_2 meter and PID or

FID to the depth of the boring. Also consistent with the HASP, air monitoring should be conducted continuously with the LEL/O_2 meter during any activity if flammable or explosive vapors are suspected to be present. Prior to any subsurface investigation activities, air monitoring should be conducted to establish background levels for total organic vapors using a PID or FID. All work activity must STOP where tests indicate the concentration of flammable vapors exceeds 10% of the LEL, and the source of vapors must be investigated.

Caution:

Some vacuum systems commonly used for utility clearance are considered unsuitable for use for environmental investigation sites. The manufacturers' catalogs for some vacuum assisted units have a disclaimer stating, "Not for use with Hydrocarbons, Explosives, Corrosive or Toxic Material," and are not intrinsically safe. On these units, potential petroleum vapors would pass through a hot blower into a tank where sparks or static electricity could be generated.

Given the disclaimer and that some units and associated tanking are not explosion proof. The following steps will be considered prior to using vacuum assisted utility clearance units where soils could be impacted with petroleum hydrocarbons or flammable vapors.

1) Request from the manufacturer and/or the contractor doing the work to supply manufacturers' documentation and specifications for use of the unit at environmental sites.

2) Request documentation that the unit is intrinsically safe and may be used in areas where petroleum hydrocarbon may be present.

3) Obtain details on how the unit deals with vapors through the system and complies with American Society of Civil Engineering guidelines for vacuum assisted utility clearance document number C-38-02.

4) Obtain the procedures for grounding portable units to discharge potential static electricity during operation.

5) If none of the above are available, then hand auger instead, and do not use vacuum assisted methods.

IV. Review of Utility Mark-Out Strategy

The following strategy for identifying and clearing underground utilities at ChevronTexaco sites is provided for review.

At all sites the following steps must be performed prior to initiating any intrusive work:

1. Contacting the appropriate states One-Call utility mark-out organization (see Table 1), and follow specific notification requirements for the geographic area.

2. Complete the underground/overhead utility checklist (Attachment 1), and meet on-site with utility representatives to verify utility mark-outs.

3. Based on the above, determine the need to perform supplemental utility identification by either exposing the utility via hand digging / hand augering, or using soil vacuum excavation. If any utility

mark-outs are in question, then the location of the utility must be confirmed by hand digging/hand augering methods or using a soil vacuum method prior to drilling.

4. GPR and RFD methods may be used to help located marked-out utilities, but should not be considered a substitute for hand digging or soil vacuum methods, especially if the location of the utility is unknown.

5. The identification of utilities will be performed to overlap the largest outer dimensions of the auger being used for the drilling operation by exposing the utility via hand digging/hand augering, or by using soil vacuum excavation.

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Attachment J

Daily/Periodic Excavation Inspection Form

ARCADIS BBL
Infrastructure, environment, facilities

Daily / Periodic Excavation Inspection Checklist

Project Name:	**Date / Time:**
Project Number:	**Location:**
Prepared By:	**Project Manager:**

This checklist must be completed for all excavations. It documents that daily and post-event / periodic inspections are conducted.

Soil Classified As: Stable Rock Type A Type B Type C

Soil Classified On: By:

Type of Protective System in Use: Sloping Shoring Other _____

Description:

Inspection Item	YES	NO	Comments
Is the underground / overhead utilities checklist completed?			
Are underground installations protected from damage?			
Are adequate means of entry / exit available in the excavation?			
If exposed to traffic, are personnel wearing reflective vests?			
Do barriers exist to prevent equipment from rolling into the excavation?			
Was air monitoring conducted prior to and during excavation entry?			
Was the stability of adjacent structures reviewed by a registered P.E.?			
Are spoil piles at least 2 feet from the excavation edge?			
Is fall protection in use near excavations deeper than 6 feet?			
Are work tasks completed remotely if feasible?			
Is a protective system in place and in good repair?			
Is emergency rescue (lifeline / body harness) equipment used due to potential atmospheric hazard?			
Is excavation exposed to vibration?			
Are employees protected from falling / elevated material?			
Is soil classification adequate for current environmental / weather conditions?			
Do portable ladders extend at least 4 feet above the excavation?			
Are portable ladders or ramps secured in place?			
Have all personnel attended safety meeting on excavation hazards?			
Are support systems for adjacent structures in place?			
Is the excavation free from standing water?			
Is water control and diversion of surface runoff adequate?			
Are employees wearing required protective equipment?			
BBL Excavation Competent Person:			**Date/Time:**

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Attachment K

Excavation and Trenching Policy and Procedure Memo

BBL	TOPIC: EXCAVATION AND TRENCHING	PPM#: HS 2.08
Policy & Procedure Memo	SECTION: Health & Safety	COMPANY LOCATIONS AFFECTED: All

STATEMENT OF POLICY:

The Firm is committed to operate in a manner which protects the health and safety of its personnel. Employees of the Firm must abide by applicable local, state, and federal regulations while conducting activities for the Firm. To maintain a safe and healthful workplace, employees of the Firm must utilize the procedures outlined in this PPM for any excavation activity conducted as part of the Firm's business.

This PPM sets forth standard procedures to be utilized by employees of the Firm when working with open excavations made in the earth's surface. This procedure also establishes administrative roles and responsibilities to meet the requirements and definitions of 29 CFR 1926 Subpart P.

To reduce the potential for injury, personnel must avoid entering excavations whenever feasible alternatives exist. If entry into an excavation cannot be avoided, the safety and engineering controls outlined in this procedure must be implemented by authorized personnel under direct supervision of personnel competent with respect to potential hazards present and regulatory requirements of 29 CFR 1926 Subpart P.

DESCRIPTION OF PROCEDURE:

1. OSHA DEFINITIONS FOR EXCAVATION ACTIVITIES

A. *Aluminum Hydraulic Shoring* means a pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (wailers). Such system is designed to support the sidewalls of an excavation and prevent cave-ins.

B. *Benching* (Benching system) means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

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

D. *Competent person* means one who, through education, training, and/or experience, is capable of identifying existing and predictable hazards or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

E. *Excavation* means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

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

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

H. *Protective system* means a method of protecting employees from cave-ins, from material that could fall or

roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide protection.

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

J. *Registered Professional Engineer* means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

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

L. *Shield* (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shield can be either premanufactured or job-built in accordance with 1926.652 (c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields".

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

N. *Sloping* (Sloping system) means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

O. *Stable rock* means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

P. *Support system* means a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Q. *Trench* means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 meters). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 meters) or less (measured at the bottom of the excavation), the excavation is considered to be a trench.

2. ADMINISTRATIVE ROLES AND RESPONSIBILITIES

A. Officers/Division Heads

1) Verify that all excavation activities are properly identified and addressed within a project work plan, site health and safety plan and/or other project documents.

2) Verify that employees designated as "competent person" for excavation activities have experience, training, and authority to fulfill the requirements of the position.

3) Verify that proper excavation and personal protective equipment is available for use by divisional employees.

B. Corporate Health and Safety Associate

1) Review and revise this procedure as required to meet regulatory requirements.

2) Provide technical assistance regarding excavation procedures, hazard identification, "competent person" designation, and personal protective systems.

3) Audit project specific excavation activities for compliance with this procedure.

4) Review and revise, as appropriate, site-specific health and safety plans to include requirements for excavation activities.

5) Verify that all employees assigned as a "competent person" for excavation activities meet the OSHA definition as such with respect to training and authority.

C. Regional Health and Safety Coordinators

1) Verify that all employees assigned as a "competent person" for excavation activities meet the OSHA definition as such with respect to training and authority.

2) Provide technical assistance regarding excavation procedures, hazard identification, "competent person" designation, and personal protective systems.

3) Audit project-specific excavation activities for compliance with this procedure.

4) Review and revise, as appropriate, site-specific health and safety plans to include requirements for excavation activities.

D. Divisional Health and Safety Coordinators

1) Review this PPM with all employees involved with excavation activities on a project specific basis;

2) Verify that all employees assigned as a "competent person" for excavation activities meet the OSHA definition as such with respect to training and authority.

3) Audit project-specific excavation activities for compliance with this PPM.

E. Site Designated "Competent Person"

1) Must be capable of identifying existing or predictable hazards in surroundings and/or working conditions associated with excavation activities.

2) Must be authorized to take prompt corrective measures to eliminate hazardous conditions associated with excavation activities.

3) Verify that the safety procedures identified in this PPM and 29 CFR 1926 Subpart P are utilized when required to protect employees during excavation activities.

4) Conduct and document daily inspections of all excavations and protective systems.

5) Conduct and document inspections of all excavations after any event (e.g., thunderstorm) that may affect excavation stability.

6) Attend "Competent Person" training for excavation and trenching activities.

7) Attend 8-Hour Supervisory training.

8) Attend Confined Space Entry training.

F. Employees Required to Work Around or In Excavations

1) Must be capable of recognizing existing or predictable hazards in surroundings and/or working conditions associated with excavation activities.

2) Understand all safety requirements outlined in this PPM and 29 CFR 1926 Subpart P to be utilized to protect employees during excavation activities

3) Attend annual OSHA refresher training.

4) Attend Confined Space Entry training.

3. GENERAL SAFETY REQUIREMENTS FOR ALL EXCAVATIONS

A. All surface obstructions must be moved or supported so as to protect employees and equipment.

B. Prior to excavation, all underground installations (water, electric, telephone, gas, etc.) must be located and documented. Proper procedures for locating underground objects may include interviews with utility or facility personnel, contacting locator services (e.g., Dig Safe), reviewing site drawings, and/or using geomagnetic sensing instrumentation. (See Section 6)

C. When excavating in areas near underground installations, proper precautions must be taken to determine

the exact location of the installations and to adequately protect and support them. While an excavation is open, underground installations shall be protected, supported or removed as necessary to protect employees.

D. Structural ramps used as a means of access and egress to/from excavations must be designed by a "competent person", constructed of uniform materials, securely attached, and treated to prevent slipping.

E. If personnel are working in a location exposed to vehicular traffic they must be provided with and be required to wear reflective safety vests.

F. Personnel are not permitted to be beneath elevated loads handled by equipment.

G. Mobile equipment located near open excavations must be adequately protected from falling or rolling into excavations by the use of barricades or warning devices.

H. All excavations over 4 feet in depth must be tested for hazardous atmospheres whenever personnel are required to enter and a potential exists for the existence of hazardous contaminants or oxygen deficiency. Excavations under 4 feet in depth must be evaluated by the competent person and, at the competent person's discretion, tested for hazardous atmospheres whenever personnel are required to enter and a potential exists for the existence of hazardous contaminants or oxygen deficiency.

I. Means of rescue including a lifeline and body harness must be used by personnel entering excavations with a potential for air hazards. A standby person must be stationed outside the excavation to tend the lifeline(s).

J. Water must not be allowed to accumulate in open excavations where employees are working. When necessary, means such as diverting natural drainage around the excavation or actively pumping water must be used to prevent or control water accumulation.

K. All structures adjacent to an open excavation must be supported, or a registered professional engineer must determine that the structure will not be affected by the excavation activities.

L. Excavated materials (spoil) must be placed no closer than 2 feet from the edge of an open excavation, and otherwise retained to prevent loose material from falling into the excavation.

M. Protection such as guardrails, barricades, or covers must be in place to protect personnel from possible falls into open excavations, pits, wells, and shafts.

N. Work tasks will be designed to limit the number of personnel required to enter any excavation. All tasks that can be completed remotely from outside the excavation (such as soil sampling) will be conducted in such a manner.

O. Personnel will not be allowed to enter any excavation unless adequate protective systems and procedures are utilized to prevent accidents and injury.

P. All excavations over four feet in depth shall be provided with a stairway, ladder, ramp, or other safe means of egress so as to require no more than 25 feet of lateral travel. As deemed necessary by the

competent person, excavations under four feet in depth will be provided with a stairway, ladder, ramp, or other safe means of egress so as to require no more than 25 feet of lateral travel.

4. EXCAVATIONS REQUIRING PROTECTIVE SYSTEMS

A. The following excavations require protective systems:

1) All excavations into which employees will enter, regardless of depth where the potential for cave-in exists.

2) Any excavation over 5 feet in depth into which employees will enter that is not entirely in stable rock as defined in this procedure.

3) Any excavation near a structure, (e.g. foundations, piers, footers, walls, sidewalks, tanks, roadways, etc.), as required by the registered professional engineer reviewing the stability of the excavation and the structure.

B. All excavations over 20 feet in depth must be designed by a registered professional engineer regardless of whether personnel will enter it or not.

C. All excavations with adjacent structures which are located a distance less than 4 to 6 times the depth of the excavation away shall be reviewed by a registered professional engineer to determine if the stability of the structure will be affected by the excavation.

D. Support systems for an adjacent structure must be designed by a registered professional engineer.

5. SELECTION AND USE OF PROTECTIVE SYSTEMS

A. <u>Shoring or Shielding</u>

1) If shoring or shielding is selected as the protective system for an excavation, soil classification in accordance with 1926 Subpart P Appendix A (see Section 10 of this procedure) is required; and

2) One of the following options must be utilized for all excavations which will be shored or shielded:

a. Timber shoring as specified in 1926 Subpart P Appendix C must be utilized;

b. Hydraulic shoring, trench jacks, air shores, or shields as required in 1926.652 (c)(2) must be utilized following the system manufacturer's data;

c. A system which follows other tabulated data (approved by a registered professional engineer) must be utilized; or

d. The excavation must be designed by a registered professional engineer.

B. <u>Sloping</u>

1) If sloping is selected as the protective system for an excavation, the excavation sides must be sloped at a maximum of 34^{o} (1 1/2 Horizontal: 1 Vertical), uness the procedure in #2 is followed.

2) Soil classification in accordance with Section 10 of this procedure) is required for all excavations with sides which will be sloped greater than 34^{o} (1 1/2 Horizontal: 1 Vertical) and

a. Sloping, based on soil classification, as specified in 1926 Subpart P Appendix B must be utilized;

b. A sloping system which follows other tabulated data (approved by a registered professional engineer) must be utilized; or

c. The excavation must be designed by a registered professional engineer.

6. ATMOSPHERIC TESTING FOR ENTRY

A. Any excavation over 4 feet in depth with a potential for hazardous contaminants or oxygen deficiency must be tested for hazardous atmospheres prior to and during activities involving entry.

B. The site designated "competent person" will document initial and periodic air monitoring results for all activities requiring entry into the excavation.

C. All atmospheric testing of excavations must be conducted in the following sequence and meet the following air quality criteria:

1) Oxygen content must be 19.5 to 23.5%;

2) Combustible gas or vapor must not exceed 10% of its lower explosive limit (LEL);

3) Toxic air contaminant levels must not exceed 50% of the permissible exposure limit for the specific contaminant;

4) Carbon monoxide must not exceed 20 ppm; and

5) Hydrogen sulfide must not exceed 5 ppm.

7. LOCATION OF UNDERGROUND/OVERHEAD UTILITIES

A. The competent person and the project manager shall both verify that local underground facilities location/protection agencies are notified within the required time frame prior to the initiation of excavation activities.

B. Prior to initiation of excavation or trenching operations the competent person shall verify that all utilities have been located.

C. The competent person shall verify that the Overhead/Underground Utilities Checklist (A copy of the checklist is attached to this PPM) is completed and authorized prior to the commencement of excavation and trenching activities.

8. **DAILY/PERIODIC INSPECTIONS**

A. Prior to initiation of daily excavation or trenching operations the competent person shall verify that a daily inspection of the excavation has been conducted.

B. During excavation or trenching operations the competent person shall verify that periodic inspections of all excavations are conducted after any event (e.g., thunderstorm) that may affect excavation stability.

C. The competent person shall verify that a daily/periodic inspection checklist (A copy of the checklist is attached to this PPM) is completed for each inspection of excavation and trenching activities.

9. **TRAINING**

A. "Competent Person" Training

In order to be assigned duties as a competent person with respect to excavation and trenching personnel must complete the firm's training course including but not limited to the following topics:

1) Soil classification techniques
2) Excavation hazard recognition
3) Protective systems
4) Requirements of 1926 subpart P and appendices
5) Procedures for addressing safety hazards.

B. General Hazard Awareness Training

1) New Employees

a) Provided general orientation training with respect to this procedure at time of hire.

2) Existing Employees will be provided with excavation and trenching awareness training:

a) Through DHSC at initiation of this procedure.

b) As part of other safety training (i.e., 8-Hour Refresher, Confined Space, and 8-Hour Supervisory.

C. Project - Specific Training

1. Site orientation on excavation projects shall include a discussion of:

a) Site excavation hazards and procedures;
b) Requirements for conducting activities remotely whenever possible;
c) Client requirements and procedures for excavation activities; and
d) This PPM.

2. Daily Safety Meetings on projects involving excavation activities shall include a discussion of:

a) Site excavation hazards and procedures;
b) requirements for conducting activities remotely whenever possible;
c) Client requirements and procedures for excavation activities; and
d) This PPM.

10. SOIL CLASSIFICATION FOR SELECTION OF PROTECTIVE SYSTEMS

A. Soil Classification

1) This section describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. This section contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

2) This section applies when a sloping, benching or shoring system is utilized as a method of protection for employees from cave-ins.

3) Soil Classification Definitions

a) **Cemented soil** means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.
b) **Cohesive soil** means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sides, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.
c) **Dry soil** means soil that does not exhibit visible signs of moisture content.
d) **Fissured** means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.
e) **Granular soil** means gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

f) **Layered system** means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

g) **Moist soil** means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

h) **Plastic** means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

i) **Saturated soil** means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or sheer vane.

j) **Soil classification system** means, for the purpose of this procedure, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the characteristics of the deposits and the environmental conditions of exposure.

k) **Submerged soil** means soil which is underwater or is free seeping.

l) **Unconfined compressive strength** means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

m) **Wet soil** means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

4) Types/Classes of Soil

a) **Type/Class A Soils** are cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

(1) The soil is fissured;
(2) The soil is subject to vibration from heavy traffic, pile driving, or similar effects;
(3) The soil has been previously disturbed;
(4) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4 Horizontal:1 Vertical) or greater; or
(5) The material is subject to other factors that would require it to be classified as a less stable material.

b) **Type/Class B Soils** are:

(1) Cohesive soils with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa);
(2) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay

loam;

(3) Previously disturbed soils, except those which would otherwise be classed as Type C soil;

(4) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration;

(5) Dry rock that is not stable; or

(6) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4 Horizontal:1 Vertical), but only if the material would otherwise be classified as Type B.

c) **Type/Class C Soils** are:

(1) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less;

(2) Granular soils including gravel, sand, and loamy sand; or

(3) Submerged soil or soil from which water is freely seeping; or

(4) Submerged rock that is not stable; or

(5) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4 Horizontal:1 Vertical) or steeper.

5) Methods for Classifying Soils

a) Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in this section.

b) The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis conducted by a competent person using tests described below, or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.

c) The visual and manual analyses, such as those noted as being acceptable in this section, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.

(1) Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

(a) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.

(b) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.

(c) Observe the side of the open excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.

(d) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

(e) Observe the open side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.

(f) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.

(g) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

2) Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

(a) **Plasticity.** Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.

(b) **Dry strength.** If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

(c) **Thumb penetration.** The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.

(d) **Other strength tests.** Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.

(e) **Drying test.** The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry:

(1) If the sample develops cracks as it dries, significant fissures are indicated.

(2) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as an unfissured cohesive material, and the unconfined compressive strength should be determined by using the thumb penetration or other test.

(3) If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

6) Layered system

a) A layered system shall be classified in accordance with its weakest layer.
b) Each layer may be classified individually where a more stable layer lies under a less stable layer.

7) Reclassifying Soils

a) If, after classifying a soil, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person.
b) The soil shall be reclassified as necessary to reflect the changed circumstances.

- END OF PROCEDURE -

Executive Authorization: 

Date: 3/00

ARCADIS BBL

Attachment L

Material Safety Data Sheets

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Asbestos **CAS Number:** 1332-21-4
Chemical Formula: $Ca_2H_2Mg_5O_{24}Si_8$
Structural Chemical Formula: $Ca_2Mg_5Si_8O_{22}(OH)_2$
ACX Number: X1001167-5
Synonyms: ACTINOLITE; ACTINOLITE ASBESTOS; AMIANTHUS; AMOSITE; AMOSITE (CUMMINGTONITE-GRUNERITE); AMPHIBOLE; ANTHOPHYLLITE; ANTHOPHYLLITE ASBESTOS; ASBEST; ASBESTOS; ASBESTOS DUST; ASBESTOS FIBER; ASBESTOS FIBRE; ASBESTOSE; ASCARITE; CHRYSOTILE; CROCIDOLITE (RIEBECKITE); FIBROUS GRUNERITE; TREMOLITE; TREMOLITE ASBESTOS
Derivation: Asbestos is a generic term applied to many naturally occurring, hydrated silicates (minerals) found in rock which separate into flexible fibers when crushed or processed. Commercially important forms are amosite, anthophyllite (mined and used only in Finland), chrysotile, and crocidolite. Other types include tremolite and actinolite.
General Use: Chrysotile was most widely used in US industry. Since asbestos is insensitive to chemical attack and incombustible, asbestos has been used in more than 5,000 products including thermal and electrical insulation, roofing, cement pipe and sheet flooring, friction materials, gaskets, coatings, plastics, textiles, and paper products. However, due to its health hazards, other materials are now replacing it wherever possible. Under TSCA, EPA proposed to prohibit or phase out the manufacture and use of asbestos in certain products. EPA issued a final rule banning the manufacture, importation, processing, and distribution of most asbestos-containing products. Between 1950 and 1972 asbestos was used as spray insulation in buildings, but OSHA now prohibits spray application of actinolite, anthophyllite, asbestos, or tremolite (29 CFR 1910.1001).

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Asbestos		ca 100% wt

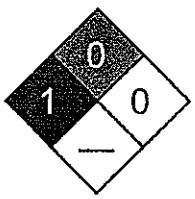
Trace Impurities: Metals including nickel, cobalt, chromium, manganese, beryllium, cadmium, copper, and thallium; other fibrous materials including tremolite and brucite; and oils and waxes.

OSHA PEL
TWA: 0.1 f/cm^3; STEL: 1 f/cm^3 30 minutes; See 29 CFR 1910.1001 for specific details.

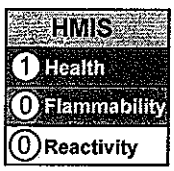
NIOSH REL
TWA: 0.1 fiber/cm^3.

ACGIH TLV
TWA: 0.1 f/cc; measured as resirable fraction of the aerosol; Value is for fibers longer than 5 microns, with an aspect ratio =/> 3:1, as determined by the membrane filter method at 400 to 450 times magnification (4-mm objective), using phase-contrast illumination.

Section 3 - Hazards Identification



Fire Diamond



ANSI Signal Word

Caution

☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

White or greenish (chrysotile), blue (crocidolite), or gray-green (amosite) fibrous solids; odorless. Chronic Effects: asbestosis, lung cancer, cancer of chest lining/abdominal cavities. Diseases typically develop decades after exposure begins.

Potential Health Effects

Target Organs: Respiratory system, eyes; possibly digestive system

Primary Entry Routes: Inhalation, ingestion, skin and/or eye contact

Acute Effects

Inhalation: Nose and throat irritation are possible with high exposure.

Eye: Irritation.

Skin: Irritation with exposure to high concentrations.

Ingestion: Gastrointestinal tract irritation is possible.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A1, Confirmed human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Medical Conditions Aggravated by Long-Term Exposure: Long-term, high-level exposure may aggravate any chronic lung (asthma, emphysema, bronchitis) or heart condition.

Chronic Effects: Asbestos may cause 1) asbestosis, 2) lung cancer, 3) mesothelioma, 4) pleural plaques, and 5) several other forms of cancer. *Asbestosis* is fibrosis (scarring) of lung tissue after many years of high-level occupational exposure. Scarring may be progressive even after exposure ceases. Even though detectable in lungs of a high proportion of adults in industrialized areas, asbestosis does not result from lower level environmental exposure. Its symptoms range from mild shortness of breath and dry cough to severe disabling breathlessness, heart failure, and ultimately death. Lung scarring can be seen on X-ray and alterations in lung function can be detected with spirometry (a medical test). Examination typically detects rales (crackling sounds in lungs). Severe cases may have cyanosis (bluish skin discoloration) and clubbing of fingertips. *Lung cancer* can result from lower exposure levels than asbestosis, but also takes many years to develop. Smokers exposed to asbestos are at 5 to 10X higher risk than exposed nonsmokers. *Mesothelioma* is a very aggressive cancer of the pleura (lining around the lungs) or peritoneum (lining of the abdomen), and develops after decades of (sometimes low level) exposure. Symptoms may include chest and abdominal pain, weight loss, and/or shortness of breath, with death within 2 years of diagnosis. *Pleural plaques* are thickenings, sometimes with calcium deposits, of the lung's lining and may be seen on X-ray. While not associated specifically with health effects, they indicate significant exposure. *Other sites of cancer* include larynx (vocal cords), portions of digestive tract, and possibly the kidney. Asbestos's toxicity depends on fiber type (crocidolite > amosite > chrysotile), size (longer > shorter), shape (long, thin needle-like > curly), and solubility. Health effects depend on dose (exposure concentration and dura tion), smoking habits, and individual susceptibility.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Clean any fibers from nose and mouth. Encourage victim to cough, spit, and blow nose to remove fibers.

Eye Contact: Do not rub. Gently lift eyelids and flush with flooding amounts of water.

Skin Contact: Shower with water and soap. Wet contaminated clothing prior to removal and seal in a plastic bag for disposal as hazardous waste. If rash develops, consult physician.

Ingestion: Induce vomiting *only* if awake and alert. Consult a physician.

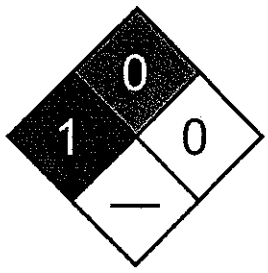
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Asbestosis diagnosis is based on chest X-ray with an abnormal ILO "B" reading (small irregular opacities), rales, restrictive pattern spirometry, adequate exposure history, and symptoms. Consider pneumovax, annual flu shot, and other supportive treatment as needed. See Sec. 8, Administrative Controls for specific recommendations for medical surveillance.

Special Precautions/Procedures: Emergency personnel should protect against any exposure when aiding victims.

Section 5 - Fire-Fighting Measures

Flash Point: Noncombustible solid.
Autoignition Temperature: NA
LEL: NA
UEL: NA
Extinguishing Media: Use extinguishing media appropriate for surrounding fire. Wet asbestos fibers with water spray to prevent dust generation. *Do not* scatter spilled asbestos with high-pressure water streams.
General Fire Hazards/Hazardous Combustion Products: None; noncombustible solid.
Fire-Fighting Instructions: Isolate hazard area and deny entry. Avoid asbestos dust generation and inhalation; it may have damaging effects on the lungs. *Do not* release runoff from fire control methods to sewers or waterways. Because there may be airborne asbestos fibers, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.



Fire Diamond

Section 6 - Accidental Release Measures

Spill/Leak Procedures: Notify safety personnel and evacuate all unnecessary personnel. Cleanup personnel should protect against dust inhalation and skin or eye contact. Avoid dust generation, blowing, dry brushing, and dry mopping. Provide HEPA- filtered (high-efficiency particulate air) portable ventilation systems. Use wet cleaning methods or approved HEPA vacuum cleaning system to pick up spills. The techniques used must collect particulate without dispersing dust into air. Place waste in *properly labeled* dust-tight containers or sealed, heavy-gauge, impervious plastic bags for disposal.
Small Spills: No data found.
Large Spills: No data found.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid any exposure to asbestos. Work with asbestos only in a sufficient wet state to prevent emission of airborne fibers. Practice good personal hygiene and housekeeping procedures. Use only with ventilation sufficient to reduce airborne concentrations to the lowest feasible level. Wear personal protective clothing and equipment and respiratory protection. Inhaling or ingesting asbestos fibers from contaminated clothing or skin can be hazardous. *Do not* allow dusts and asbestos-containing wastes to accumulate. .
Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.
Recommended Storage Methods: Store in closed (dust-tight) containers or heavy-gauge impervious plastic bags in a clean, secure area protected from physical damage. *Do not* open containers that can release asbestos dust without providing proper enclosure or control measure.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Enclose all operations and provide local exhaust ventilation and dust collection systems at the site of release to prevent airborne dispersion. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Educate workers about asbestos and asbestos-containing materials' hazards. Inform employees of asbestos standard (29 CFR 1910.1001). Exposure to asbestos, tremolite, anthophyllite, and actinolite in construction work is covered by 29 CFR 1926.58. Instruct employees in proper practices for handling asbestos-containing materials and correct use of protective equipment. Prevent or minimize asbestos exposure. Regulate areas where exposure in excess of the PEL is likely. Post warning signs in all regulated areas. Do not substitute personal protective equipment for proper handling and engineering controls. If exposures exceed the PEL, ensure employees wear appropriate protective clothing. Monitor work areas that expose employees to airborne concentrations at or above the action level (Sec. 2). Whenever production, process, control equipment, personnel, or work practices change, institute new monitoring. Medical surveillance is required for all employees possibly exposed at or above the action level. Provide preplacement medical examination that includes complete medical and work history, complete physical examination that emphasizes respiratory and cardiovascular systems and digestive tract, the respiratory disease standardized questionnaire, a posterior-anterior 14" x 17" chest roentgenogram, and pulmonary function tests [FVC and FEV(1)]. Annual periodic medical examinations shall include all these elements and an abbreviated questionnaire. Encourage smoking cessation due to synergistic effects of smoking and asbestos exposure. If it is 10+ years since first asbestos exposure, an individual should have a chest roentgenogram: every 5 years (ages 15 to 35), every 2 years (ages 35 to 45), every year (age 45+). Within 30 days of employment termination, an individual should receive a periodic medical examination with the elements listed above. Keep medical surveillance records for duration of employment, plus 30 years.

Personal Protective Clothing/Equipment: Wear coveralls or gauntlets made of cotton polyester material; head-coverings; and foot coverings such as canvas booties, rubber galoshes or safety shoes. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. At concentrations above the NIOSH REL or at any detectable concentration, wear any SCBA that has a full facepiece and is operated in a pressure-demand or other positive- pressure mode (assigned protection factor = 10,000); or any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA or other positive-pressure mode (assigned protection factor = 10,000). For escape wear an air-purifying, full-facepiece respirator with a high-efficiency particulate filter; or any appropriate escape-type, SCBA. If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Place contaminated protective devices or work clothing in labeled, impermeable, and sealed containers or bags. Separate contaminated work clothes from street clothes. *Do not* remove asbestos from clothing by blowing or shaking. Launder contaminated clothing before wearing. Inform laundering service of asbestos-contaminated clothing and of asbestos' potential harmful effects (29 CFR 1910.1001). A vacuum with HEPA filter may be used to remove asbestos fibers. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: White or greenish (chrysotile), blue (crocidolite), or gray-green (amosite) fibrous, odorless solids.

Physical State: Solid

Water Solubility: Insoluble

Formula Weight: Varies with asbestos form (See Sec. 1)

Freezing/Melting Point: Decomposes

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Asbestos is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization does not occur. Airborne dispersion of asbestos fibers.

Storage Incompatibilities: Strong acids can attack chrysotile and rapidly extract its MgO and H_2O content; glacial acetic acid can decompose it. Hot water slowly breaks down chrysotile. Like other asbestos forms, it resists strong alkali [(5M NaOH at least up to 212 °F (100 °C)].

Hazardous Decomposition Products: It is heat resistant, but decomposes and alters its microscopic fiber structure above 1112 °F (600 °C). Chrysotile dehydroxylates at 1112 to 1436 °F (600 to 780 °C); the "asbestos anhydride" in turn breaks down to a mixture of silica (SiO_2) and fosterite (Mg_2SiO_4) at 1472 to 1562 °F (800 to 850 °C). Above 1832 °F (1000 °C), magnesium pyroxenes form and melt at ~2642 °F (1450 °C).

Section 11 - Toxicological Information

Acute Inhalation Effects:
Human, inhalation, TC_{Lo}: 1.2 fb/cc/19 yr/continuous caused pleural effusion, dyspnea, and sputum effects.
Other Effects:
Genetic Effects - *E. coli*: 10 mg/plate (+/-S9) produced mutations.
Rat, implant: 750 mg/kg; toxic effects: equivocal tumorigenic agent by RTECS criteria; tumors at site of application.
Mouse, intraperitoneal: 80 mg/kg; toxic effects: equivocal tumorigenic agent by RTECS criteria; tumors at site of application.
See *RTECS* CI6475000, for additional data.

Section 12 - Ecological Information

Environmental Fate: As a mineral asbestos is not affected by photolytic processes. It is considered to be nonbiodegradable by aquatic organisms; no evidence was found regarding bioaccumulation in aquatic organisms. Although some trace metals and organic compounds have an affinity for asbestos minerals, asbestos itself does not have an adsorptive affinity for the solids normally found in natural water systems.
Ecotoxicity: No data found.

Section 13 - Disposal Considerations

Disposal: Asbestos is a poor candidate for incineration. Place asbestos and asbestos-containing wastes into good quality plastic bags and bury in a landfill. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Asbestos
ID: NA2212
Hazard Class: 9 - Miscellaneous hazardous material
Packing Group: III - Minor Danger
Symbols: D - Domestic transportation
Label Codes: 9 - Class 9
Special Provisions: 156, IB8, IP2, IP4
Packaging: **Exceptions:** 155 **Non-bulk:** 216 **Bulk:** 240
Quantity Limitations: **Passenger aircraft/rail:** 200 kg **Cargo aircraft only:** 200 kg
Vessel Stowage: **Location:** A **Other:** 34, 40

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a), per CAA Section 112 1 lb (0.454 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Benzene **CAS Number:** 71-43-2
Chemical Formula: C_6H_6
Structural Chemical Formula: C_6H_6
EINECS Number: 200-753-7
ACX Number: X1001488-9
Synonyms: Benzene; BENZENE; (6)ANNULENE; BENZEEN; BENZEN; BENZIN; BENZINE; BENZOL; BENZOL 90; BENZOLE; BENZOLENE; BENZOLO; BICARBURET OF HYDROGEN; CARBON OIL; COAL NAPHTHA; CYCLOHEXATRIENE; EPA PESTICIDE CHEMICAL CODE 008801; FENZEN; MINERAL NAPHTHA; MOTOR BENZOL; NITRATION BENZENE; PHENE; PHENYL HYDRIDE; POLYSTREAM; PYROBENZOL; PYROBENZOLE
General Use: Manufacture of chemicals including styrene, dyes, and many other organic chemicals. Has been used in artificial leather, linoleum, oil cloth, airplane dopes, lacquers; as solvent for waxes, resins, oils etc.
May also be a minor component of gasoline, petrol.
Exposure should be minimized by use in closed systems.
Handling procedures and control measures should be evaluated for exposure before commencement of use in plant operations.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
benzene	71-43-2	99.9

OSHA PEL
TWA: 1 ppm; STEL: 5 ppm.

NIOSH REL
TWA: 0.1 ppm; STEL: 1 ppm.

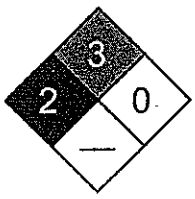
DFG (Germany) MAK
Skin.

ACGIH TLV
TWA: 0.5 ppm; STEL: 2.5 ppm; skin.

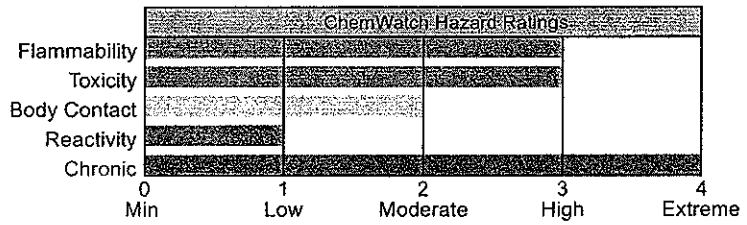
IDLH Level
500 ppm.

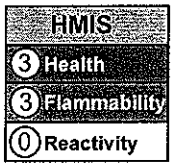
EU OEL
TWA: 1 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Toxic. Other Acute Effects: headache, dizziness, drowsiness. Absorbed through skin. Chronic Effects: dermatitis, leukemia, bone marrow damage. Carcinogen. Reproductive effects. Flammable.

Potential Health Effects

Target Organs: blood, central nervous system (CNS), bone marrow, eyes, upper respiratory system, skin
Primary Entry Routes: inhalation, skin contact
Acute Effects
Inhalation: The vapor is discomforting to the upper respiratory tract and lungs and may be harmful if inhaled.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

Inhalation hazard is increased at higher temperatures.

The symptoms of acute exposure to high vapor concentrations include confusion, dizziness, tightening of the leg muscles and pressure over the forehead followed by a period of excitement. If exposure continues the casualty quickly becomes stupefied and lapses into a coma with narcosis.

Effects of inhalation may include nausea, vomiting headache, dizziness, drowsiness, weakness, sometimes preceded by brief periods of exhilaration, or euphoria, irritability, malaise, confusion, ataxia, staggering, weak and rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips and tinnitus. Severe exposures may produce blurred vision, shallow, rapid breathing, delirium, cardiac arrhythmias, unconsciousness, deep anesthesia, paralysis and coma characterized by motor restlessness, tremors and hyperreflexia (occasionally preceded by convulsions). Polyneuritis and persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia and agitation may also occur. Two-three weeks after the exposure, nervous irritability, breathlessness and unsteady gait may still persist; cardiac distress and an unusual dicoloration of the skin may be evident for up to four weeks. Hemotoxicity is not normally a feature of acute exposures although anemia, thrombocytopenia, petechial hemorrhage, and spontaneous internal bleeding have been reported. Fatal exposures may result from asphyxia, central nervous system depression, cardiac and respiratory failure and circulatory collapse; sudden ventricular fibrillation may also be fatal.

Death may be sudden or may be delayed for 24 hours. Central nervous system, respiratory or hemorrhagic complications may occur up to five days after the exposure and may be lethal; pathological findings include respiratory inflammation with edema, and lung hemorrhage, renal congestion, cerebral edema and extensive petechial hemorrhage in the brain, pleurae, pericardium, urinary tract, mucous membrane and skin.

Exposure to toxic levels has also produced chromosome damage.

Eye: The liquid is highly discomforting to the eyes, may be harmful following absorption and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

The vapor is moderately discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.

Defatting and/or drying of the skin may lead to dermatitis. Open cuts, abraded or irritated skin should not be exposed to this material.

Toxic effects may result from skin absorption.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: The liquid is discomforting to the gastrointestinal tract and may be harmful if swallowed.

Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Liquid is an irritant and may cause burning and blistering of skin on prolonged exposure.

Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes.

Benzene is a myelotoxicant known to suppress bone-marrow cell proliferation and to induce hematologic disorders in humans and animals.

Signs of benzene-induced aplastic anemia include suppression off leukocytes (leukopenia), red cells (anemia), platelets (thromocytopenia) or all three cell types (pancytopenia). Classic symptoms include weakness, purpura, and hemorrhage. The most significant toxic effect is insidious and often irreversible injury to the blood forming tissue. Leukemia may develop.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:

1.Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.

2.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.

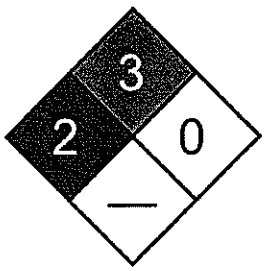
3.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.

4.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.

5.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.

6.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients. Consider complete blood count. Evaluate history of exposure.

Section 5 - Fire-Fighting Measures



Fire Diamond

Flash Point: -11 °C Closed Cup
Autoignition Temperature: 562 °C
LEL: 1.3% v/v
UEL: 7.1% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).
Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Pollutant - contain spillage. Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.
Storage Requirements: Store in original containers in approved flame-proof area.
No smoking, bare lights, heat or ignition sources.
DO NOT store in pits, depressions, basements or areas where vapors may be trapped. Keep containers securely sealed.
Store away from incompatible materials in a cool, dry well ventilated area.
Protect containers against physical damage and check regularly for leaks.
Observe manufacturer's storing and handling recommendations.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.
Personal Protective Clothing/Equipment:
Eyes: Chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Nitrile gloves; Neoprene gloves.
Safety footwear.
Do NOT use this product to clean the skin.
Respiratory Protection:
Exposure Range >1 to 10 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >10 to 100 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range >100 to 1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Note: must change cartridge at beginning of each shift
Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.
Glove Selection Index:
PE/EVAL/PE ..... Best selection
PVA ..... Best selection
TEFLON ..... Best selection

VITON	Best selection
VITON/NEOPRENE	Best selection
NITRILE+PVC	Poor to dangerous choice for other than short-term immersion
BUTYL	Poor to dangerous choice for other than short-term immersion
NITRILE	Poor to dangerous choice for other than short-term immersion
NEOPRENE	Poor to dangerous choice for other than short-term immersion
PVC	Poor to dangerous choice for other than short-term immersion
NATURAL RUBBER	Poor to dangerous choice for other than short-term immersion
BUTYL/NEOPRENE	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, highly flammable liquid; floats on water. Characteristic aromatic odor. Highly volatile. Mixes with alcohol, chloroform, ether, carbon disulfide, carbon tetrachloride, glacial acetic acid, acetone and oils.

Physical State: Liquid
Odor Threshold: 4.68 ppm
Vapor Pressure (kPa): 9.95 at 20 °C
Vapor Density (Air=1): 2.77
Formula Weight: 78.12
Specific Gravity (H_2O=1, at 4 °C): 0.879 at 20 °C
Evaporation Rate: Fast

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 80.1 °C (176 °F)
Freezing/Melting Point: 5.5 °C (41.9 °F)
Volatile Component (% Vol): 100
Water Solubility: 0.18 g/100 g of water at 25 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid reaction with oxidizing agents.

Section 11 - Toxicological Information

Toxicity
Oral (man) LD_{Lo}: 50 mg/kg
Oral (rat) LD_{50}: 930 mg/kg
Inhalation (rat) LC_{50}: 10000 ppm/7h
Inhalation (human) LC_{Lo}: 2000 ppm/5m
Inhalation (man) TC_{Lo}: 150 ppm/1y - I
Inhalation (human) TC_{Lo}: 100 ppm
Reproductive effector in rats

Irritation
Skin (rabbit): 20 mg/24 hr - mod
Eye (rabbit): 2 mg/24 hr - SEVERE

See *RTECS* CY 1400000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. It may be subject to biodegradation based on reported biodegradation of 24% and 47% of the initial 20 ppm in a base-rich para-brownish soil in 1 and 10 weeks, respectively. It may be subject to biodegradation in shallow, aerobic groundwaters, but probably not under anaerobic conditions. If released to water, it will be subject to rapid volatilization; the half-life for evaporation in a wind-wave tank with a moderate wind speed of 7.09 m/sec was 5.23 hours; the estimated half-life for volatilization from a model river one meter deep flowing 1 m/sec with a wind velocity of 3 m/sec is estimated to be 2.7 hours at 20 °C. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation based on a reported biodegradation half-life of 16 days in an aerobic river die-away test. In a marine ecosystem biodegradation occurred in 2 days after an acclimation period of 2 days and 2 weeks in the summer and spring, respectively, whereas no degradation occurred in winter. According to one experiment, it has a half-life of 17 days due to photodegradation which could contribute to removal in situations of cold water, poor nutrients, or other conditions less conductive to microbial degradation. If released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days calculated using an experimental rate constant for the reaction. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate. It is fairly soluble in water and is removed from the atmosphere in rain.

Ecotoxicity: LC_{50} Clawed toad (3-4 wk after hatching) 190 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Morone saxatilis (bass) 5.8 to 10.9 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Poecilia reticulata (guppy) 63 ppm/14 days /Conditions of bioassay not specified; LC_{50} Salmo trutta (brown trout yearlings) 12 mg/l/1 hr (static bioassay); LD_{50} Lepomis macrochirus (bluegill sunfish) 20 mg/l/24 to 48 hr /Conditions of bioassay not specified; LC_{100} Tetrahymena pyriformis (ciliate) 12.8 mmole/l/24 hr /Conditions of bioassay not specified; LC_{50} Cancer magister (crab larvae) stage 1, 108 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Crangon franciscorum (shrimp) 20 ppm/96 hr /Conditions of bioassay not specified

Henry's Law Constant: 5.3×10^{-3}

BCF: eels 3.5

Biochemical Oxygen Demand (BOD): 1.2 lb/lb, 10 days

Octanol/Water Partition Coefficient: $\log K_{ow} = 2.13$

Soil Sorption Partition Coefficient: K_{oc} = woodburn silt loam 31 to 143

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Benzene
ID: UN1114
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:** 40

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U019 Toxic Waste, Ignitable Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a), per CAA Section 112 10 lb (4.535 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111
Issue Date: 2006-06

Ethylbenzene
ETH3050

Section 1 - Chemical Product and Company Identification 61

Material Name: Ethylbenzene
CAS Number: 100-41-4
Chemical Formula: C_8H_{10}
Structural Chemical Formula: $C_6H_5{\cdot}C_2H_5$
EINECS Number: 202-849-4
ACX Number: X1003016-1
Synonyms: AETHYLBENZOL; BENZENE,ETHYL-; EB; ETHYL BENZENE; ETHYLBENZEEN; ETHYLBENZENE; ETHYLBENZOL; ETILBENZENE; ETYLOBENZEN; PHENYLETHANE
General Use: Used in the manufacture of cellulose acetate, styrene and synthetic rubber; solvent or diluent; component of automotive and aviation gasoline.
Component of many petroleum hydrocarbon solvents, thinners.
The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
ethylbenzene	100-41-4	>95

OSHA PEL
TWA: 100 ppm; 435 mg/m^3.

NIOSH REL
TWA: 100 ppm (435 mg/m^3); STEL: 125 ppm (545 mg/m^3).

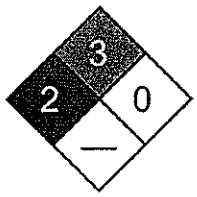
DFG (Germany) MAK
Skin.

ACGIH TLV
TWA: 100 ppm; STEL: 125 ppm.

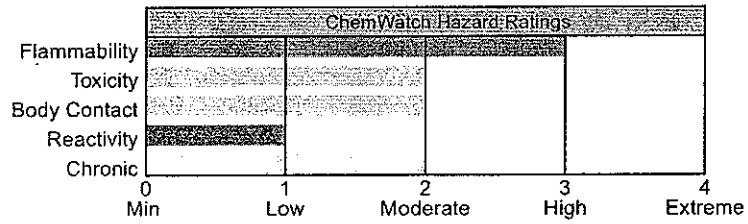
IDLH Level
800 ppm (10% LEL).

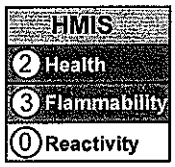
EU OEL
TWA: 100 ppm; STEL: 200 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; pungent odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: chest constriction, vertigo, narcosis, cramps, respiratory paralysis. Chronic Effects: fatigue, sleepiness, headache, blood disorders, lymphocytosis. Flammable.

Potential Health Effects

Target Organs: eyes, respiratory system, skin, central nervous system (CNS), blood
Primary Entry Routes: inhalation, skin contact, eye contact
Acute Effects
Inhalation: The vapor is discomforting to the upper respiratory tract.
Inhalation hazard is increased at higher temperatures.
Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Inhalation of vapor may aggravate a pre-existing respiratory condition such as asthma, bronchitis, emphysema.
When humans were exposed to the 100 and 200 ppm for 8 hours about 45-65% is retained in the body. Only traces of unchanged ethyl benzene are excreted in expired air following termination of inhalation exposure.
Humans exposed to concentrations of 23-85 ppm excreted most of the retained dose in the urine (mainly as metabolites).
Guinea pigs that died from exposure had intense congestion of the lungs and generalized visceral hyperemia. Rats exposed for three days at 8700 mg/m^3 (2000 ppm) showed changes in the levels of dopamine and noradrenaline in various parts of the brain.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.
The vapor is discomforting to the eyes.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Two drops of the material in to the conjunctival sac produced only slight irritation of the conjunctival membrane but no corneal injury.

Skin: The liquid is discomforting to the skin if exposure is prolonged and is capable of causing skin reactions which may lead to dermatitis.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.
The mean rate of absorption of liquid ethyl benzene applied to 17.3 cm2 area of the forearm of seven volunteers for 10-15 minutes was determined to be 38 mg/cm2/hr. Immersion of the whole hand in aqueous solutions of ethyl benzene (112-156 mg/l) for 1 hour yielded mean absorption rates of 118 and 215.7 ug/cm2/hr. The rate of absorption is thus greater than that of aniline, benzene, nitrobenzene, carbon disulfide and styrene.
Repeated application of the undiluted product to the abdominal area of rabbits (10-20 applications over 2-4 weeks) resulted in erythema, edema and superficial necrosis. The material did not appear to be absorbed through the skin in sufficient quantity to produce outward signs of toxicity.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid may produce considerable gastrointestinal discomfort and may be harmful or toxic if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.
Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.
Industrial workers exposed to a maximum level of ethyl benzene of 0.06 mg/l (14 ppm) reported headaches and irritability and tired quickly. Functional nervous system disturbances were found in some workers employed for over 7 years whilst other workers had enlarged livers.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

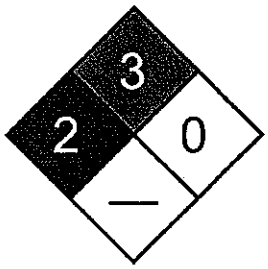
Ingestion: Rinse mouth out with plenty of water. DO NOT induce vomiting.
Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink.
Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:

1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance
4.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures



Fire Diamond

Flash Point: 12.8 °C Closed Cup
Autoignition Temperature: 432 °C
LEL: 1.6% v/v
UEL: 7% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are flammable.
Moderate fire hazard when exposed to heat or flame.
Vapor forms an explosive mixture with air.
Moderate explosion hazard when exposed to heat or flame.
Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion or decomposition leading to violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).
May emit clouds of acrid smoke.
Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area.
General exhaust is adequate under normal operating conditions.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Barrier cream with polyethylene gloves or Nitrile gloves.
Protective footwear.
Respiratory Protection:
Exposure Range >100 to <800 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 800 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Other: Overalls. Eyewash unit.
Glove Selection Index:
VITON ..... Best selection
TEFLON ..... Best selection

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid; floats on water. Aromatic solvent odor. Soluble in alcohol, benzene, carbon tetrachloride and ether.

Physical State: Liquid
Odor Threshold: 8.7 to 870.0 mg/m^3
Vapor Pressure (kPa): 1.333 at 25.9 °C
Vapor Density (Air=1): 3.66
Formula Weight: 106.17
Specific Gravity (H_2O=1, at 4 °C): 0.8670 at 20 °C
Evaporation Rate: Fast

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 136.2 °C (277 °F) at 760 mm Hg
Freezing/Melting Point: -95 °C (-139 °F)
Volatile Component (% Vol): 100
Water Solubility: 0.01% by weight

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 3500 mg/kg
Inhalation (human) TC_{Lo}: 100 ppm/8h
Inhalation (rat) LC_{Lo}: 4000 ppm/4h
Intraperitoneal (mouse) LD_{50}: 2642 mg/kg~
Dermal (rabbit) LD_{50}: 17800 mg/kg~
Liver changes, utheral tract, effects on fertility, specific developmental abnormalities (musculoskeletal system) recorded.
NOTE: Substance has been shown to be mutagenic in various assays, or belongs to a family of chemicals producing damage or change to cellular DNA.

Irritation
Skin (rabbit): 15 mg/24h mild
Eye (rabbit): 500 mg - SEVERE

See *RTECS* DA 0700000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to the atmosphere, it exist predominantly in the vapor phase based on its vapor pressure where it will photochemically degrade by reaction with hydroxyl radicals (half-life 0.5 to 2 days) and partially return to earth in rain. It will not be subject to direct photolysis. Releases into water will decrease in concentration by evaporation and biodegradation. The time for this decrease and the primary loss processes will depend on the season, and the turbulence and microbial populations in the particular body of water. Representative half-lives are several days to 2 weeks. Some may be adsorbed by sediment but significant bioconcentration in fish is not expected to occur based upon its octanol/water partition coefficient. It is only adsorbed moderately by soil. It will not significantly hydrolyze in water or soil.

Ecotoxicity: LC_{50} Cyprinodon variegatus (sheepshead minnow) 275 mg/l 96 hr in a static unmeasured bioassay; LC_{50} Pimephales promelas (fathead minnow) 12.1 mg/l/96 hr (confidence limit 11.5 - 12.7 mg/l), flow-through bioassay with measured concentrations, 26.1 °C, dissolved oxygen 7.0 mg/l, hardness 45.6 mg/l calcium carbonate, alkalinity 43.0 mg/l; Toxicity threshold (cell multiplication inhibition test): Pseudomonas putida (bacteria) 12 mg/l ; LC_{50} Palaemonetes pugio (grass shrimp, adult) 14,400 ug/l/24 hr in a static unmeasured bioassay; LC_{50} Palaemonetes pugio (grass shrimp, larva) 10,200 ug/l/24 hr in a static unmeasured bioassay; Toxicity threshold (cell multiplication inhibition test): Microcystis aeruginosa (algae) 33 mg/l; Scenedesmus quadricauda (green algae) > 160 mg/l

Henry's Law Constant: 8.44×10^{-3}

BCF: goldfish 1.9

Biochemical Oxygen Demand (BOD): theoretical 2.8%, 5 days

Octanol/Water Partition Coefficient: log $K_{OW} = 3.15$

Soil Sorption Partition Coefficient: $K_{OC} = 164$

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Ethylbenzene
ID: UN1175
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
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Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Lead **CAS Number:** 7439-92-1
Chemical Formula: Pb
Structural Chemical Formula: Pb
EINECS Number: 231-100-4
ACX Number: X1000227-2
Synonyms: C.I. 77575; C.I. PIGMENT METAL 4; GLOVER; KS-4; LEAD; LEAD FLAKE; LEAD INORGANIC; LEAD METAL; LEAD S2; LEAD SZ; OLOW; OMAHA & GRANT; PB-S 100; PLUMBUM
General Use: Used as a construction material in chemical reaction equipment (tank piping,etc.); manufacture of tetraethyl lead; pigments for paints.
Used in pottery glazes, glass, ceramics, bearing metal and alloys, solder and other lead alloys.
Also used in metallurgy of steel and other metals, cable sheathing, storage batteries, radiation shielding and ammunition.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
lead	7439-92-1	>99

OSHA PEL
TWA: 0.05 mg/m^3; as Pb inorganic.

ACGIH TLV
TWA: 0.05 mg/m^3.

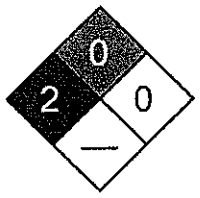
EU OEL
TWA: 0.1 mg/m^3.

NIOSH REL
TWA: 0.050 mg/m^3.

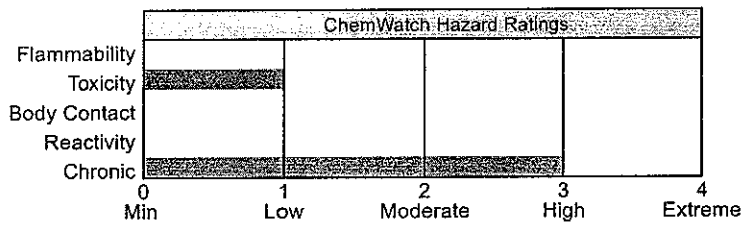
IDLH Level
100 mg/m^3 (as Pb).

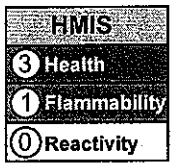
DFG (Germany) MAK
TWA: 0.1 mg/m^3; PEAK: 8 mg/m^3; measured as inhalable fraction of the aerosol; Excluding lead arsenate and lead chromate.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Poison

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆
Bluish-white, silvery, or gray metal. Cumulative poison. Chronic Effects: severe neurological effects, blood/kidney damage, sterility, decreased fertility, developmental damage to fetus. Possible cancer hazard.

Potential Health Effects

Target Organs: blood, central nervous system (CNS), peripheral nervous system, kidneys, gastrointestinal (GI) tract
Primary Entry Routes: inhalation, ingestion
Acute Effects
Inhalation: The dust may be discomforting to the upper respiratory tract and may be harmful if inhaled.
Eye: The dust may be discomforting to the eyes.
Skin: The material may be mildly discomforting to the skin.
Prolonged exposure may cause skin reactions.
Skin absorption is not considered a significant route of exposure.
Ingestion: The material is moderately discomforting to the gastrointestinal tract and may be harmful if swallowed.

In rats intestinal lead absorption is bidirectional and does not follow a linear relationship with oral dose.
Acute effects of exposure are generally minor because of its relative insolubility and physical form. Unusual instances of exposure have been reported in inadequately ventilated indoor firing ranges (as fume), in the application of surma, a mascara-like cosmetic agent, to the conjunctival surfaces in Asian countries and in lead-smelting and associated occupations.
In humans lead metabolism fits into a three compartment model. The first compartment in which lead has a half-life of about 35 days includes the blood; it receives blood from the gut and delivers some of it to the urine and communicates with the other two pools. The second compartment in which lead has a similar half-life includes the soft tissues which contain about half the blood level; they share lead with hair, nails, sweat, saliva, bile and other digestive secretions. The skeleton is the third compartment and contains the vast bulk of the total body burden, possesses a very long half-life and demonstrates a difference between the dense and less dense components to bind lead.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Not listed.

Chronic Effects: Symptoms of exposure include headache, fatigue, sleep disturbances, abdominal pains and decreased appetite. Overexposure to lead in the form of dust has toxic effects on the lungs and kidneys and on the nervous system resulting in mental disturbances and anemia.
Skin absorption is not considered to be a significant route of exposure.
Worker exposure to lead must be kept to a minimum, especially in cases where lead is worked at temperatures whereby lead vapors are evolved e.g. metal refining.
Lead is an accumulative poison and exposure even to small amounts can raise the body's content to toxic levels.
Potential adverse effects on the offspring of pregnant workers have been cited in the literature.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If available, administer medical oxygen by trained personnel.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Rinse mouth out with plenty of water.
Seek medical attention if irritation or discomfort persist.

After first aid, get appropriate in-plant, paramedic, or community medical support.

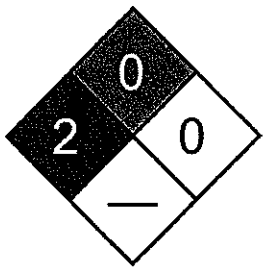
Note to Physicians: 1.Gastric acids solubilize lead and its salts and lead absorption occurs in the small bowel.
2.Particles of less than 1um diameter are substantially absorbed by the alveoli following inhalation.
3.Lead is distributed to the red blood cells and has a half-life of 35 days.
It is subsequently redistributed to soft tissue & bone-stores or eliminated.The kidney accounts for 75% of daily lead loss; integumentary and alimentary losses account for the remainder.
4.Neurasthenic symptoms are the most common symptoms of intoxication.
Lead toxicity produces a classic motor neuropathy.
Acute encephalopathy appears infrequently in adults.
Diazepam is the best drug for seizures.
5.Whole-blood lead is the best measure of recent exposure; free erythrocyte protoporphyrin (FEP) provides the best screening for chronic exposure. Obvious clinical symptoms occur in adults when whole-blood lead exceeds 80 ug/dL.
6.British Anti-Lewisite is an effective antidote and enhances fecal and urinary excretion of lead. The onset of action of BAL is about 30 minutes and most of the chelated metal complex is excreted in 4-6 hours, primarily in the bile.
Adverse reaction appears in up to 50% of patients given BAL in doses exceeding 5 mg/kg. CaNa2EDTA has also been used alone or in concert with BAL as an antidote.
D-penacillamine is the usual oral agent for mobilization of bone lead; its use in the treatment of lead poisoning remains investigational.
2-3-dimercapto-1-propanesulfonic acid (DMPS) and dimercaptosuccinic acid (DMSA) are water soluble analogues of BAL and their effectiveness is undergoing review.
As a rule, stop BAL if lead decreases below 50 ug/dL; stop CaNa2EDTA if blood lead decreases below 40 ug/dL or urinary lead drops below 2 mg/24 hrs.
BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Lead in blood	50 ug/100 mL	Not Critical	B
Lead in urine	150 ug/gm creatinine	Not critical	B
Zinc Protoporphyrin in blood	250 ug/100 mL erythrocytes OR 100 ug/100 mL blood	After 1 month exposure	B

B: Background levels occur in specimens collected from subjects NOT exposed.

Section 5 - Fire-Fighting Measures

Flash Point: Not available; probably noncombustible
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: There is no restriction on the type of extinguisher which may be used.
General Fire Hazards/Hazardous Combustion Products: Noncombustible.
Not considered to be a significant fire risk; however, containers may burn.
Moderate fire hazard, in the form of dust, when exposed to heat or flames.
Decomposition products may include toxic lead dust and lead oxide fumes.
Fire Incompatibility: Incompatible with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.



Fire Diamond

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Use fire fighting procedures suitable for surrounding area.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
If safe to do so, remove containers from path of fire.
Cool fire-exposed containers with water spray from a protected location.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear protective clothing, gloves, safety glasses and dust respirator.
Use dry clean-up procedures and avoid generating dust.
Vacuum up.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Control personal contact by using protective equipment and dust respirator.
Prevent spillage from entering drains, sewers or waterways.
Recover product wherever possible. Avoid generating dust. Sweep / shovel up.
If required, wet with water to prevent dusting.
Put residues in labeled plastic bags or other containers for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Limit all unnecessary personal contact.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Recommended Storage Methods: Check that containers are clearly labeled.
Packaging as recommended by manufacturer.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
If risk of overexposure exists, wear NIOSH-approved dust respirator.
Correct fit is essential to obtain adequate protection.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Impervious gloves; rubber gloves.
Rubber boots.
Protective footwear.
Respiratory Protection:
Exposure Range >0.05 to 0.5 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >0.5 to 2.5 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >2.5 to 50 mg/m^3: Powered Air Purifying Respirator, Half or Full Facepiece or Hood
Exposure Range >50 to 100 mg/m^3: Supplied Air Respirator with Full Facepiece, Hood, Helmet, or Suit, operated in a Positive Pressure Mode
Exposure Range >100 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: magenta (P100)
Note: (29CFR 1910.1025) for general industry
Other: Overalls. Eyewash unit. Skin cleansing cream.
Provide adequate ventilation in warehouse or closed storage areas.
General and local exhaust ventilation usually required to maintain airborne dust levels to safety levels.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Bluish-white, silvery-gray metal. Malleable, lustrous when freshly cut and tarnishes when exposed to air. Reacts with strong acids like nitric acid, sulphuric or hydrochloric acid. Attacked by water in presence of oxygen. Poor electrical conductor. Lead fumes are formed at temperatures above 500-700 °C.

Physical State: Divided solid
Vapor Pressure (kPa): 0.24 at 1000 °C
Vapor Density (Air=1): Not applicable
Formula Weight: 207.19
Specific Gravity (H_2O=1, at 4 °C): 11.34
Evaporation Rate: Not applicable
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 1740 °C (3164 °F)
Freezing/Melting Point: 327.4 °C (621.32 °F)
Volatile Component (% Vol): Not applicable
Water Solubility: Insoluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Hazardous polymerization will not occur. Stable under normal storage conditions.
Storage Incompatibilities: Avoid storage with strong acids, oxidants, ammonium nitrate, chlorine trifluoride and sodium azide.

Section 11 - Toxicological Information

Toxicity
Oral (woman) TD_{Lo}: 450 mg/kg/6 years
Inhalation (human) TC_{Lo}: 0.01 mg/m^3
WARNING: Lead is a cumulative poison and has the potential to cause abortion and intellectual impairment to unborn children of pregnant workers.

Irritation
Nil Reported

See *RTECS* OF 7525000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released or deposited on soil, it will be retained in the upper 2-5 cm of soil, especially soils with at least 5% organic matter or a pH 5 or above. Leaching is not important under normal conditions although there is some evidence to suggest that it is taken up by some plants. Generally, the uptake from soil into plants is not significant. It is expected to slowly undergo speciation to the more insoluble sulfate, sulfide, oxide, and phosphate salts. It enters water from atmospheric fallout, runoff or wastewater; little is transferred from natural ores. It is a stable metal and adherent films of protective insoluble salts form that protect the metal from further corrosion. That which dissolves tends to form ligands. It is effectively removed from the water column to the sediment by adsorption to organic matter and clay minerals, precipitation as insoluble salt (the carbonate or sulfate, sulfide), and reaction with hydrous iron and manganese oxide. Under most circumstances, adsorption predominates. It does not appear to bioconcentrate significantly in fish but does in some shellfish such as mussels. When released to the atmosphere, it will generally be in dust or adsorbed to particulate matter and subject to gravitational settling and be transformed to the oxide and carbonate.

Ecotoxicity: LC_{50} Japanese quail (Coturnix japonica), males or females, 14 days old, oral (5-day ad libitum in diet) >5,000 ppm; at 1000, 2236 & 5000 onset of toxic signs began at 7, 7 & 7 days and remissed at 11, 11 & 12 days, respectively, no mortality was observed; control references were dieldrin & dicrotophos; corn oil diluent was added to diet at ratio of 2:98 by wt; (extreme concentrations: 1,000-5,000 ppm)

BCF: freshwater fish 1.38 to 1.65

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: None

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 10 lb (4.535 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
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(518) 842-4111

Methylene Chloride
MET5440

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Methylene Chloride **CAS Number:** 75-09-2
Chemical Formula: CH_2Cl_2
EINECS Number: 200-838-9
ACX Number: X1000032-3
Synonyms: AEROTHENE MM; CHLORURE DE METHYLENE; DCM; DICHLOROMETHANE; METHANE DICHLORIDE; METHANE,DICHLORO-; METHYLENE BICHLORIDE; METHYLENE CHLORIDE; METHYLENE DICHLORIDE; METHYLENUM CHLORATUM; METYLENU CHLOREK; NARKOTIL; R 30; R30 (REFRIGERANT); SOLAESTHIN; SOLMETHINE
Derivation: Produced by chlorination of methane.
General Use: Used as a solvent for cellulose acetate, adhesives, food processing, and pharmaceuticals; in degreasing and cleaning fluids, paint and varnish removers, decaffeination of coffee, in propellant mixtures for aerosols; as a blowing agent in foams, dewaxing agent, component of fire extinguishing compound, chemical intermediate, low temperature heat-transfer medium, and as a fumigant. Formerly used as an anesthetic.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Methylene chloride	75-09-2	ca < 100% vol

Trace Impurities: Stabilizers may be added such as: amines, 4-cresol, hydroquinone, methanol, 2-methyl-2-ene, 1-naphthol, nitromethane + 1,4-dioxane, phenol, resorcinol, and thymol.

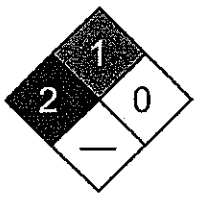
OSHA PEL
TWA: 25 ppm; STEL: 125 ppm.

NIOSH REL

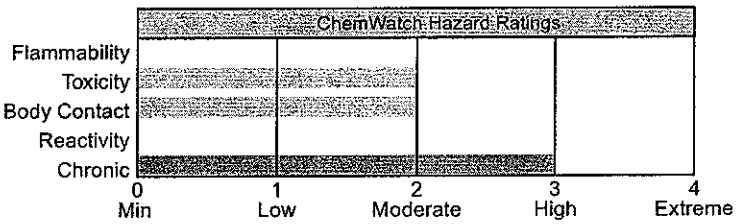
ACGIH TLV
TWA: 50 ppm.

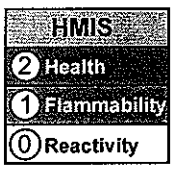
IDLH Level
2300 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, volatile liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: narcosis at high concentrations. Can form flammable mixtures with air, explosive when mixed with oxygen.

Potential Health Effects

Target Organs: Eyes, skin, central nervous system (CNS), cardiovascular system (CVS), blood.
Primary Entry Routes: Inhalation, skin and eye contact.

Acute Effects Methylene chloride will cross the placenta. The estimated lethal dose is 0.5 to 5 mL/kg. Although methylene chloride has a distinct sweetish odor, it is not recognized at levels low enough to protect from overexposure.

Inhalation: Symptoms include headache, giddiness, irritability, nausea, stupor, numbness and tingling of limbs, fatigue, anemia and polymorphonuclear leukocytosis, digestive disturbances, and neurasthenic disorders (emotional and psychic disorders characterized by easy fatigue, lack of motivation, feelings of inadequacy, and psychosomatic symptoms). Many symptoms are attributed to the metabolism of methylene chloride to carbon monoxide in the body. The carbon monoxide forms carboxyhemoglobin in the blood, which unlike hemoglobin, does not have the ability to carry oxygen. This lack of oxygen leads to CNS and CVS problems. However, CNS effects have been seen in persons without a significantly elevated blood carbon monoxide level.

Eye: Exposure to vapors produces irritation, tearing, and conjunctivitis. Direct contact with the liquid causes severe pain, but permanent damage does not occur.

Skin: Contact is irritating and can be painful (burns) if confined to skin (i.e. trapped under gloves or clothing). Methylene chloride can be absorbed through the skin to cause systemic effects.

Ingestion: Expected to cause gastrointestinal irritation, nausea, vomiting, and systemic effects.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Class B, Justifiably suspected of having carcinogenic potential.

Medical Conditions Aggravated by Long-Term Exposure: Skin and cardiovascular disorders.

Chronic Effects: Repeated skin contact can cause dermatitis. Liver disease has been reported. *Case Reports*: 1 yr exposure caused toxic encephalopathy (toxicity of the brain) with audio and visual delusions and hallucinations; 3 yr exposure to 300 to 1000 ppm caused memory loss, intellectual impairment, and balance disturbances.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air, administer 100% humidified, supplemental oxygen and support breathing.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 min. Consult an ophthalmologist if pain or irritation persist.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting with Ipecac syrup. If vomiting does not occur, the decision to perform gastric lavage should be made.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Lethal blood level = 280 mg/L. Biological monitoring: carbon monoxide in expired air (nonsmokers only). Recently, methylene chloride concentrations in urine have been found to correlate well to concentrations in air.

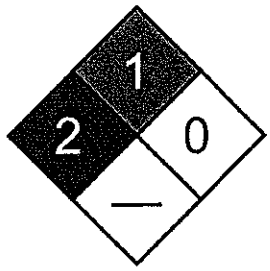
Section 5 - Fire-Fighting Measures

Flash Point: Methylene chloride does not have a flash point by standard tests. However, it does form flammable mixtures with air.

Autoignition Temperature: 1033 °F (556 °C)

LEL: 15.5% (in oxygen); LFL: 12% v/v

UEL: 66.4% (in oxygen); UFL: 19% v/v



Fire Diamond

Extinguishing Media: For small fires, use dry chemical or carbon dioxide. For large fires, use water spray, fog, or regular foam.

General Fire Hazards/Hazardous Combustion Products: Hydrogen chloride, carbon monoxide and phosgene. Creates an explosion hazard if allowed to enter a confined space. Container may explode in heat of fire.

Fire-Fighting Instructions: Apply cooling water to sides of tanks until well after fire is out. Stay away from ends of tanks. Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection.

Section 6 - Accidental Release Measures

Spill/Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel need to protect against inhalation and skin/eye contact.

Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material.

Large Spills: Dike far ahead of spill for later reclamation or disposal. Do not release into sewers or waterways. Damp mop any residue.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Do not use near ignition sources. Wear appropriate PPE. Do not use plastic or rubber hose for unloading trucks or tank cars unless the materials have been tested and approved for methylene chloride service. Never eat, drink, or smoke in work areas. Practice good personal hygiene after using methylene chloride, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec. 10). To minimize decomposition, all storage containers should be galvanized or lined with a phenolic coating. Indoor storage tanks should have vents piped outdoors to prevent vapors from escaping into work areas. Prevent moisture from entering tanks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Do not use closed circuit rebreathing systems employing soda lime or other carbon dioxide absorber because of formation of toxic compounds capable of producing cranial nerve paralysis. To prevent static sparks, electrically ground and bond all equipment used with and around methylene chloride. Provide general or local exhaust ventilation systems to maintain airborne levels below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on skin, liver, CNS, CVS, and blood. A complete blood count should be performed and carboxyhemoglobin levels should be determined periodically. Any level above 5% should prompt investigation of employee and workplace to determine the cause (smokers will already have an increased level of carboxyhemoglobin and are at increased risk). Use less hazardous solvents where possible.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Polyvinyl alcohol and Viton laminated with Neoprene are suitable materials for PPE. Natural rubber, synthetic rubbers, and polyvinyl chloride *do not* provide protection against methylene chloride. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For any detectable concentration, use any SCBA or supplied-air respirator (with auxiliary SCBA) with a full facepiece and operated in pressure demand or other positive- pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove methylene chloride from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless; volatile with a sweet odor.

Physical State: Liquid

Odor Threshold: 540 to 2160 mg/m^3

Vapor Pressure (kPa): 350 mm Hg at 68 °F (20 °C); 440 mm Hg at 77 °F (25 °C)

Bulk Density: 11.07 lb/gal at 68 °F (20 °C)

Formula Weight: 84.9

Specific Gravity (H_2O=1, at 4 °C): 1.33 at 15 °C

Refractive Index: 1.4244 at 68 °F (20 °C)

Boiling Point: 104 °F (40 °C)

Freezing/Melting Point: -142 °F (-97 °C)

Viscosity: 0.430 cP at 68 °F (20 °C)

Surface Tension: 0.5 to 2.3 g/L (*in oxygen*)

Ionization Potential (eV): 11.32 eV

Critical Temperature: 473 °F (245 °C)

Critical Pressure: 60.9 atm

Water Solubility: 2%

Other Solubilities: Soluble in alcohol, acetone, chloroform, carbon tetrachloride, ether, and dimethylformamide.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Methylene chloride is stable at room temperature in closed containers under normal storage and handling conditions. Tends to carbonize when vapor contacts steel or metal chlorides at high temperatures 572 to 842 °F (300 to 450 °C). Hazardous polymerization does not occur. Exposure to heat, ignition sources, and incompatibles.

Storage Incompatibilities: Include aluminum, lithium, sodium, aluminum bromide, azides, dimethyl sulfoxide + perchloric acid, N-methyl-N-nitrosourea + potassium hydroxide, sodium-potassium alloy, potassium *t*-butoxide, dinitrogen pentoxide, dinitrogen tetraoxide, nitric acid, and oxidizers. Methylene chloride will attack some forms of plastic, rubber, and coatings. Corrodes iron, some stainless steel, copper, and nickel.

Hazardous Decomposition Products: Hydrogen chloride, carbon monoxide and phosgene.

Section 11 - Toxicological Information

Acute Oral Effects:

Rat, oral, LD_{50}: 1600 mg/kg.

Human, oral, LD_{Lo}: 357 mg/kg caused somnolence, paresthesia, and convulsions or effect on seizure threshold.

Acute Inhalation Effects:

Human, inhalation, TC_{Lo}: 500 ppm/8 hr caused euphoria.

Irritation Effects:

Rabbit, eye: 162 mg caused moderate irritation.

Rabbit, skin: 810 mg/24 hr caused severe irritation.

Other Effects:

Rat, oral: 1275 mg/kg caused DNA damage.

Rat, inhalation: 8400 ppm/6 hr/13 weeks (intermittently) caused changes in liver weight.

Rat, inhalation: 3500 ppm/2 yr (intermittently) caused endocrine tumors.

Mutagenicity - Human, fibroblast: 5000 ppm/1 hr (continuously) caused DNA inhibition.

Human, inhalation, TC_{Lo}: 500 ppm/1 yr (intermittently) caused altered sleep time, somnolence, and change in heart rate.

See *RTECS* PA8050000, for additional data.

Section 12 - Ecological Information

Environmental Fate: In air, methylene chloride degrades by reaction with photochemically-produced hydroxyl radicals (half-life = a few months) but does not undergo *direct* photolysis. Degradation products include carbon monoxide, carbon dioxide, and phosgene. In water, it is removed primarily by evaporation (est. half-life = 3 to 5.6 hr under moderate mixing conditions). Some may biodegrade but it is not expected to adsorb to sediment or bioconcentrate. If released to soil most methylene chloride will rapidly evaporate. Some may leach through soil. Methylene chloride will adsorb to peat moss but not to sand.

Ecotoxicity: *Pimephales promelas* (fathead minnow), LC_{50} = 193 mg/L/96 hr; *Lepomis macrochirus* (bluegill), LC_{50} = 230 mg/L/24 hr; *Poecilia reticulata* (guppies), LC_{50} = 294 ppm/14 days. Cytotoxic to plants.

Octanol/Water Partition Coefficient: log K_{OW} = 1.25

Section 13 - Disposal Considerations

Disposal: Pour on sand or earth at a safe distance/location from occupied areas and allow to evaporate (most is transformed to carbon monoxide). A good candidate for liquid injection, rotary kiln, or fluidized bed incineration. Investigate biodegradation: methylene chloride is reported to completely biodegrade under aerobic conditions with sewage seed or activated sludge between 6 hrs. and 7 days. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Dichloromethane
ID: UN1593
Hazard Class: 6.1 - Poisonous materials
Packing Group: III - Minor Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB3, N36, T7, TP2
Packaging: **Exceptions:** 153 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U080 Toxic Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001, per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Material Safety Data Sheet Collection
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Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Pentachlorophenol **CAS Number:** 87-86-5
Chemical Formula: C_6HCl_5O
Structural Chemical Formula: C_6Cl_5OH
EINECS Number: 201-778-6
ACX Number: X1001598-0
Synonyms: ACUTOX; CHEM-PENTA; CHEM-TOL; CHLON; CHLOROPHEN; CRYPTOGIL OIL; CRYPTOGIL OL; DOW PENTACHLOROPHENOL DP-2 ANTIMICROBIAL; DOWCIDE 7; DOWICIDE 6; DOWICIDE 7; DOWICIDE 7 ANTIMICROBIAL; DOWICIDE EC-7; DURA TREET II; DUROTOX; EP 30; EPA PESTICIDE CHEMICAL CODE 063001; FORPEN-50 WOOD PRESERVATIVE; FUNGIFEN; GLAZD PENTA; GRUNDIER ARBEZOL; 1-HYDROXYPENTACHLOROBENZENE; LAUXTOL; LAUXTOL A; LIROPREM; ONTRACK WE HERBICIDE; OSMOSE WOOD PRESERVING COMPOUND; PCP; PENCHLOROL; PENTA; PENTA CONCENTRATE; PENTA READY; PENTA WR; PENTACHLOORFENOL; PENTACHLOROFENOL; PENTACHLOROPHENATE; 2,3,4,5,6-PENTACHLOROPHENOL; PENTACHLOROPHENOL; PENTACHLOROPHENOL,DOWICIDE EC-7; PENTACHLOROPHENOL,DP-2; PENTACHLOROPHENOL,TECHNICAL; PENTACHLORPHENOL; PENTACLOROFENOLO; PENTACON; PENTA-KIL; PENTASOL; PENWAR; PERATOX; PERMACIDE; PERMAGARD; PERMASAN; PERMATOX DP-2; PERMATOX PENTA; PERMITE; PREVENOL; PRILTOX; SANTOBRITE; SANTOPHEN; SANTOPHEN 20; SINITUHO; TERM-I-TROL; THOMPSON'S WOOD FIX; ORTHO TRIOX LIQUID VEGETATION KILLER; WATERSHED WOOD PRESERVATIVE; WEED AND BRUSH KILLER; WEEDONE; WITOPHEN P; WOODTREAT; WOODTREAT A
Derivation: Produced by chlorinating phenol.
General Use: Used as an insecticide for termite control; as a pre-harvest defoliant; general herbicide; molluscide; fungicide; bactericide; antimildew agent; wood preservative; in the synthesis of pentachlorophene esters; in cooling towers of electric plants; as additives to adhesives based on starch and vegetable and animal protein; in shingles, roof tiles, brick walls, concrete blocks, insulation, pipe sealant compounds, photographic solutions, and textiles; and in drilling mud in the petroleum industry.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Pentachlorophenol	87-86-5	

Trace Impurities: chlorodibenzodioxins, chlorodibenzofurans (commercial); polychlorophenols, chlorodibenzodioxins, chlorodibenzofurans, polychlorobenzenes, hydroxychlorodiphenyl ethers, 2-bromo-3,4,5,6-tetrachlorophenol (technical grade)

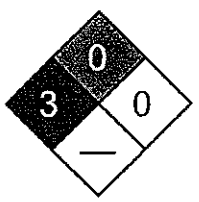
OSHA PEL
TWA: 0.5 mg/m^3; skin.

NIOSH REL
TWA: 0.5 mg/m^3; skin.

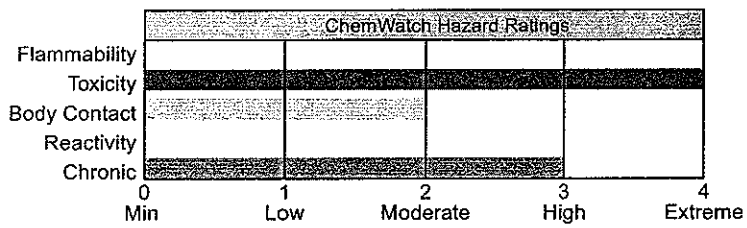
ACGIH TLV
TWA: 0.5 mg/m^3; skin.

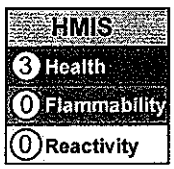
IDLH Level
2.5 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Poison

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

White or dark gray (technical grade) crystalline solid; phenolic odor. Severely irritating to eyes/skin/respiratory tract. Poison. Other Acute Effects: upset stomach, high fever, increased metabolic rate, heart failure. Chronic Effects: human carcinogen (animal data), mutations.

Potential Health Effects

Target Organs: Eyes, skin, liver, kidneys, and respiratory, central nervous (CNS), and cardiovascular systems

Primary Entry Routes: Inhalation, skin and/or eye contact, skin absorption

Acute Effects

Inhalation: Causes irritation, cough, sneezing, rapid breathing; and systemic effects.

Eye: Causes severe irritation or burns, pupil dilation, corneal opacity and numbness, and possibly permanent visual change or loss.

Skin: Causes severe irritation or burns, dermatitis and systemic effects including upset stomach, weakness, twitching, rapid breathing, polyuria (frequent urination), followed by oliguria (little urination), metabolic acidosis, anemia, hemolysis, high fever, profuse sweating, thirst, increased basal metabolic rate, rapid heart beat, seizures, collapse, heart failure, coma, cerebral edema (brain swelling), and death. Significant exposures may cause permanent damage including impaired autonomic nervous function and circulation.

Ingestion: Causes gastrointestinal tract irritation, loss of hunger, and systemic effects.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A3, Animal carcinogen; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Class A2, Unmistakably carcinogenic in animal experimentation only.

Medical Conditions Aggravated by Long-Term Exposure: Individuals with kidney, liver, or metabolic disorders may be at a higher risk from exposure to pentachlorophenol. *Note: Pentachlorophenol may cross the placenta and affect an unborn child.*

Chronic Effects: Chronic exposure to pentachlorophenol may cause dermatitis, chloracne, conjunctivitis, bronchitis, damage to the cardiovascular and immune systems, anorexia (appetite loss), anemia, weight loss, bruising, weakness, fever, sweating, dizziness, headache, anxiety, difficult breathing, kidney and liver damage, and possibly cancer.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 min. Consult a physician or ophthalmologist if pain or irritation persist.

Skin Contact: *Quickly* remove contaminated clothing and wash exposed area with soap and water, repeatedly. Get medical attention immediately.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. *Do not* induce vomiting due to risk of CNS depression and seizures.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Severe systemic poisoning results primarily from uncoupling of mitochondrial oxidative phosphorylation, with ensuing hyperpyrexia. Reduce temperature and replace fluid and electrolytes lost through sweating. Treat symptomatically and supportively. *Do not* administer salicylates. Treat severe acidosis with IV sodium bicarbonate. Monitor for electrolyte imbalance, metabolic acidosis, hemolytic anemia, methemoglobinemia, pancreatitis, and liver and kidney dysfunction. Administer oxygen by mask continuously to minimize tissue anoxia.

Section 5 - Fire-Fighting Measures

Flash Point: Not applicable; noncombustible solid

Autoignition Temperature: None reported.

LEL: None reported.

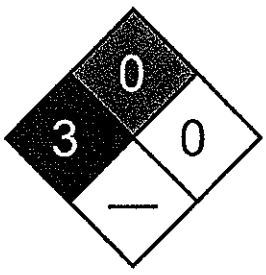
UEL: None reported.

Flammability Classification: Noncombustible solid

Extinguishing Media: Use agent suitable for surrounding fire.

General Fire Hazards/Hazardous Combustion Products: Include hydrogen chloride (HCl) and chlorinated phenols. May be dissolved in hydrocarbon solution.

Fire-Fighting Instructions: *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.



Fire Diamond

Section 6 - Accidental Release Measures

Spill/Leak Procedures: Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources. Isolate the area for at least 80 to 160 feet. Ventilate area, deny entry, stay upwind. Stop leak if you can do so without risk. Cleanup personnel should protect against exposure.

Small Spills: If in solid form, *do not* sweep! Carefully scoop up or vacuum (with a HEPA filter). Absorb liquid spill with an inert, noncombustible absorbent such as sand or vermiculite.

Large Spills: For large spills, dike far ahead of liquid spill for later disposal. Cover with plastic sheet to prevent dispersion. *Do not* release into sewers or waterways. If in water, apply activated carbon (10 times the spilled amount of pentachlorophenol). Remove trapped material with suction hoses.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use only with adequate ventilation to maintain concentrations at nonhazardous levels (Sec. 2). Wear personal protective clothing and equipment to prevent any contact with skin and eyes (Sec. 8), and avoid dust inhalation. Practice good personal hygiene procedures to prevent inadvertently ingesting this material. *Do not* attempt to handle broken containers without proper protective equipment. Immediately wash skin if contact with pentachlorophenol occurs. Shower and change into clean clothing after working with pentachlorophenol. Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in tightly closed containers in a cool, well-ventilated area away from heat, light, ignition sources, and incompatibles. Protect containers from physical damage. Outside or detached storage is preferred.

Storage Requirements: Store according to USEPA hazardous waste storage regulations.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Where feasible, enclose operations to avoid dust dispersion into the work area. Whenever possible, automatically transfer pentachlorophenol from storage containers to process containers. Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PEL (Sec. 2). Local exhaust ventilation is preferred.

Administrative Controls: Educate workers about the hazards associated with this material. Train in work practices which minimize exposure. Consider preplacement and periodic medical exams with emphasis on the lungs, liver, kidneys, skin, cardiovascular and nervous systems.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent any skin contact. Nitrile rubber and Viton are recommended >8, neoprene and 4H >4. *Do not* use natural rubber or polyvinyl alcohol. Wear dust-proof eyeglasses (solid form) or chemical safety goggles (solution), per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not protective eye devices. Appropriate eye protection must be worn instead of, or in conjunction with, contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For concentrations >= 2.5 mg/m^3: any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust, mist, and fume filter, or any powered, air-purifying respirator with organic vapor cartridge(s) in combination with a dust, mist and fume filter, or any supplied-air respirator, or any SCBA with a full facepiece; emergency/unknown concentrations/IDLH conditions: any SCBA that has a full facepiece and is operated in pressure-demand or other positive-pressure mode, or any supplied-air respirator that has a full facepiece and is operated in pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode; escape: any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter or any appropriate escape-type SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen- deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Segregate contaminated clothing such that cleaning personnel *do not* come in contact with pentachlorophenol. Remove this material from your shoes and clean personal protective equipment. Immediately remove contaminated clothing. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: White or dark gray (technical grade) crystalline solid; may be in solution.

Physical State: Solid

Odor Threshold: PCP Soln 857 ug/l at 30 |'b0C

Vapor Pressure (kPa): 0.00011 mm Hg at 77 °F (25 °C)

Vapor Density (Air=1): 9.2

Formula Weight: 266.35
Specific Gravity (H_2O=1, at 4 °C): 1.978 at 22 °C/4 °C
Evaporation Rate: Low, calculated
Boiling Point: 588 °F (309 °C) (decomposes)
Freezing/Melting Point: 374 °F (190 °C)
Water Solubility: 514 mg/L at 68 °F (20 °C) (slight)
Other Solubilities: Soluble in methanol, ethanol, alcohol, pine oil, dilute alkali, and ether.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Pentachlorophenol is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Avoid contact with chemical incompatibles.

Storage Incompatibilities: Include strong oxidizers (contact may produce fire or explosion), strong acids or bases, acid chlorides, acid anhydrides, and ultraviolet light (solution).

Hazardous Decomposition Products: Thermal oxidative decomposition of pentachlorophenol can produce hydrogen chloride (HCl), chlorinated phenols, and carbon monoxide.

Section 11 - Toxicological Information

Acute Oral Effects:

Man, oral, LD_{Lo}: 401 mg/kg caused toxic effects: change in motor activity (specific assay); sweating; body temperature increase.

Rat, oral, LD_{50}: 27 mg/kg produced toxic effects: BP elevation not characterized in autonomic section; hyperglycemia; body temperature increase.

Acute Inhalation Effects:

Rat, inhalation, LC_{50}: 355 mg/m^3; toxic effects: excitement, muscle contraction or spasticity; dyspnea.

Acute Skin Effects:

Rabbit, skin, LD_{Lo}: 40 mg/kg; toxic effects: muscle weakness; BP elevation not characterized in autonomic section; urine volume increased.

Rat, skin, LD_{50}: 96 mg/kg; toxic effects: excitement, muscle contraction or spasticity; dyspnea.

Mouse, subcutaneous: 46 mg/kg; toxic effects: tumorigenic - equivocal tumorigenic agent by RTECS criteria; lungs, thorax, or respiration - tumors; liver - tumors.

Irritation Effects:

Rabbit, open draize test: 10 mg/24 hr: mild irritation.

Other Effects:

Rat, oral: 84 mg/kg for 28 days, intermittent; toxic effects: endocrine - other changes; changes in serum composition.

Rat, oral: 840 mg/kg for 12 weeks, continuous; toxic effects: changes in liver weight; changes in erythrocite (RBC) cell count; weight loss or decreased weight gain.

Tumorgenicity, mouse, oral: 8736 mg/kg for 2 years, continuous; toxic effects: tumorigenic - carcinogenic by RTECS criteria; endocrine - tumors.

Mutagenicity - *S. typhimurium*, 40 nmol/plate induced mutation. *S. Cerevisiae*, 400 mg/L induced mutation.

Rat, female, oral: 50 mg/kg, administered on gestational days 6-15 produced specific developmental abnormalities - musculoskeletal system.

Rat, female, oral: 4 g/kg, administered 77 days prior to mating produced effects on newborn - weaning or lactation index; growth statistics.

Rat, female, oral: 60 mg/kg, administered on gestational day 9 produced effects on embryo or fetus - fetotoxicity.

See *RTECS* SM6300000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be subject to slow biodegradation and leaching into groundwater. If released in water, it will adsorb to sediment, photodegrade (especially at high pH) and slowly biodegrade. Bioconcentration in fish will be moderate. In air, it will be lost due to photolysis and reaction with photochemically produced hydroxyl radicals. Half-life in soil: weeks to 3 months. Very low mobility in soil. It tends to adsorb to soil and sediment. However, leaching to groundwater is possible. K_{oc} - 1000, calculated; 3000-4000 (measured, sediment)

Ecotoxicity: Pentachlorophenol is highly toxic to algae, crustaceans, and fish. Trout, fresh water, 5 ppm for 3 hr: lethal. Mallard duck, LC_{50}: 4500 ppm. *Daphnia magna*, 7 day LC_{50}: 0.53 mg/L. Fathead minnow, small, 24 hr LC_{50}: 0.24 mg/L. *Poecilia reticulata*, >7 day LC_{50}: 0.38 mg/L.

Henry's Law Constant: 2.45 x 10^{-8} atm-m^3/mole at 77 °F

Octanol/Water Partition Coefficient: log K_{OW} = 5.12

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable federal, state, and local regulations. One method is to burn in a chemical incinerator equipped with a scrubber and ash disposal facility. Handle empty containers carefully as hazardous residues may still remain. *Do not* reuse empty containers. Combustible containers should be burned in a pesticide incinerator or disposed of in a specified landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Pentachlorophenol
ID: UN3155
Hazard Class: 6.1 - Poisonous materials
Packing Group: II - Medium Danger
Symbols:
Label Codes: 6.1 - Poison *or* Poison Inhalation Hazard *if inhalation hazard, Zone A or B*
Special Provisions: IB8, IP2, IP4
Packaging: **Exceptions:** None **Non-bulk:** 212 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 25 kg **Cargo aircraft only:** 100 kg
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed See F027 Toxic Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 10 lb (4.535 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Toluene
CAS Number: 108-88-3
Chemical Formula: C_7H_8
Structural Chemical Formula: $C_6H_5CH_3$
EINECS Number: 203-625-9
ACX Number: X1001512-0
Synonyms: ANTISAL 1A; BENZENE,METHYL-; CP 25; METHACIDE; METHANE,PHENYL-; METHYL BENZENE; METHYL BENZOL; METHYLBENZENE; METHYLBENZOL; PHENYL METHANE; PHENYLMETHANE; TOLUEEN; TOLUEN; TOLUENE; TOLUENO; TOLUOL; TOLUOLO; TOLU-SOL
General Use: Used as a solvent for paint, resins, lacquers inks & adhesives. Component of solvent blends and thinners; in gasoline and aviation fuel. Used in the manufacture of chemicals, dyes, explosives, benzoic acid.
Some grades of toluene may contain traces of xylene and benzene.
Odor threshold: 2 ppm approx. Odor is not a reliable warning property due to olfactory fatigue.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
toluene	108-88-3	> 99.5

OSHA PEL
TWA: 200 ppm; Ceiling: 300 ppm; 500 ppm, 10-minute maximum peak.

ACGIH TLV
TWA: 50 ppm; skin.

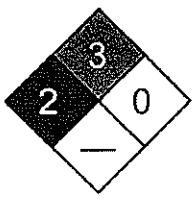
EU OEL
TWA: 192 mg/m^3 (50 ppm); STEL: 384 mg/m^3 (100 ppm).

NIOSH REL
TWA: 100 ppm (375 mg/m^3); STEL: 150 ppm (560 mg/m^3).

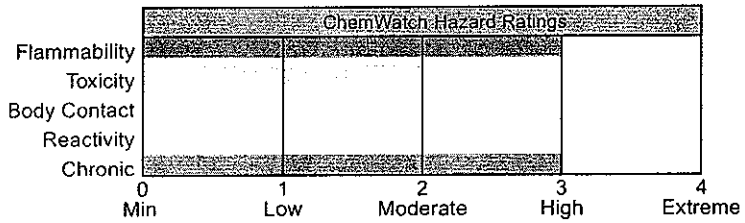
IDLH Level
500 ppm.

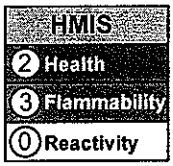
DFG (Germany) MAK
TWA: 50 ppm; PEAK: 200 ppm; skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sickly, sweet odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: weakness, headache, dizziness, confusion, insomnia. Chronic Effects: liver/kidney damage, may cause birth defects. Flammable.

Potential Health Effects

Target Organs: Skin, liver, kidneys, central nervous system.
Primary Entry Routes: Inhalation, skin contact/absorbtion.
Acute Effects
Inhalation: The vapor is highly discomforting to the upper respiratory tract.
Inhalation hazard is increased at higher temperatures.

Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Central nervous system (CNS) depression may include nonspecific discomfort, symptoms of giddiness, headache, dizziness, nausea, anesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness.
Serious poisonings may result in respiratory depression and may be fatal.

Eye: The liquid produces a high level of eye discomfort and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The vapor is discomforting to the eyes if exposure is prolonged.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.
Defatting and/or drying of the skin may lead to dermatitis and it is absorbed by skin.
Toxic effects may result from skin absorption.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.
Chronic toluene habituation occurs following intentional abuse (glue-sniffing) or from occupational exposure. Ataxia, incoordination and tremors of the hands and feet (as a consequence of diffuse cerebral atrophy), headache, abnormal speech, transient memory loss, convulsions, coma, drowsiness, reduced color perception, frank blindness, nystagmus (rapid, involuntary eye-movements), decreased hearing leading to deafness and mild dementia have all been associated with chronic abuse.
Peripheral nerve damage, encephalopathy, giant axonopathy, electrolyte disturbances in the cerebrospinal fluid and abnormal computer tomographic (CT) scans are common amongst toluene addicts. Although toluene abuse has been linked with kidney disease, this does not commonly appear in cases of occupational toluene exposures. Cardiac and hematological toxicity are however associated with chronic toluene exposure. Cardiac arrhythmia, multifocal and premature ventricular contractions and supraventricular tachycardia are present in 20% of patients who abused toluene-containing paints.
Previous suggestions that chronic toluene inhalation produced human peripheral neuropathy have largely been discounted. However central nervous system (CNS) depression is well documented where blood toluene levels exceed 2.2 mg%. Toluene abusers can achieve transient circulating concentrations of 6.5 mg%. Amongst workers exposed for a median time of 29 years to toluene no subacute effects on neurasthenic complaints and pyschometric test results could be established.
The prenatal toxicity of very high toluene concentrations has been documented for several animal species and man. Malformations indicative of specific teratogenicity have not generally been found. The toxicity described in the literature takes the form of embryo death or delayed fetal growth and delayed skeletal system development. Permanent damage of children has been seen only when mothers had suffered from chronic intoxication as a result of "sniffing".

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

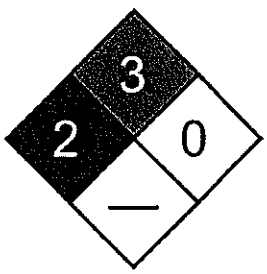
Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Following acute or short-term repeated exposures to toluene:
1. Toluene is absorbed across to alveolar barrier, the blood/air mixture being 11.2/15.6 (at 37 °C) The order of toluene, in expired breath, is of the order of 18 ppm following sustained exposure to 100 ppm.
The tissue/blood proportion is 1/3 except in adipose where the proportion is 8/10.
2.Metabolism by microsomal mono-oxygenation, results in the production of hippuric acid. This may be detected in the urine in amounts between 0.5 and 2.5 g/24hr which represents, on average 0.8 gm/gm of creatinine.
The biological half life of hippuric acid is in the order of 1-2 hours.
3.Primary threat to life from ingestion and/or inhalation is respiratory failure.
4.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
5.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
6.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
7.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
8.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.
BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Hippuric acid in urine	2.5 gm/gm creatinine	End of shift Last 4 hrs of shift	B,NS
Toluene in venous blood	1 mg/L	End of shift	SQ
Toluene in end-exhaled air		End of shift	SQ

NS: Non-specific determinant; also observed after exposure to other material
SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.
B: Background levels occur in specimens collected from subjects NOT exposed.

Section 5 - Fire-Fighting Measures

Flash Point: 4 °C Closed Cup
Autoignition Temperature: 480 °C
LEL: 1.2% v/v
UEL: 7.1% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO) and carbon dioxide (CO_2).



Fire Diamond

Fire Incompatibility: Avoid contamination with strong oxidizing agents as ignition may result.
Nitric acid with toluene, produces nitrated compounds which are explosive.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protective location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; Metal drum; Metal safety cans. Packing as supplied by manufacturer.
Plastic containers may only be used if approved for flammable liquid.
Check that containers are clearly labeled and free from leaks.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area; local exhaust ventilation may be required for safe working, i. e., to keep exposures below required standards; otherwise, PPE is required.
General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in special circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator. Correct fit is essential to ensure adequate protection.
Provide adequate ventilation in warehouses and enclosed storage areas.

In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; chemical goggles. Full face shield.

DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.

Respiratory Protection:

Exposure Range >200 to <500 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range 500 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: black

Other: Overalls. Barrier cream. Eyewash unit.

Glove Selection Index:

PE/EVAL/PE	Best selection
VITON/CHLOROBUTYL	Best selection
VITON	Best selection
PVA	Best selection
TEFLON	Satisfactory; may degrade after 4 hours continuous immersion
SARANEX-23 2-PLY	Poor to dangerous choice for other than short-term immersion
CPE	Poor to dangerous choice for other than short-term immersion
VITON/NEOPRENE	Poor to dangerous choice for other than short-term immersion
SARANEX-23	Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL	Poor to dangerous choice for other than short-term immersion
NITRILE+PVC	Poor to dangerous choice for other than short-term immersion
NITRILE	Poor to dangerous choice for other than short-term immersion
BUTYL	Poor to dangerous choice for other than short-term immersion
PVC	Poor to dangerous choice for other than short-term immersion
NEOPRENE	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid with a strong aromatic odor; floats on water. Mixes with most organic solvents.

Physical State: Liquid

Odor Threshold: 2.14 ppm

Vapor Pressure (kPa): 2.93 at 20 °C

Vapor Density (Air=1): 3.2

Formula Weight: 92.14

Specific Gravity (H_2O=1, at 4 °C): 0.87 at 20 °C

Evaporation Rate: 2.4 (BuAc=1)

pH: Not applicable

pH (1% Solution): Not applicable.

Boiling Point: 111 °C (232 °F) at 760 mm Hg

Freezing/Melting Point: -95 °C (-139 °F)

Volatile Component (% Vol): 100

Water Solubility: < 1 mg/mL at 18 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Segregate from strong oxidizers.

Section 11 - Toxicological Information

Toxicity

Oral (human) LD_{Lo}: 50 mg/kg

Oral (rat) LD_{50}: 636 mg/kg

Inhalation (human) TC_{Lo}: 100 ppm

Inhalation (man) TC_{Lo}: 200 ppm

Inhalation (rat) LC_{50}: > 26700 ppm/1h

Dermal (rabbit) LD_{50}: 12124 mg/kg

Reproductive effector in rats

Irritation

Skin (rabbit): 20 mg/24h-moderate

Skin (rabbit): 500 mg - moderate

Eye (rabbit): 0.87 mg - mild

Eye (rabbit): 2 mg/24h - SEVERE

Eye (rabbit): 100 mg/30sec - mild

See *RTECS* XS 5250000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be lost by evaporation from near-surface soil and by leaching to the groundwater. Biodegradation occurs both in soil and groundwater, but it is apt to be slow especially at high concentrations, which may be toxic to microorganisms. The presence of acclimated microbial populations may allow rapid biodegradation. It will not significantly hydrolyze in soil or water under normal environmental conditions. If released into water, its concentration will decrease due to evaporation and biodegradation. This removal can be rapid or take several weeks, depending on temperature, mixing conditions, and acclimation of microorganisms. It will not significantly adsorb to sediment or bioconcentrate in aquatic organisms. If released to the atmosphere, it will degrade by reaction with photochemically produced hydroxyl radicals (half-life 3 hr to slightly over 1 day) or be washed out in rain. It will not be subject to direct photolysis.

Ecotoxicity: LC_{50} Aedes aegypti-4th instar (mosquito larvae) 22 mg/l /Conditions of bioassay not specified; LC_{50} Cyprinodon variegatus (sheepshead minnow) 277-485 mg/l 96 hr /Conditions of bioassay not specified; LC_{50} Calandra granaria (grain weevil) 210 mg/l /in air; LC_{50} Cancer magister (crab larvae stage I) 28 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Crangon franciscorum (shrimp) 4.3 ppm 96 hr /Conditions of bioassay not specified; LC_{50} Artemia salina (brine shrimp) 33 mg/l 24 hr /Conditions of bioassay not specified; LC_{50} Morone saxatilis (striped bass) 7.3 mg/l 96 hr /Conditions of bioassay not specified; LC_{50} Pimephales promelas (fathead minnows) 55-72 mg/l (embryos), 25-36 mg/l (1-day posthatch protolarvae), and 26-31 mg/l (30-day-old minnows)/ 96 hour /Conditions of bioassay not specified

Henry's Law Constant: 0.0067

BCF: eels 13.2

Biochemical Oxygen Demand (BOD): 0%, 5 days

Octanol/Water Partition Coefficient: log K_{ow} = 2.69

Soil Sorption Partition Coefficient: K_{oc} = silty loam 37

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Toluene
ID: UN1294
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U220 Toxic Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Xylene **CAS Number:** 1330-20-7
Chemical Formula: C_8H_{10}
Structural Chemical Formula: $C_6H_4(CH_3)_2$
EINECS Number: 215-535-7
ACX Number: X1001166-8
Synonyms: BENZENE,DIMETHYL-; COMPONENT 1 (83%): XYLENES; COMPONENT 2 (17%): ETHYL BENZENE; DIMETHYLBENZENE; DIMETHYLBENZENES; EPA PESTICIDE CHEMICAL CODE 086802; KSYLEN; METHYL TOLUENE; METHYLTOLUENE; VIOLET 3; XILOLI; XYLENE; XYLENEN; XYLOL; XYLOLE
General Use: A strong solvent for general use in the manufacture of paints, varnishes, lacquers, thinners, inks, rubber, pesticides, herbicides and paint strippers.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
xylene	1330-20-7	> 95

OSHA PEL
TWA: 100 ppm; 435 mg/m^3.

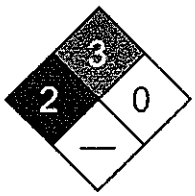
NIOSH REL
TWA: 100 ppm, 435 mg/m^3; STEL: 150 ppm, 655 mg/m^3.

DFG (Germany) MAK
TWA: 100 ppm; PEAK: 200 ppm; skin.

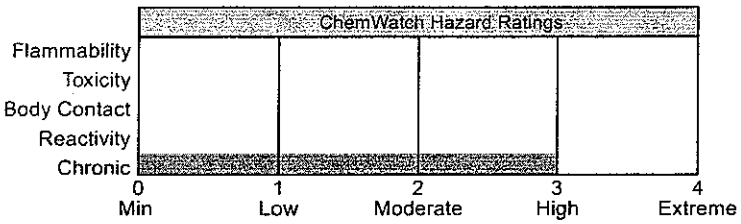
ACGIH TLV
TWA: 100 ppm; STEL: 150 ppm.

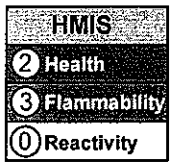
EU OEL
TWA: 50 ppm; STEL: 100 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear, sweet smelling liquid. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, nausea, drowsiness. Chronic Effects: dermatitis, kidney/liver/peripheral nerve damage. May cause birth defects (animal data). Flammable.

Potential Health Effects

Target Organs: central nervous system (CNS), eyes, gastrointestinal (GI) tract, liver, kidneys, skin
Primary Entry Routes: inhalation, skin absorption (slight), eye contact, ingestion
Acute Effects
Inhalation: Xylene is a central nervous system depressant. The vapor is discomforting to the upper respiratory tract and may be harmful if inhaled.
Inhalation hazard is increased at higher temperatures.
Toxic effects are increased by consumption of alcohol.
Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Headache, fatigue, lassitude, irritability and gastrointestinal disturbances (e.g., nausea, anorexia and flatulence) are the most common symptoms of xylene overexposure. Injury to the heart, liver, kidneys and nervous system has also been noted among workers. Transient memory loss, renal impairment, temporary confusion and some evidence of disturbance of liver function was reported in three workers overcome by gross exposure to xylene (10000 ppm). One worker died and autopsy revealed pulmonary congestion, edema, and focal alveolar hemorrhage.

Volunteers inhaling xylene at 100 ppm for 5 to 6 hours showed changes in manual coordination, reaction time and slight ataxia. Tolerance developed during the workweek but was lost over the weekend. Physical exercise may antagonize this effect. Xylene body burden in humans exposed to 100 or 200 ppm xylene in air depends on the amount of body fat with 4% to 8% of total absorbed xylene accumulating in human adipose tissues.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration. The vapor is highly discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Corneal changes have been reported in furniture polishers exposed to xylene.

Skin: The liquid is highly discomforting to the skin and may cause drying of the skin, which may lead to dermatitis and it is absorbed by the skin.

Toxic effects may result from skin absorption.

Open cuts, abraded or irritated skin should not be exposed to this material.

The material may accentuate any pre-existing skin condition.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.

Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.

Small excess risks of spontaneous abortion and congenital malformation was reported amongst women exposed to xylene in the first trimester of pregnancy. In all cases however the women had also been exposed to other substances. Evaluation of workers chronically exposed to xylene has demonstrated a lack of genotoxicity. Exposure to xylene has been associated with increased risks of hemopoietic malignancies but, again simultaneous exposure to other substances (including benzene) complicate the picture. A long-term gavage study of mixed xylenes (containing 17% ethyl benzene) found no evidence of carcinogenic activity in rats and mice of either sex.

Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to xylene:

1.Gastrointestinal absorption is significant with ingestions.

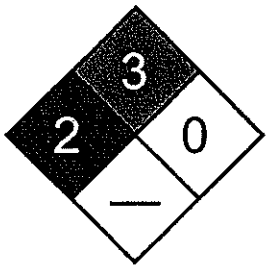
For ingestions exceeding 1-2 mL (xylene)/kg, intubation and lavage with cuffed endotracheal tube is recommended. The use of charcoal and cathartics is equivocal.
2.Pulmonary absorption is rapid with about 60-65% retained at rest.
3.Primary threat to life from ingestion and/or inhalation is respiratory failure.
4.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
5.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
6.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
7.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Methylhippuric acids in urine	1.5 gm/gm creatinine	End of shift	
	2 mg/min	Last 4 hrs of shift.	

Section 5 - Fire-Fighting Measures



Fire Diamond

Flash Point: 25.6 °C
Autoignition Temperature: 241 °C
LEL: 1.0% v/v
UEL: 7.0% v/v
Extinguishing Media: Alcohol stable foam; dry chemical powder; carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are flammable.
Moderate fire hazard when exposed to heat or flame.
Vapor forms an explosive mixture with air.
Moderate explosion hazard when exposed to heat or flame.
Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion or decomposition leading to violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).
Other combustion products include carbon dioxide (CO_2).
Fire Incompatibility: Avoid contamination with strong oxidizing agents as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of overexposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights or ignition sources.
Avoid generation of static electricity. DO NOT use plastic buckets.
Ground all lines and equipment. Use spark-free tools when handling.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.
Plastic containers may only be used if approved for flammable liquids.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e., to keep exposures below required standards; otherwise, PPE is required.
CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear.
General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in specific circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.
In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Barrier cream with polyethylene gloves; Butyl rubber gloves or Neoprene gloves or PVC gloves.
Safety footwear.
Do NOT use this product to clean the skin.
Other: Overalls. Impervious protective clothing.
Eyewash unit.
Ensure there is ready access to an emergency shower.
Glove Selection Index:

PE/EVAL/PE	Best selection
PVA	Best selection
VITON	Best selection
TEFLON	Best selection
PVDC/PE/PVDC	Poor to dangerous choice for other than short-term immersion
NATURAL+NEOPRENE	Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL	Poor to dangerous choice for other than short-term immersion
NITRILE+PVC	Poor to dangerous choice for other than short-term immersion
HYPALON	Poor to dangerous choice for other than short-term immersion
NAT+NEOPR+NITRILE	Poor to dangerous choice for other than short-term immersion
BUTYL	Poor to dangerous choice for other than short-term immersion
BUTYL/NEOPRENE	Poor to dangerous choice for other than short-term immersion

NITRILE..... Poor to dangerous choice for other than short-term immersion
NEOPRENE..... Poor to dangerous choice for other than short-term immersion
PVC..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear colorless flammable liquid with a strong aromatic odor; floats on water. Mixes with most organic solvents.

Physical State: Liquid
Odor Threshold: 5.00 x10^{-5} ppm
Vapor Pressure (kPa): 0.5 at 15 °C
Vapor Density (Air=1): 3.66 at 15 °C
Formula Weight: 106.18
Specific Gravity (H_2O=1, at 4 °C): 0.87 at 15 °C
Evaporation Rate: 0.7 Bu Ac=1

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 137 °C (279 °F) to 140 °C (284 °F)
Freezing/Melting Point: -47 °C (-53 °F)
Volatile Component (% Vol): 100
Water Solubility: Practically insoluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity
Oral (human) LD_{Lo}: 50 mg/kg
Oral (rat) LD_{50}: 4300 mg/kg
Inhalation (human) TC_{Lo}: 200 ppm
Inhalation (man) LC_{Lo}: 10000 ppm/6h
Inhalation (rat) LC_{50}: 5000 ppm/4h
Reproductive effector in rats

Irritation
Skin (rabbit):500 mg/24h moderate
Eye (human): 200 ppm irritant
Eye (rabbit): 87 mg mild
Eye (rabbit): 5 mg/24h SEVERE

See *RTECS* ZE 2100000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Most of the xylenes are released into the atmosphere where they may photochemically degrade by reaction with hydroxyl radicals (half-life 1-18 hr). The dominant removal process in water is volatilization. Xylenes are moderately mobile in soil and may leach into groundwater where they are known to persist for several years, despite some evidence that they biodegrade in both soil and groundwater. Bioconcentration is not expected to be significant.
Ecotoxicity: LC_{50} Rainbow trout 13.5 mg/l/96 hr /Conditions of bioassay not specified; LD_{50} Goldfish 13 mg/l/24 hr /Conditions of bioassay not specified
Henry's Law Constant: 0.22
BCF: estimated at 2.14 to 2.20
Octanol/Water Partition Coefficient: log K_{OW} = 3.12 to 3.20
Soil Sorption Partition Coefficient: K_{OC} = 48 to 68

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Xylenes
ID: UN1307
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Shipping Name and Description: Xylenes
ID: UN1307
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: B1, IB3, T2, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U239 Ignitable Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Zinc
CAS Number: 7440-66-6
Chemical Formula: Zn
EINECS Number: 231-175-3
ACX Number: X1002588-8
Synonyms: ASARCO L 15; BLUE POWDER; C.I. 77945; C.I. PIGMENT BLACK 16; C.I. PIGMENT METAL 6; EMANAY ZINC DUST; GRANULAR ZINC; HODGSONS ZINC DUST - HYFINE & STANDARD; JASAD; MERRILLITE; PASCO; ZINC; ZINC DUST
Derivation: Manufactured by concentrating zinc ore, roasting the concentrate, followed with thermal smelting (reduction with carbon); by reducing the zinc oxide with carbon in retorts from which the resultant zinc is distilled and condensed; or by the hydrometallurgical or electrolytical process where the zinc oxide is leached from the roasted or calcined material with sulfuric acid to form zinc sulfate solution which is then leached from electrolyzed cells to deposit zinc on the cathodes.
General Use: Used in alloys (dental amalgams, brass), metallic driers, mixed-metal stabilizers, automotive parts, electrical fuses, storage and dry-cell batteries, in vacuum fluorescence displays, in electrical contact grease, in bearings, in paper defoxing, galvanizing iron and other metals, protective coating, desilverizing agent for lead, deoxidizing bronze, reducing agent in organic chemistry, reagent in analytical chemistry, extracting gold, electroplating, metal spraying, anodic inhibitors, fungicides, nutrition, roofing, gutters, engravers' plates, cable wrappings, railroad car linings, purifying fats, bleaching glue, canteens, and organ pipes.

Section 2 - Composition / Information on Ingredients

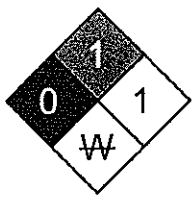
Name	CAS	%
Zinc	7440-66-6	special high-grade (99.990%), high-grade (99.95%), intermediate (99.5%), brass special (99%), prime western (98%).

Trace Impurities: Tin, lead, iron, cadmium, arsenic, cesium, antimony, and zinc chloride (increases corrosion resistance).

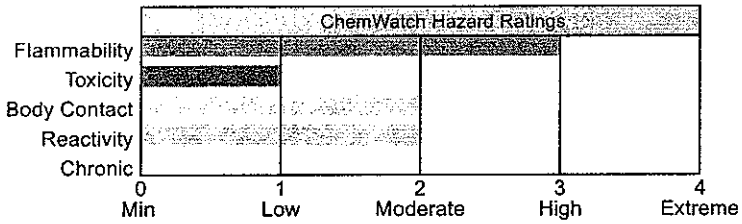
OSHA PEL **NIOSH REL**

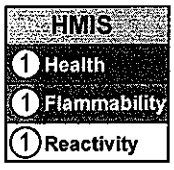
ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Explosive Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Bluish-white lustrous metal with white coating of basic carbonate on exposure to moist air. Dust forms explosive mixtures with water. Dust is flammable, may ignite spontaneously in air.

Potential Health Effects

Target Organs: Respiratory system, eyes, and skin

Primary Entry Routes: Inhalation and eye and skin contact

Acute Effects

Inhalation: Exposure to dust may result in cough. Heated zinc may give off zinc oxide (ZnO) fumes. Characteristics of exposure include sweet taste, dry throat, injury to mucous membrane, cough, weakness, aches, chills, fever, nausea, and vomiting. Concentrations of ZnO particulates at 45 to 870 mg/m^3 cause "metal fume fever," a transient condition characterized by fever, chills, muscle pain, and vomiting. Recovery normally occurs within 24 to 48 hours. Tolerance may develop but is generally lost over a weekend.

Eye: Zinc dust particles can irritate the eyes. Zinc salts will precipitate eye protein and cause corneal and lens changes.

Skin: A human skin irritant.

Ingestion: Relatively non-toxic, though significant ingestion (12 g) of metallic zinc was reported to cause lethargy, light headedness, staggering gait, and difficulty writing, suggesting cerebellar dysfunction. Ingestion of acidic food or beverages stored in zinc or galvanized containers can lead to nausea, vomiting, diarrhea, and abdominal pain.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Chronic Effects: Abnormally large amounts of zinc may enter and leave the body for years without resulting in symptoms or clinical evidence. Zinc poisoning has been associated with prolonged consumption of water from galvanized pipes. Symptoms include irritability, muscular stiffness and pain, loss of appetite and nausea. Ingestion of excessive doses for prolonged periods alters the immune response and causes copper and iron deficiency, anemia, headache, vomiting, chills, fever, malaise, and abdominal pain.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed. Apply artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation develop.

Skin Contact: Remove contaminated clothing and rinse with flooding amounts of water. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Maintain hydration and observe for metabolic acidosis, hypocalcemic tetany, anuria, liver damage, gastric perforation, and pyloric stenosis. For pulmonary edema (noncardiogenic), maintain ventilation and oxygenation with close arterial blood gas monitoring. Early use of PEEP and mechanical ventilation may be needed to maintain pO_2 greater than 50 mm Hg with FIO_2 less than 60%. For eye exposure, rinse with 0.05 M neutral sodium edetate to help prevent or reverse a portion of the protein precipitation.

Section 5 - Fire-Fighting Measures

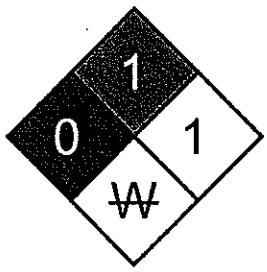
Flash Point: Not applicable, combustible solid

Autoignition Temperature: Cloud, 1256 °F (680 °C); dust layer, 860 °F (460 °C); powder 650 mJ spark.

LEL: Dust cloud explosion, 0.5 oz/ft^3

UEL: None reported.

Flammability Classification: Combustible solid



Fire Diamond

Extinguishing Media: *Do not* use water or foam. Use a Class D fire extinguisher, dry chemical, dry ground limestone, dry clay, soda ash, lime, or sand, or withdraw from area and let fire burn.

General Fire Hazards/Hazardous Combustion Products: Fire will produce irritating, corrosive and/or toxic gases. Inhalation or contact with vapors, substance, or decomposition products may cause severe injury or death. Zinc dust reacts vigorously or explosively on contact with water. It produces flammable gases on contact with water or moist air. It may be ignited by heat, sparks or flames and may re-ignite after fire is extinguished. Dust forms explosive mixtures with air.

Fire-Fighting Instructions: *Do not* get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank as rupture or explosion may be imminent. *Do not* release runoff from fire control methods to sewers or waterways as runoff may create fire or explosion hazard. Corrosive solutions may be produced on contact with water. Move containers from fire area if it can be done without undue risk. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in

pressure-demand or positive-pressure mode. Structural firefighters' protective clothing will only provide limited protection.

Section 6 - Accidental Release Measures

Spill/Leak Procedures: Eliminate all ignition sources (no smoking, flares, sparks or flames). Isolate spill or leak area immediately for at least 160 to 330 feet (50 to 100 meters) in all directions. *Do not* walk through or touch spilled material. For large spills consider downwind evacuation for at least 800 feet (250 meters). Keep unauthorized personnel away, stay upwind, keep out of low areas, and ventilate area before entry.

Small Spills: Cover with dry earth, dry sand, or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain. With a clean shovel, carefully scoop material into a dry, sealed container and move container from spill area. Cleanup personnel should protect against dust inhalation and skin and eye contact.

Large Spills: For large spills, dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Bulk dust in damp state may heat spontaneously and ignite on exposure to air. . Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Protect against physical damage. Store in a cool, dry ventilated place away from heat and ignition sources and incompatibles.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Routinely evaluate exposure to zinc by collecting personal and area air samples. Prevention of metal fume fever is a matter of keeping exposure of workers below the level of zinc oxide concentration currently accepted as satisfactory for working with metal in the industry (15 mg/m^3) by employment of proper local exhaust ventilation to collect fumes at their source. Enclose operations and/or provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Post hazard and warning information in the work area. In addition, educate, train, and communicate all information on the health and safety hazards of zinc to potentially exposed workers.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator equipped with particulate (dust/fume/mist) filters. Particulate filters must be checked daily before work for physical damage and replaced as needed. If, while wearing a filter cartridge or canister respirator, you can smell, taste, or otherwise detect zinc, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. *Do not* take contaminated work clothes home. Launder before reuse. Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to zinc dust. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Bluish-white lustrous metal or dark powder.

Physical State: Solid

Vapor Pressure (kPa): 1 mm Hg at 908.6 °F (487 °C); 60 mm Hg at 1292 °F (700 °C)

Formula Weight: 65.38

Specific Gravity (H_2O=1, at 4 °C): 7.14 at 77 °F (25°C)

Boiling Point: 1666.4 °F (908 °C)

Freezing/Melting Point: 787.1 °F (419.5 °C)

Ionization Potential (eV): 9.39405 eV

Water Solubility: Insoluble **Other Solubilities:** Soluble in acid, alkalies, acetic acid

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Zinc powder is stable at room temperature in closed containers under normal storage and handling conditions. However, moist zinc can react exothermically and ignite spontaneously in air. Hazardous polymerization cannot occur. Avoid exposure to moisture, heat, and ignition sources (flares, sparks, cigarettes, and open flames).

Storage Incompatibilities: Avoid contact with acids, alkali hydroxides (e.g., sodium hydroxide), ammonium nitrate, ammonium sulfide, arsenic oxide, barium dioxide, barium oxide, barium nitrate, cadmium, carbon disulfide, catalytic metals, chlorates, chlorides, chlorine, chlorinated rubber, chromium (VI) oxide, ethyl acetoacetate + tribromoneopentyl alcohol, fluorine, halogenated hydrocarbons, hydrazine mononitrate, hydroxylamine, lead azide, lead nitride, magnesium nitrate, manganese chloride, nitric acid, *o*-nitroanisole, nitrobenzene, nonmetals, oxidizing agents (sulfur, oxygen), paint primer base, pentacarbonyliron, performic acid, potassium chlorate, potassium nitrate, potassium peroxide, seleninyl bromide, selenium, sodium chlorate, sodium peroxide, tellurium, transition metal halides, and water.

Hazardous Decomposition Products: Thermal oxidative decomposition of zinc metal/powder can produce hydrogen gas and zinc oxide fumes (of particle diameter <=1 µm).

Section 11 - Toxicological Information

Irritation Effects:

Human, skin, standard Draize test, 300 µg over 3 days intermittently caused mild irritation.

Other Effects:

Acute Inhalation Effects: Human, inhalation, 124 mg/m^3/50 minutes, resulted in toxic effects on lung, thorax, or respiration - cough and dyspnea, and skin and appendages - sweating.

See *RTECS* ZG8600000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Bioaccumulation may be significant (Biological Concentration Factor (BCF) ranges from 85 to 100,000). Zinc can persist in water indefinitely.

Ecotoxicity: Chronic aquatic toxicity limits: 0.04 ppm; toxicity to aquatic plants: 25 ppm. Rainbow trout, LC_{50} = 4 ppm/48 hrs; zebrafish (embryo), LC_{50} = 19 ppm/72 hrs. Zinc accumulates in gill tissue and bone. Zinc is thought to exert its toxic action by forming insoluble compounds with the mucous that covers the gills, by damage to the gill epithelium, or by an internal poison.

Section 13 - Disposal Considerations

Disposal: Reclaim for salvage or reuse. Unsalvageable waste may be buried in an approved landfill. Maximum concentration in effluent to sewer or stream is 1 ppm. Criteria for land treatment or burial disposal practices are under significant review. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Zinc powder *or* Zinc dust
ID: UN1436
Hazard Class: 4.3 - Dangerous when wet material
Packing Group: I - Great Danger
Symbols:
Label Codes: 4.3 - Dangerous When Wet, 4.2 - Spontaneously Combustible
Special Provisions: A19, IB4, IP1, N40
Packaging: **Exceptions:** None **Non-bulk:** 211 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 15 kg
Vessel Stowage: **Location:** A **Other:**

Shipping Name and Description: Zinc powder *or* Zinc dust
ID: UN1436
Hazard Class: 4.3 - Dangerous when wet material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 4.3 - Dangerous When Wet, 4.2 - Spontaneously Combustible
Special Provisions: A19, IB7, IP2
Packaging: **Exceptions:** None **Non-bulk:** 212 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 15 kg **Cargo aircraft only:** 50 kg
Vessel Stowage: **Location:** A **Other:**

Shipping Name and Description: Zinc powder *or* Zinc dust
ID: UN1436
Hazard Class: 4.3 - Dangerous when wet material
Packing Group: III - Minor Danger
Symbols:
Label Codes: 4.3 - Dangerous When Wet, 4.2 - Spontaneously Combustible
Special Provisions: IB8, IP4
Packaging: **Exceptions:** None **Non-bulk:** 213 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 25 kg **Cargo aircraft only:** 100 kg
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

AMERADA HESS CORPORATION

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades **MSDS No. 9950**

EMERGENCY OVERVIEW
DANGER!
EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION (rev. Jan-04)

Amerada Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800)424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732)750-6000
MSDS Internet Website www.hess.com/about/environ.html

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS * (rev. Jan-04)

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

3. HAZARDS IDENTIFICATION (rev. Dec-97)

EYES
Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES (rev. Dec-97)

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES (rev. Dec-97)

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 °F (-43°C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 °F (>280 °C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 "Low Expansion Foam - 1994 Edition."

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES (rev. Dec-97)

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product

vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE (rev. Dec-97)

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION (rev. Jan-04)

EXPOSURE LIMITS

Component (CAS No.)	Source	Exposure Limits TWA (ppm)	STEL (ppm)	Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	800	--	2003 NOIC: 1000 ppm (TWA) Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3

Component (CAS No.)	Exposure Limits			
	Source	TWA (ppm)	STEL (ppm)	Note
n-Hexane (110-54-3)	OSHA	500	--	
	ACGIH	50	--	skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	50	--	A4 (skin)
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25	--	
Xylene, mixed isomers (1330-20-7)	OSHA	100	--	
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES (rev. Jan-04)

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 °F (39 to 200 °C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H_2O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %

SOLUBILITY (H_2O): Non-oxygenated gasoline - negligible (< 0.1% @ 77 °F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 °F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY (rev. Dec-94)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS

Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES (rev. Dec-97)

ACUTE TOXICITY

Acute Dermal LD50 (rabbits): > 5 ml/kg
Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating
Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION (rev. Jan-04)

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS (rev. Dec-97)

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION (rev. Jan-04)

DOT PROPER SHIPPING NAME:	Gasoline
DOT HAZARD CLASS and PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 1203
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

PLACARD:

15. REGULATORY INFORMATION (rev. Jan-04)

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)

Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION (rev. Jan-04)

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
HMIS® HAZARD RATING	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
	* CHRONIC		

SUPERSEDES MSDS DATED: 12/30/97

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than

N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

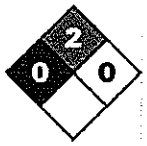
ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute (212)642-4900
API	American Petroleum Institute (202)682-8000
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation [General Info: (800)467-4922]
EPA	U.S. Environmental Protection Agency
HMIS	Hazardous Materials Information System
IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Workplace Hazardous Materials Information System (Canada)

MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types) **MSDS No. 9909**

EMERGENCY OVERVIEW
CAUTION!
OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT
EFFECTS CENTRAL NERVOUS SYSTEM
HARMFUL OR FATAL IF SWALLOWED

Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause moderate eye irritation and skin irritation (rash). Long-term, repeated exposure may cause skin cancer.
If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).



NFPA 704 (Section 16)

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800) 424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732) 750-6000
MSDS INTERNET WEBSITE: www.hess.com (See Environment, Health, Safety & Social Responsibility)

SYNONYMS: Ultra Low Sulfur Diesel (ULSD); Low Sulfur Diesel; Motor Vehicle Diesel Fuel; Diesel Fuel #2; Dyed Diesel Fuel; Non-Road, Locomotive and Marine Diesel Fuel; Tax-exempt Diesel Fuel

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and CHEMICAL INFORMATION ON INGREDIENTS

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Diesel Fuel (68476-34-6)	100
Naphthalene (91-20-3)	Typically < 0.01

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher. Diesel fuel may be dyed (red) for tax purposes. May contain a multifunctional additive.

3. HAZARDS IDENTIFICATION

EYES
Contact with liquid or vapor may cause mild irritation.

SKIN
May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information.

IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash).

4. FIRST AID MEASURES

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	> 125 °F (> 52 °C) minimum PMCC
AUTOIGNITION POINT:	494 °F (257 °C)
OSHA/NFPA FLAMMABILITY CLASS:	2 (COMBUSTIBLE)
LOWER EXPLOSIVE LIMIT (%):	0.6
UPPER EXPLOSIVE LIMIT (%):	7.5

FIRE AND EXPLOSION HAZARDS
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

FIRE FIGHTING INSTRUCTIONS
Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS
Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Diesel fuel, and in particular low and ultra low sulfur diesel fuel, has the capability of accumulating a static electrical charge of sufficient energy to cause a fire/explosion in the presence of lower flashpoint products such as gasoline. The accumulation of such a static charge occurs as the diesel flows through pipelines, filters, nozzles and various work tasks such as tank/container filling, splash loading, tank cleaning; product sampling; tank gauging; cleaning, mixing, vacuum truck operations, switch loading, and product agitation. There is a greater potential for static charge accumulation in cold temperature, low humidity conditions.

Documents such as 29 CFR OSHA 1910.106 "Flammable and Combustible Liquids, NFPA 77 Recommended Practice on Static Electricity, API 2003 "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents and ASTM D4865 "Standard Guide for Generation and Dissipation of Static

Electricity in Petroleum Fuel Systems" address special precautions and design requirements involving loading rates, grounding, bonding, filter installation, conductivity additives and especially the hazards associated with "switch loading." ["Switch Loading" is when a higher flash point product (such as diesel) is loaded into tanks previously containing a low flash point product (such as gasoline) and the electrical charge generated during loading of the diesel results in a static ignition of the vapor from the previous cargo (gasoline).]

Note: When conductivity additives are used or are necessary the product should achieve 25 picosiemens/meter or greater at the handling temperature.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

Components (CAS No.)	Source	Exposure Limits TWA/STEL	Note
Diesel Fuel: (68476-34-6)	OSHA	5 mg/m, as mineral oil mist	
	ACGIH	100 mg/m^3 (as totally hydrocarbon vapor) TWA	A3, skin
Naphthalene (91-20-3)	OSHA	10 ppm TWA	
	ACGIH	10 ppm TWA / 15 ppm STEL	A4, Skin

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION
A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE
Clear, straw-yellow liquid. Dyed fuel oil will be red or reddish-colored.

ODOR
Mild, petroleum distillate odor

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	320 to 690 oF (160 to 366 °C)
VAPOR PRESSURE:	0.009 psia @ 70 °F (21 °C)
VAPOR DENSITY (air = 1):	> 1.0
SPECIFIC GRAVITY (H_2O = 1):	0.83 to 0.88 @ 60 °F (16 °C)
PERCENT VOLATILES:	100 %
EVAPORATION RATE:	Slow; varies with conditions
SOLUBILITY (H_2O):	Negligible

10. STABILITY and REACTIVITY

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID and INCOMPATIBLE MATERIALS
Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers; Viton ®; Fluorel ®

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY
Acute dermal LD50 (rabbits): > 5 ml/kg
Acute oral LD50 (rats): 9 ml/kg
Primary dermal irritation: extremely irritating (rabbits)
Draize eye irritation: non-irritating (rabbits)
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY
Carcinogenic: OSHA: NO IARC: NO NTP: NO ACGIH: A3

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

MUTAGENICITY (genetic effects)
This material has been positive in a mutagenicity study.

12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

PROPER SHIPPING NAME:	Diesel Fuel	Placard (International Only):
HAZARD CLASS and PACKING GROUP:	3, PG III	
DOT IDENTIFICATION NUMBER:	NA 1993 (Domestic) UN 1202 (International)	
DOT SHIPPING LABEL:	None	

Use Combustible Placard if shipping in bulk domestically

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the *de minimis* levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

CALIFORNIA PROPOSITON 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

INGREDIENT NAME (CAS NUMBER)	Date Listed
Diesel Engine Exhaust (no CAS Number listed)	10/01/1990

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 3 (Combustible Liquid) and Class D, Division 2, Subdivision B (Toxic by other means)

16. OTHER INFORMATION

NFPA® HAZARD RATING HEALTH: 0
FIRE: 2
REACTIVITY: 0

Refer to NFPA 704 "Identification of the Fire Hazards of Materials" for further information

HMIS® HAZARD RATING HEALTH: 1 * * Chronic
FIRE: 2
PHYSICAL: 0

SUPERSEDES MSDS DATED: 02/28/2001

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute (212) 642-4900
API	American Petroleum Institute (202) 682-8000
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation [General info: (800) 467-4922]
EPA	U.S. Environmental Protection Agency
HMIS	Hazardous Materials Information System
IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Canadian Workplace Hazardous Materials Information System

ARCADIS BBL

Attachment M

Chemical Hazard Information

TABLE 3-1 (CONT'D)
CHEMICAL HAZARD INFORMATION

Substance [CAS Number]	IP[1] (eV)	Odor Threshold (ppm)	Route[2]	Symptoms of Exposure	Treatment	TWA[3]	STEL[4]	Source[5]	IDLH (NIOSH)[6]
Asbestos 1332-21-4	NA	ND	Inh Ing Con	Irritated eyes or skin, gastrointestinal irritation: Chronic exposure: Asbestosis, restricted pulmonary function, finger clubbing, Carcinogen	Eye: Irrigate immediately Breath: Move to fresh air Skin: Soap wash Swallow: Induce vomiting if conscious	0.1 f/cc 0.1f/cc		PEL TLV	
Acetone [67-64-1]	9.7	13-100	Inh Ing Con	Irritated eyes, nose, and throat; headache; dizziness; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1000 ppm 500 ppm 250 ppm		PEL TLV REL	20,000 ppm
Arsenic and soluble inorganic compounds (as As) [7740-38-2]	NA	NA	Inh Abs Ing Con	Ulceration of nasal septum; dermatitis; gastrointestinal disturbances; hyperpigmentation of skin (carcinogenic); peripheral neuropathy; respiratory irritation	Eye: Irrigate immediately (15 min) Skin: Soap wash immediately Swallow: Immediate medical attention	0.01 mg/m^3 0.01 mg/m^3 (Ca-29 CFR 1910.1018)	C0.002 mg/m^3	PEL TLV REL	Ca (5 mg/m^3)
Benzene [71-43-2]	9.24	34-119	Inh Abs Ing Con	Irritated eyes, nose, and respiratory system; giddiness; headache; nausea; staggered gait; fatigue; anorexia, lassitude; dermatitis; bone marrow depression – carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1 ppm (0.5 ppm) NIC-0.1 skin 0.1 ppm	2.5 ppm	PEL TLV REL	Ca (500 ppm)* *OSHA 29 CFR 1910.1028
2-Butanone (MEK) [78-93-3]	9.54	NE	Inh Ing Con	Irritated eyes, skin, nose; headache dizziness; vomiting; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	200 ppm 200 ppm 200 ppm	300 ppm 300 ppm	PEL TLV REL	3000 ppm
Cis-1,2-Dichloroethene 156-59-2	9.65	17	Inh Ing Con	Irritated eyes, nausea, vomiting, and epigastric distress. Symptoms of exposure-related narcosis including drowsiness, tremor, incoordination, dizziness, and weakness; defatting of skin/dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	200 ppm 200 ppm 200 ppm		PEL TLV REL	1000 ppm
Carbon dioxide 124-38-9	13.77	ND	Inh Con	Dizziness, restless, sweating, increased heartrate, coma; asphysiation, convulsion, frostbite	Eye: If frozen, seek medical attention immediately, if not, flush for 15 minutes and then seek medical attention Skin: Immediate medical attention Breath: Respiratory support	5000 ppm 5000 ppm 5000 ppm	30,000 ppm	PEL TLV REL	40,000 PPM
Chromium metal (as Cr) [7440-47-3]	NA	NA	Inh Ing	Histologic fibrosis of lungs	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1 mg/m^3 0.5 mg/m^3 0.5 mg/m^3		PEL TLV REL	250 mg/m^3
Coal-tar-pitch volatiles (benzene-soluble fraction) (polynuclear aromatic hydrocarbons [PAH]) [65996-93-2]	ND	ND	Ing Con	Eye sensitivity to light; eye and skin irritation, dermatitis, bronchitis; carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.2 mg/m^3 0.2 mg/m^3 0.1 mg/m^3		PEL TLV REL	Ca [80 mg/m^3]
1,2-Dichloroethane (ethylene dichloride) (107-06-02	11.05	ND	Inh Abs Ing	Depressed cns, nausea, vomiting, dermatitis, irritated eyes, corneal opacity. Carcinogenic	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support	50 ppm w/ceiling 100ppm 10 ppm	2 ppm 2 ppm	PEL TLV REL	Ca (50 ppm)

TABLE 3-1 (CONT'D)
CHEMICAL HAZARD INFORMATION

Substance [CAS Number]	IP[1] (eV)	Odor Threshold (ppm)	Route[2]	Symptoms of Exposure	Treatment	TWA[3]	STEL[4]	Source[5]	IDLH (NIOSH)[6]
			Con		Swallow: Immediate medical attention	1 ppm			
Ethylbenzene [100-41-4]	8.76	0.09-0.6	Inh Ing Con	Irritated eyes, mucous membranes; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 100 ppm 100 ppm	125 ppm 125 ppm 125 ppm	PEL TLV REL	800 ppm
Fuel Oil (No. 2) 68334-30-5		.082	Inh Abs Ing Con	Skin irritation, respiratory irritation; headache; dizziness; nausea, vomitting; weakness, loss of coodination, blurred vision, drowsiness, confusion, or disorientation; central nervous system effects; respiratory depression; tremors, convultions, loss of consciousness, coma, death – carcinogen	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	500 ppm (as petroleum distillates) 100 ppm (as total hydrocarbons) Skin 10-hr TWA: 350 mg/m^3 Ceiling (15 min): 1800 mg/m^3 (as distillates)		PEL TLV REL	As petro distillates 1,100 ppm
Gasoline [8006-61-9]	<10.6	NA	Inh Abs Ing Con	Irt eyes, skin, muc memb; derm; head, ftg, blurred vision, dizz, slurred speech, conf; chem pneu; possible liver, kidney damage; – **carcinogenic**	Eye: Irrigate immediately Skin: Soap flush immediately Breath: Respiratory support Swallow: Immediate medical attention	NE 300 ppm NE	NE 500 ppm NE	PEL TLV REL	**Ca** (N.D.)
n-Hexane 110-54-3	10.18	NA	Inh Abs Ing Con	Irritated eyes, nose; li-head; nausea, headache; numb extremities, muscular weakness; dermatitis; giddiness; chemical pneumonia (aspir liq)	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	500 ppm 50 ppm 50 ppm		PEL TLV REL	1100 ppm (LEL)
Hydrogen Sulfide [7783-06-4]	NA	NA	Inh Con	Profuse salivation, nausea, vomiting, diarrhea, giddiness, headache, vertigo, amnesia, palpitations, arrhythmia, weakness, cramps, collapse, unconsciousness, death	Eye: Irrigate immediately Skin: Wash immediately Breath: Respiratory support Swallow: NA	Ceiling: 20ppm:50 ppm, 10-min max peak 10ppm Ceiling: 10ppm, 10-min	15 ppm	PEL TLV REL	100 ppmI
Isopropylbenzene [98-82-8]	8.75	.012	Inh Abs Ing Con	Respiratory tract irritation, dizziness, uncoordination, headache, unconsciousness; conjunctival irritation; redness and irritation to skin; GI irritation	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	50 ppm 50 ppm 50 ppm		PEL TLV REL	900 ppm
Kerosene [8008-20-6]	NA	NA	Inh Ing Con	Irritation to eyes, skin, nose, and throat, burning sensation in the chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquide)	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	100 mg/m^3		PEL TLV REL	
Lead, inorganic dusts and fumes (as Pb) [7439-92-1]	NA	NA	Inh Ing Con	Weakness, lassitude, insomnia; facial pallor; eye pallor; anorexia, low weight, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremors; wrist and ankle paralysis; brain damage; kidney damage; irritated eyes; hypotension	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.05 mg/m^3 0.05 mg/m^3 <0.1 mg/m^3 See 29 CFR 1910.1025		PEL TLV REL	100 mg/m^3

TABLE 3-1 (CONT'D)
CHEMICAL HAZARD INFORMATION

Substance [CAS Number]	IP[1] (eV)	Odor Threshold (ppm)	Route[2]	Symptoms of Exposure	Treatment	TWA[3]	STEL[4]	Source[5]	IDLH (NIOSH)[6]
Methane [74-82-8]	12.48	NA	Inh	simple asphyxiant by displacing air necessary for life.Symptoms include rapid respiration, muscular incoordination, fatigue, dizziness, nausea, vomiting, unconsciousness, death	Immediately remove victim to fresh air.If breathing has stopped, give artificial respiration.If breathing is difficult, give oxygen.	S/A 1000 ppm S/A	S/A S/A S/A	PEL TLV REL	NE
Methyl alcohol (Methanol) 67-56-1	10.84	2000 ppm	Inh Abs Ing Con	Irritated eyes, skin, upper respiratory syst; head drowsiness, dizziness, vertigo, nausea, vomiting;blindness	Eye: Irrigate immediately Skin: Water flush promptly Breath: Respiratory support Swallow: Immediate medical attention	200 ppm 200 ppm 200 ppm	250 ppm	PEL TLV REL	6000 ppm
Methyl tert-butyl ether (MTBE) [1634-04-4]			Inh Ing Con	Irritated eyes; central nervous system effects; lightheadedness, dizziness, weakness; nausea; headache; muscular disturbances; skin irritant; damage to eye tissue	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	40 ppm		PEL TLV REL	
Naphthalene [91-203]	8.12	ND	Inh Abs Ing Con	Irritated eyes; headache; confusion, excitement, malaise; nausea, vomiting, abdominal pain; irritated bladder, profuse sweating; jaundice, renal shutdown; dermatitis	Eye: Irrigate immediately Skin: Molten flush immediately/ sol-liq soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	10 ppm 10 ppm 10 ppm	15 ppm	PEL TLV REL	250 ppm
Tert-butyl alcohol [75-65-0]	9.70	0.12-0.26	Inh Ing Con	Irritated eyes, skin, nose, throat; drowsiness; narcosis	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 100 ppm 100 ppm	C150 ppm	PEL TLV REL	1,600 ppm
Tetraethyl lead [78-00-2]	11.10	ND	Ing Abs Ing Con	Insomnia, lassitude, anxiety; tremor, hyperflexia, spasticity; bradycardia, hypotention, hypothermia, pallor, nausea, anorexia, low-weight, confusion, disorientation, halucinations, phycosis, mania, convulsions, coma; eye irritant.	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.075 mg/m^3[skin] 0.1 mg/m^3[skin] 0.075 mg/m^3[skin]		PEL TLV REL	40 mg/m^3
Toluene [108-88-3]	8.82	0.16-37	Inh Abs Ing Con	Fatigue, weakness; confusion, euphoria, dizziness; headache; dilated pupils, lacrimation; nervousness, muscular fatigue, insomnia; paralysis; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 50 ppm (skin) 100 ppm	150 ppm 150 ppm	PEL TLV REL	500 ppm
Trichloroethylene (TCE, trichloroethene) [79-01-6]	9.45	21.4	Inh Ing Con	Headache, vertigo; visual disturbance, tremors, somnolence, nausea, vomiting; irritated eyes; dermatitis; cardiac arrhythmia, paresthesia – carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 50 ppm 25 ppm (10-hour)	C200 ppm C100 ppm C2 ppm (60 MIN)	PEL TLV REL	Ca (1,000 ppm)
Xylene (o-, m-, and p-isomers) [1330-20-7; 95-47-6; 108-38-3; 106-42-3]	8.56 8.56 8.44	1.1-20	Inh Abs Ing Con	Dizziness, excitement, drowsiness, incoordination, staggering gait; irritated eyes, nose, throat; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 100 ppm 100 ppm	150 ppm 150 ppm 150 ppm	PEL TLV REL	900 ppm

[1]IP = Ionization potential (electron volts).
[2]Route = Inh, Inhalation; Abs, Skin absorption; Ing, Ingestion; and Con, Skin and/or eye contact.
[3]TWA = Time-weighted average. The TWA concentration for a normal workday (usually 8 or 10 hours) and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day without adverse effect.
[4]STEL = Short-term exposure limit. A 15-minute TWA exposure that should not be exceeded at any time during a workday, even if the TWA is not exceeded.
[5]PEL = Occupational Safety and Health Administration (OSHA) permissible exposure limit (29 CFR 1910.1000, Table Z).
[5]TLV = American Conference of Governmental Industrial Hygiene (ACGIH) threshold limit value – TWA.
[5]REL = National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit.
[6]IDLH (NIOSH) = Immediately dangerous to life or health (NIOSH). Represents the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
NE = None established. No evidence could be found for the existence of an IDLH (NIOSH Pocket Guide to Chemical Hazards, Pub. No. 90-117, 1990, 1997).
C = Ceiling limit value which should not be exceeded at any time.
Ca = Carcinogen.
NA = Not applicable.
ND = Not Determined.
LEL = Lower explosive limits.
LC_{50} = Lethal concentration for 50 percent of population tested.
LD_{50} = Lethal dose for 50 percent of population tested.
NIC = Notice of intended change (ACGIH).

References:

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ARCADIS BBL

Attachment N

Site-Related COCs and Maximum Concentrations

Golden Road Disposal Site
Health and Safety Plan

Primary Constituent of Concern Classes

Primary COC Classes
VOCs
PAHs
Metals
Asbestos

Maximum Concentrations Detected of Chemical of Concern

Chemical of Concern	Sample ID	Medium	Detected Concentration
Acetone	GR-TP3N-LIQ	Liquid	7,100 µg/L
Pentachlorophenol	GR-SS-2	Soil	360,000 µg/ kg
Benzene	GR-TP3N-CAN	Waste	120,000 µg/kg
Benzo(a)anthracene	GR-TP-3N1	Soil	8,200 µg/kg
Chrysene	GR-TP-3N1	Soil	13,000 µg/kg
Benzo(b)fluoranthene	GR-TP-3N1	Soil	12,000 µg/kg
Benzo(k)fluoranthene	GR-TP-3N1	Soil	11,000 µg/kg
Benzo(a)pyrene	GR-TP-3N1	Soil	8,100 µg/kg
Indeno(1,2,3-cd)pyrene	GR-TP-3N1	Soil	11,000 µg/kg
Methylene Chloride	GR-TP3N-CAN	Waste	170,000,000 µg/kg
2-Methylphenol	GR-TP-3N1	Soil	880 µg/kg
Toluene	GR-TP3N-CAN	Waste	220,000,000 µg/kg
Ethylbenzene	GR-TP3N-CAN	Waste	32,000,000 µg/kg
Xylenes	GR-TP3N-CAN	Waste	150,000,000 µg/kg
Aluminum	GR-SS-6	Soil	97,700 µg/kg
Antimony	GR-SS-6	Soil	27.9 µg/kg
Arsenic	GR-SS-6	Soil	26.8 µg/kg
Barium	GR-SS-6	Soil	361 µg/kg
Beryllium	GR-SS-6	Soil	1.9 µg/kg
Chromium	GR-TP3	Soil	386 µg/kg
Cobalt	GR-SS-2	Soil	295 µg/kg
Copper	GR-SS-6	Soil	5,380 µg/kg
Lead	GR-SS-2	Soil	2,680 µg/kg
Manganese	GR-SS-2	Soil	2,100 µg/kg
Mercury	GR-SS-6	Soil	0.14 µg/kg
Nickel	GR-SS-7	Soil	425 µg/kg
Selenium	GR-SS-6	Soil	4.3 µg/kg
Zinc	GR-SS-6	Soil	2,250 µg/kg
Asbestos	ASB-2	---	10.5 %
Endrin Ketone	GR-TP3	Soil	13 µg/kg
Dieldrin	GR-SED-1	Soil	3.9 µg/kg
Aroclor-1016	GR-SED-1	Soil	220 µg/kg
Aroclor-1254	GR-SS-7	Soil	110 µg/kg
Aroclor-1260	GR-TP3	Soil	95 µg/kg

Notes:
µg/L – micrograms per liter
µg/kg – micrograms per kilogram

TABLE 4-9
SOUTH PARCEL
DRUM WASTE ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			S-D1
Sample I.D.			GR-SD-1
Matrix			Waste
Date Sampled			08/11/1999
Parameter	**Units**	**Criteria***	
TCLP Volatiles			
Trichloroethene	UG/L	500	6
Benzene	UG/L	500	52
TCLP Semivolatiles			
2-Methylphenol	UG/L	200000	9
3 & 4-Methylphenol	UG/L	200000	15
TCLP Metals			
Arsenic	UG/L	5000	11.0
Barium	UG/L	100000	375
Lead	UG/L	5000	37.4
Selenium	UG/L	1000	6.1
MISC			
pH	SU	<2 to >12.5	5.5

NOTES:
Only detected results reported.
( ) - Concentration exceeds criteria.
*** - Federal Register, Vol. 55, No. 61 & No. 126.**

TABLE 4-10
SOUTH PARCEL
LIQUID WASTE ANALYTICAL RESULTS (TEST PIT 3N)
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			TP-3N
Sample I.D.			GR-TP3N-LIQ
Matrix			Waste
Date Sampled			08/04/1999
Parameter	Units	Criteria*	
Volatiles			
Chloroethane	UG/L	NV	6
Methylene Chloride	UG/L	NV	33000
Acetone	UG/L	NV	7100
1,1-Dichloroethane	UG/L	NV	12
2-Butanone	UG/L	200000	6100
Benzene	UG/L	500	230
4-Methyl-2-Pentanone	UG/L	NV	5600
Tetrachloroethene	UG/L	700	15
Toluene	UG/L	NV	11000
Ethylbenzene	UG/L	NV	3700
Xylene (Total)	UG/L	NV	19000

NOTES:
Only detected results reported.
( ) - Concentration exceeds criteria.
NV - No Value.
*** - Federal Register, Vol. 55, No. 61 & No. 126.**

TABLE 4-10
SOUTH PARCEL
LIQUID WASTE ANALYTICAL RESULTS (TEST PIT 3N)
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			TP-3N
Sample I.D.			GR-TP3N-CAN
Matrix			Waste
Date Sampled			08/04/99
ameter	Units	Criteria*	
Volatiles			
ethylene Chloride	UG/KG	NV	170000000
cetone	UG/KG	NV	58000
2-Butanone	UG/KG	200000	380000
Benzene	UG/KG	500	120000
Toluene	UG/KG	NV	220000000
Ethylbenzene	UG/KG	NV	32000000
Xylene (Total)	UG/KG	NV	150000000

NOTES:
Only detected results reported.
( ) - Concentration exceeds criteria.
NV - No Value.
*** - Federal Register, Vol. 55, No. 61 & No. 126.**

TABLE 4-11
SOUTH PARCEL
ASBESTOS ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			ASB-1	ASB-2	ASB-3
Sample I.D.			ASB-1	ASB-2	ASB-3
Matrix					
Date Sampled			08/05/99	08/05/99	08/05/99
Parameter	Units	Criteria*			
MISC					
Asbestos	%	1 %		10.50	8.50

NOTES:
Only detected results reported.
( ) - Concentration exceeds criteria.

*** - 40 CFR, Part 61, Subpart M.**

TABLE 4-12
SOUTH PARCEL
SURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			SS-01	SS-02	SS-03	SS-04	SS-05
Sample I.D.			GR-SS-1	GR-SS-2	GR-SS-3	GR-SS-4	GR-SS-5
Matrix			Soil	Soil	Soil	Soil	Soil
Sample Depth			0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled			07/28/99	07/28/99	07/28/99	07/28/99	07/28/99
Parameter	Units	Criteria*					
Volatiles							
Acetone	UG/KG	200	2	490	4	12	2
Carbon Disulfide	UG/KG	2700	2		5	1	3
2-Butanone	UG/KG	300		130		4	
1,1,1-Trichloroethane	UG/KG	800			1		
Semivolatiles							
2-Methylphenol	UG/KG	100	85		R		
4-Methylphenol	UG/KG	900	67		R		
2,4-Dimethylphenol	UG/KG	NV	92		R		
Naphthalene	UG/KG	13000	2100		54		780
2-Methylnaphthalene	UG/KG	36400	3100		51	35	1000
Acenaphthylene	UG/KG	41000			R		
Acenaphthene	UG/KG	50000			R		37
Dibenzofuran	UG/KG	6200	670		R		200
Fluorene	UG/KG	50000			R		45
Pentachlorophenol	UG/KG	1000		360000	R		
Phenanthrene	UG/KG	50000	1300		R	35	410
Anthracene	UG/KG	50000	93		190		42
Carbazole	UG/KG	NV	73		R		
Di-n-butylphthalate	UG/KG	8100			45		96
Fluoranthene	UG/KG	50000	270		340		120
Pyrene	UG/KG	50000	260		290		130
Butylbenzylphthalate	UG/KG	50000		7600	R		
Benzo(a)anthracene	UG/KG	224	230		240		71
Chrysene	UG/KG	400	280		320		76
Benzo(b)fluoranthene	UG/KG	1100	120		400		36
Benzo(k)fluoranthene	UG/KG	1100	67		280		
Benzo(a)pyrene	UG/KG	61	65		320		40
Indeno(1,2,3-cd)pyrene	UG/KG	3200	52		330		
Benzo(g,h,i)perylene	UG/KG	50000	93		390		
Pesticide							

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

R - Rejected.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-12
SOUTH PARCEL
SURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			SS-01	SS-02	SS-03	SS-04	SS-05
Sample I.D.			GR-SS-1	GR-SS-2	GR-SS-3	GR-SS-4	GR-SS-5
Matrix			Soil	Soil	Soil	Soil	Soil
Sample Depth			0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled			07/28/99	07/28/99	07/28/99	07/28/99	07/28/99
Parameter	Units	Criteria*					
Pesticide							
4,4'-DDE	UG/KG	2100			2.0		
4,4'-DDT	UG/KG	2100	5.7		3.2		
Endosulfan I	UG/KG	900	2.4				
Endosulfan Sulfate	UG/KG	1000					
Endrin	UG/KG	100	10		3.4		
Endrin aldehyde	UG/KG	NV	6.7				1.8
Endrin Ketone	UG/KG	NV	8.6				
Dieldrin	UG/KG	44					
PCB							
Aroclor-1221	UG/KG	1000					
Aroclor-1232	UG/KG	1000					
Aroclor-1254	UG/KG	1000					

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

R - Rejected.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-12
SOUTH PARCEL
SURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.					SS-01	SS-02	SS-03	SS-04	SS-05
Sample I.D.					GR-SS-1	GR-SS-2	GR-SS-3	GR-SS-4	GR-SS-5
Matrix					Soil	Soil	Soil	Soil	Soil
Sample Depth					0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled					07/28/99	07/28/99	07/28/99	07/28/99	07/28/99
Parameter	**Units**	**Criteria***	**Eastern USA Background***	**Site Background****					
Metals									
Aluminum	MG/KG	SB	33000	8480	3210	396	1790	4000	2660
Antimony	MG/KG	SB	NV	0.98			2.4		0.96
Arsenic	MG/KG	7.5	3-12	2.8	24.8		13.4	1.7	17.9
Barium	MG/KG	300	15-600	95.2	155	37.5	102	45.5	159
Beryllium	MG/KG	0.16	0-1.75	0.44	1.2		0.29	0.29	1.1
Cadmium	MG/KG	10	0.1-1	NV		0.96		0.086	
Calcium	MG/KG	SB	130-35000	5680	5220	2180	1660	9600	1610
Chromium	MG/KG	50	1.5-40	11.9	7.8	27.7	263	8.2	65.1
Cobalt	MG/KG	30	2.5-60	4.5	4.9	295	3.6	3.4	4.7
Copper	MG/KG	25	1-50	13.5	29.9	14.1	41.6	12.2	20.2
Iron	MG/KG	2000	2000-55000	12400	10600	5580	14600	7400	13100
Lead	MG/KG	SB	NV	88.5	13.1	2680	19.8	5.7	10.0
Magnesium	MG/KG	SB	100-5000	2110	1110	458	356	2820	235
Manganese	MG/KG	SB	50-5000	143	56.0	2100	182	126	61.6
Mercury	MG/KG	0.1	0.001-0.2	0.12		0.068	0.066	0.055	
Nickel	MG/KG	13	0.5-25	11.1	74.6	49.0	229	10.0	84.4
Potassium	MG/KG	SB	8500-43000	1010	302	124	197	319	285
Selenium	MG/KG	2	0.1-3.9	0.90	0.87	1.6	1.0	0.96	0.82
Silver	MG/KG	SB	NV	NV		0.19			
Sodium	MG/KG	SB	6000-8000	47.2	94.0	228	159	49.0	111
Thallium	MG/KG	SB	NV	NV		1.9	0.79		
Vanadium	MG/KG	150	1-300	16.0	128	1.9	6.5	15.8	21.2
Zinc	MG/KG	20	9-50	128	22.6	763	46.3	60.0	43.8
Cyanide	MG/KG	NV	NV	NV					

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

SB - Site Background.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

**** - Site-specific background sample SS-10.**

TABLE 4-12
SOUTH PARCEL
SURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.					SS-06	SS-07	SS-08	SS-09	SS-10
Sample I.D.					GR-SS-6	GR-SS-7	GR-SS-8	GR-SS-9	GR-SS-10
Matrix					Soil	Soil	Soil	Soil	Soil
Sample Depth					0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled					07/28/99	07/28/99	07/28/99	07/28/99	07/30/99
Parameter	Units	Criteria*	Eastern USA Background*	Site Background**					
Metals									
Aluminum	MG/KG	SB	33000	8480	97700	3870	213	1590	8480
Antimony	MG/KG	SB	NV	0.98	27.9	1.5		1.2	0.98
Arsenic	MG/KG	7.5	3-12	2.8	26.8	3.4		1.7	2.8
Barium	MG/KG	300	15-600	95.2	361	89.5	7.7	68.7	95.2
Beryllium	MG/KG	0.16	0-1.75	0.44	1.9	0.25		0.096	0.44
Cadmium	MG/KG	10	0.1-1	NV	4.6				
Calcium	MG/KG	SB	130-35000	5680	6150	16100	979	1620	5680
Chromium	MG/KG	50	1.5-40	11.9	133	120	6.6	111	11.9
Cobalt	MG/KG	30	2.5-60	4.5	9.4	4.3	0.36	2.5	4.5
Copper	MG/KG	25	1-50	13.5	5380	41.2	5.9	30.0	13.5
Iron	MG/KG	2000	2000-55000	12400	14100	18000	1110	8370	12400
Lead	MG/KG	SB	NV	88.5	1180	21.8	5.1	25.1	88.5
Magnesium	MG/KG	SB	100-5000	2110	2370	2690	373	522	2110
Manganese	MG/KG	SB	50-5000	143	454	466	27.8	113	143
Mercury	MG/KG	0.1	0.001-0.2	0.12	0.14	0.056	0.052	0.055	0.12
Nickel	MG/KG	13	0.5-25	11.1	96.2	425	35.6	283	11.1
Potassium	MG/KG	SB	8500-43000	1010	860	372	30.5	157	1010
Selenium	MG/KG	2	0.1-3.9	0.90	4.3	2.0		0.79	0.90
Silver	MG/KG	SB	NV	NV	5.5	0.16		0.51	
Sodium	MG/KG	SB	6000-8000	47.2	273	162	56.8	92.3	47.2
Thallium	MG/KG	SB	NV	NV		0.64			
Vanadium	MG/KG	150	1-300	16.0	50.8	10.9	6.3	8.1	16.0
Zinc	MG/KG	20	9-50	128	2250	67.6	9.0	50.9	128
Cyanide	MG/KG	NV	NV	NV	0.64			0.72	

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

SB - Site Background.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

**** - Site-specific background sample SS-10.**

TABLE 4-12
SOUTH PARCEL
SURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			SS-06	SS-07	SS-08	SS-09	SS-10
Sample I.D.			GR-SS-6	GR-SS-7	GR-SS-8	GR-SS-9	GR-SS-10
Matrix			Soil	Soil	Soil	Soil	Soil
Sample Depth			0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled			07/28/99	07/28/99	07/28/99	07/28/99	07/30/99
Parameter	Units	Criteria*					
Pesticide							
4,4'-DDE	UG/KG	2100					
4,4'-DDT	UG/KG	2100				4.7	4.1
Endosulfan I	UG/KG	900					
Endosulfan Sulfate	UG/KG	1000				4.0	
Endrin	UG/KG	100		6.6		6.3	7.0
Endrin aldehyde	UG/KG	NV					
Endrin Ketone	UG/KG	NV					
Dieldrin	UG/KG	44				1.9	
PCB							
Aroclor-1221	UG/KG	1000				92	
Aroclor-1232	UG/KG	1000		220		180	
Aroclor-1254	UG/KG	1000		110		76	

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

R - Rejected.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-12
SOUTH PARCEL
SURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			SS-06	SS-07	SS-08	SS-09	SS-10
Sample I.D.			GR-SS-6	GR-SS-7	GR-SS-8	GR-SS-9	GR-SS-10
Matrix			Soil	Soil	Soil	Soil	Soil
Sample Depth			0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled			07/28/99	07/28/99	07/28/99	07/28/99	07/30/99
Parameter	**Units**	**Criteria***					
Volatiles							
Acetone	UG/KG	200			24	2	
Carbon Disulfide	UG/KG	2700	3	2	19	5	
2-Butanone	UG/KG	300					
1,1,1-Trichloroethane	UG/KG	800				1	
Semivolatiles							
2-Methylphenol	UG/KG	100					
4-Methylphenol	UG/KG	900					
2,4-Dimethylphenol	UG/KG	NV					
Naphthalene	UG/KG	13000	230	120		260	52
2-Methylnaphthalene	UG/KG	36400	330	94		200	77
Acenaphthylene	UG/KG	41000		64			
Acenaphthene	UG/KG	50000					
Dibenzofuran	UG/KG	6200	52				
Fluorene	UG/KG	50000					
Pentachlorophenol	UG/KG	1000					
Phenanthrene	UG/KG	50000	140	310		910	110
Anthracene	UG/KG	50000		59			
Carbazole	UG/KG	NV		45			
Di-n-butylphthalate	UG/KG	8100				370	
Fluoranthene	UG/KG	50000	42	990		2800	170
Pyrene	UG/KG	50000	46	990		2800	130
Butylbenzylphthalate	UG/KG	50000					
Benzo(a)anthracene	UG/KG	224		920		2700	78
Chrysene	UG/KG	400		1300		3800	140
Benzo(b)fluoranthene	UG/KG	1100		1800		5000	110
Benzo(k)fluoranthene	UG/KG	1100		640		3000	77
Benzo(a)pyrene	UG/KG	61		1200		3700	81
Indeno(1,2,3-cd)pyrene	UG/KG	3200		1600		5000	55
Benzo(g,h,i)perylene	UG/KG	50000		2000		6300	65
Pesticide							

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

R - Rejected.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-13
SOUTH PARCEL
SUBSURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			GW-09	GW-10	GW-11	TP-03	TP-03
Sample I.D.			GR-GW9-SB	GR-GW10-SB	GR-GW11-SB	GR-TP3	GR-TP3
Matrix			Soil	Soil	Soil	Soil	Soil
Sample Depth			0' - 2'	12' - 14'	0' - 2'	0' - 2'	2' - 4'
Date Sampled			08/04/99	08/03/99	08/04/99	08/03/99	08/03/99
Parameter	**Units**	**Criteria***					
Volatiles							
Methylene Chloride	UG/KG	100					87
Carbon Disulfide	UG/KG	2700	4				25
1,1-Dichloroethane	UG/KG	200					
2-Butanone	UG/KG	300					
Trichloroethene	UG/KG	700					
Benzene	UG/KG	60					34
Tetrachloroethene	UG/KG	1400				28	
Toluene	UG/KG	1500	13		10	33	440
Ethylbenzene	UG/KG	5500				92	57000
Xylene (Total)	UG/KG	1200	9	3	12	4100	440000
1,2-Dichloroethene (total)	UG/KG	300 (1)					
Semivolatiles							
2-Methylphenol	UG/KG	100				86	140
4-Methylphenol	UG/KG	900				260	160
2,4-Dimethylphenol	UG/KG	NV				1000	1600
Naphthalene	UG/KG	13000	420			560	790
2-Methylnaphthalene	UG/KG	36400	430			310	500
Acenaphthylene	UG/KG	41000				59	
Acenaphthene	UG/KG	50000				140	350
Dibenzofuran	UG/KG	6200	110			170	230
Diethylphthalate	UG/KG	7100				110	55
Fluorene	UG/KG	50000				120	280
Phenanthrene	UG/KG	50000	250			750	1500
Anthracene	UG/KG	50000					170
Carbazole	UG/KG	NV				61	140
Di-n-butylphthalate	UG/KG	8100	150			170	120
Fluoranthene	UG/KG	50000	86			2500	2900
Pyrene	UG/KG	50000	64			2600	2400
Benzo(a)anthracene	UG/KG	224				2800	2700
Chrysene	UG/KG	400				4500	4800

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

R - Rejected.

(1) - Value for trans-1,2-Dichloroethene was used.

(2) - Value for gamma-Chlordane was used.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-13
SOUTH PARCEL
SUBSURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			GW-09	GW-10	GW-11	TP-03	TP-03
Sample I.D.			GR-GW9-SB	GR-GW10-SB	GR-GW11-SB	GR-TP3	GR-TP3
Matrix			Soil	Soil	Soil	Soil	Soil
Sample Depth			0' - 2'	12' - 14'	0' - 2'	0' - 2'	2' - 4'
Date Sampled			08/04/99	08/03/99	08/04/99	08/03/99	08/03/99
Parameter	Units	Criteria*					
Semivolatiles							
Bis(2-ethylhexyl)phthalate	UG/KG	50000				1700	980
Benzo(b)fluoranthene	UG/KG	1100				6300	7200
Benzo(k)fluoranthene	UG/KG	1100				2500	2900
Benzo(a)pyrene	UG/KG	61				2500	3700
Indeno(1,2,3-cd)pyrene	UG/KG	3200				3000	2800
Dibenz(a,h)anthracene	UG/KG	14				2400	1400
Benzo(g,h,i)perylene	UG/KG	50000				3200	3000
Pesticide							
beta-BHC	UG/KG	200					2.1
alpha-Chlordane	UG/KG	540 (2)				7.8	
4,4'-DDD	UG/KG	2900				5.6	2.5
4,4'-DDE	UG/KG	2100				12	
4,4'-DDT	UG/KG	2100				13	2.6
Endosulfan II	UG/KG	900				3.8	
Endosulfan Sulfate	UG/KG	1000				8.5	
Endrin	UG/KG	100					
Endrin aldehyde	UG/KG	NV	1.7				
Endrin Ketone	UG/KG	NV				13	
Heptachlor epoxide	UG/KG	20					1.8
PCB							
Aroclor-1232	UG/KG	10000				320	440
Aroclor-1254	UG/KG	10000					70
Aroclor-1260	UG/KG	10000				95	72

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

R - Rejected.

(1) - Value for trans-1,2-Dichloroethene was used.

(2) - Value for gamma-Chlordane was used.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-13
SOUTH PARCEL
SUBSURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.				GW-09	GW-10	GW-11	TP-03	TP-03
Sample I.D.				GR-GW9-SB	GR-GW10-SB	GR-GW11-SB	GR-TP3	GR-TP3
Matrix				Soil	Soil	Soil	Soil	Soil
Sample Depth				0' - 2'	0' - 14'	0' - 2'	0' - 2'	2' - 4'
Date Sampled				08/04/99	08/03/99	08/04/99	08/03/99	08/03/99
Parameter	**Units**	**Criteria***	**Eastern USA Background***					
Metals								
Aluminum	MG/KG	SB	33000	2330	3000	14800	1410	1340
Antimony	MG/KG	SB	NV					1.9
Arsenic	MG/KG	7.5	3-12	6.4	2.4	5.0	2.1	1.5
Barium	MG/KG	300	15-600	63.0	25.7	140	66.3	77.1
Beryllium	MG/KG	0.16	0-1.75	0.63	0.22	0.92	0.17	0.14
Cadmium	MG/KG	10	0.1-1		0.084			
Calcium	MG/KG	SB	130-35000	1120	75900	19600	1570	941
Chromium	MG/KG	50	1.5-40	158	5.3	21.2	112	386
Cobalt	MG/KG	30	2.5-60	7.4	2.7	14.6	2.5	2.3
Copper	MG/KG	25	1-50	15.7	7.0	11.7	25.6	27.3
Iron	MG/KG	2000	2000-550000	10400	7510	26800	8320	11200
Lead	MG/KG	SB	NV	6.7	10.7	8.1	29.9	20.4
Magnesium	MG/KG	SB	100-5000	171	30900	7990	612	448
Manganese	MG/KG	SB	50-5000	112	286	799	93.0	106
Nickel	MG/KG	13	0.5-25	402	5.8	30.5	182	361
Potassium	MG/KG	SB	8500-43000	174	844	1730	163	110
Selenium	MG/KG	2	0.1-3.9					
Silver	MG/KG	SB	NV					0.24
Sodium	MG/KG	SB	6000-8000	78.4	204	118	352	74.0
Thallium	MG/KG	SB	NV					
Vanadium	MG/KG	150	1-300	21.2	8.9	27.7	5.3	10.0
Zinc	MG/KG	20	9-50	10.8	73.6	52.2	114	14.4

NOTES:
Only detected results reported.
( ) - Concentration exceeds criteria.
NV - No Value.
SB - Site Background.
*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-13
SOUTH PARCEL
SUBSURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.				TP-05	TP-10	TP-11	TP-3N1	TP-3NW
Sample I.D.				GR-TP5	GR-TP10	GR-TP11	GR-TP-3N1	GR-TP-3NW
Matrix				Soil	Soil	Soil	Soil	Soil
Sample Depth				4' - 6'	4' - 5'	4' - 6'	1' - 3'	5' - 6'
Date Sampled				08/04/99	08/04/99	08/04/99	08/05/99	08/05/99
Parameter	**Units**	**Criteria***	**Eastern USA Background***					
Metals								
Aluminum	MG/KG	SB	33000	14600	1780	2290	2040	6620
Antimony	MG/KG	SB	NV	3.9				
Arsenic	MG/KG	7.5	3-12	5.5	2.2	2.8	2.0	1.3
Barium	MG/KG	300	15-600	99.4	125	158	61.3	82.6
Beryllium	MG/KG	0.16	0-1.75	0.38	0.25	0.23	0.17	0.34
Cadmium	MG/KG	10	0.1-1	0.28				
Calcium	MG/KG	SB	130-35000	4200	1810	2200	2310	2530
Chromium	MG/KG	50	1.5-40	112	49.8	86.7	103	27.9
Cobalt	MG/KG	30	2.5-60	3.0	2.6	2.1	1.9	4.9
Copper	MG/KG	25	1-50	599	31.7	29.7	31.9	10.0
Iron	MG/KG	2000	2000-550000	11100	7270	10100	8950	8590
Lead	MG/KG	SB	NV	208	16.7	49.8	8.6	5.1
Magnesium	MG/KG	SB	100-5000	2080	608	914	877	2110
Manganese	MG/KG	SB	50-5000	187	90.7	103	112	93.5
Nickel	MG/KG	13	0.5-25	175	226	162	172	178
Potassium	MG/KG	SB	8500-43000	461	284	158	199	562
Selenium	MG/KG	2	0.1-3.9	0.83		1.6		
Silver	MG/KG	SB	NV	0.58				
Sodium	MG/KG	SB	6000-8000	105	192	53.0	79.1	84.8
Thallium	MG/KG	SB	NV			0.80	0.78	0.71
Vanadium	MG/KG	150	1-300	9.2	3.7	4.9	6.3	10.0
Zinc	MG/KG	20	9-50	244	27.7	48.2	19.9	58.4

NOTES:
Only detected results reported.
( ) - Concentration exceeds criteria.
NV - No Value.
SB - Site Background.
*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-13
SOUTH PARCEL
SUBSURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			TP-05	TP-10	TP-11	TP-3N1	TP-3NW
Sample I.D.			GR-TP5	GR-TP10	GR-TP11	GR-TP-3N1	GR-TP-3NW
Matrix			Soil	Soil	Soil	Soil	Soil
Sample Depth			4' - 6'	3' - 5'	4' - 6'	1' - 3'	5' - 6'
Date Sampled			08/04/99	08/04/99	08/04/99	08/05/99	08/05/99
Parameter	**Units**	**Criteria***					
Volatiles							
Methylene Chloride	UG/KG	100					5400
Carbon Disulfide	UG/KG	2700	6	6	3	11	9
1,1-Dichloroethane	UG/KG	200				9	
2-Butanone	UG/KG	300					100
Trichloroethene	UG/KG	700	7				
Benzene	UG/KG	60	5			17	84
Tetrachloroethene	UG/KG	1400	4			R	
Toluene	UG/KG	1500	320	6	3	97000	86000
Ethylbenzene	UG/KG	5500	20			81000	42000
Xylene (Total)	UG/KG	1200	66	19	46	610000	130000
1,2-Dichloroethene (total)	UG/KG	300 (1)	8				
Semivolatiles							
2-Methylphenol	UG/KG	100	94			880	
4-Methylphenol	UG/KG	900	290	110		790	
2,4-Dimethylphenol	UG/KG	NV	190			6300	550
Naphthalene	UG/KG	13000	580	830	380	1500	620
2-Methylnaphthalene	UG/KG	36400	410	400	330	1300	450
Acenaphthylene	UG/KG	41000	100				
Acenaphthene	UG/KG	50000	98	180	130	400	
Dibenzofuran	UG/KG	6200	130	180	140	270	
Diethylphthalate	UG/KG	7100					
Fluorene	UG/KG	50000	200	300	100	540	
Phenanthrene	UG/KG	50000	910	1300	870	2400	800
Anthracene	UG/KG	50000	170	310	160		
Carbazole	UG/KG	NV	83	190	100	270	
Di-n-butylphthalate	UG/KG	8100	470	560	280		
Fluoranthene	UG/KG	50000	2000	2700	1100	8700	3400
Pyrene	UG/KG	50000	1600	2000	1400	7400	3000
Benzo(a)anthracene	UG/KG	224	1800	2000	1400	8200	3300
Chrysene	UG/KG	400	2000	2100	2400	13000	5200

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

R - Rejected.

(1) - Value for trans-1,2-Dichloroethene was used.

(2) - Value for gamma-Chlordane was used.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-13
SOUTH PARCEL
SUBSURFACE SOIL ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			TP-05	TP-10	TP-11	TP-3N1	TP-3NW
Sample I.D.			GR-TP5	GR-TP10	GR-TP11	GR-TP-3N1	GR-TP-3NW
Matrix			Soil	Soil	Soil	Soil	Soil
Sample Depth			4' - 6'	3' - 5'	4' - 6'	1' - 3'	5' - 6'
Date Sampled			08/04/99	08/04/99	08/04/99	08/05/99	08/05/99
Parameter	**Units**	**Criteria***					
Semivolatiles							
Bis(2-ethylhexyl)phthalate	UG/KG	50000	830			1100	
Benzo(b)fluoranthene	UG/KG	1100	2200	2300	1400	12000	6200
Benzo(k)fluoranthene	UG/KG	1100	1700	1600	1800	11000	3500
Benzo(a)pyrene	UG/KG	61	2000	1800	1600	8100	4100
Indeno(1,2,3-cd)pyrene	UG/KG	3200	2500	1300	2700	11000	4200
Dibenz(a,h)anthracene	UG/KG	14	1400	1600	1600	5600	2000
Benzo(g,h,i)perylene	UG/KG	50000	3000	1400	2000	13000	5000
Pesticide							
beta-BHC	UG/KG	200					
alpha-Chlordane	UG/KG	540 (2)					
4,4'-DDD	UG/KG	2900					
4,4'-DDE	UG/KG	2100		2.6			
4,4'-DDT	UG/KG	2100					
Endosulfan II	UG/KG	900	1.9				
Endosulfan Sulfate	UG/KG	1000					
Endrin	UG/KG	100	9.2		4.9		
Endrin aldehyde	UG/KG	NV					
Endrin Ketone	UG/KG	NV	5.6	2.3	6.3		
Heptachlor epoxide	UG/KG	20				4.5	
PCB							
Aroclor-1232	UG/KG	10000	260	120	88	230	
Aroclor-1254	UG/KG	10000	110	46	24	72	
Aroclor-1260	UG/KG	10000					

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

R - Rejected.

(1) - Value for trans-1,2-Dichloroethene was used.

(2) - Value for gamma-Chlordane was used.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-14
SOUTH PARCEL
SURFACE WATER ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			SW/SED-05
Sample I.D.			GR-SW-5
Matrix			Water
Date Sampled			07/30/99
Parameter	**Units**	**Criteria***	
Volatiles			
Toluene	UG/L	100	4
Semivolatiles			
Phenol	UG/L	5.0	2
4-Methylphenol	UG/L	NV	24
Metals			
Aluminum	UG/L	100	1720
Arsenic	UG/L	150	12.7
Barium	UG/L	NV	234
Beryllium	UG/L	11	0.39
Cadmium	UG/L	7.8	0.63
Calcium	UG/L	NV	153000
Chromium	UG/L	293.9	5.9
Cobalt	UG/L	5	10.0
Copper	UG/L	37.7	22.6
Iron	UG/L	300	44300
Lead	UG/L	22.2	19.2
Magnesium	UG/L	NV	37800
Manganese	UG/L	NV	3380
Mercury	UG/L	0.77	0.14
Nickel	UG/L	215.8	74.7
Potassium	UG/L	NV	18300
Selenium	UG/L	4.6	5.6
Silver	UG/L	0.1	2.1
Sodium	UG/L	NV	126000
Vanadium	UG/L	14	11.0
Zinc	UG/L	345.2	253

NOTES:
Only detected results reported.
( ) - Concentration exceeds criteria.
NV - No Value.

*** - New York State Department of Environmental Conservation. 1998. Division of Water Technical and Operational Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June.**

TABLE 4-15
SOUTH PARCEL
SEDIMENT ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			SED-01	SED-02	SED-03	SED-04	SED-05
Sample I.D.			GR-SED-1	GR-SED-2	GR-SED-3	GR-SED-4	GR-SED-5
Matrix			Soil	Soil	Soil	Soil	Soil
Sample Depth			0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled			07/30/99	07/30/99	07/30/99	07/30/99	07/30/99
Parameter	**Units**	**Criteria***					
Volatiles							
Methylene Chloride	UG/KG	100	4				
Toluene	UG/KG	1500	4		12		
1,2-Dichloroethene (total)	UG/KG	300 (1)			85		
Semivolatiles							
4-Methylphenol	UG/KG	900	61				
Naphthalene	UG/KG	13000	170				
2-Methylnaphthalene	UG/KG	36400	190			120	
Acenaphthylene	UG/KG	41000					
Acenaphthene	UG/KG	50000	68				
Dibenzofuran	UG/KG	6200	61				
Fluorene	UG/KG	50000	69				
n-Nitrosodiphenylamine	UG/KG	NV	70				
Phenanthrene	UG/KG	50000	610	140	130	170	
Anthracene	UG/KG	50000	77				
Carbazole	UG/KG	NV	76				
Di-n-butylphthalate	UG/KG	8100	95				
Fluoranthene	UG/KG	50000	2400	200	200	240	
Pyrene	UG/KG	50000	2200	160	140	190	
Benzo(a)anthracene	UG/KG	224	2600			110	
Chrysene	UG/KG	400	4200	190	170	190	
Bis(2-ethylhexyl)phthalate	UG/KG	50000	350				
Benzo(b)fluoranthene	UG/KG	1100	6700	160	150	180	
Benzo(k)fluoranthene	UG/KG	1100	3300	150	130	140	
Benzo(a)pyrene	UG/KG	61	4500		120	140	
Indeno(1,2,3-cd)pyrene	UG/KG	3200	3300				
Benzo(g,h,i)perylene	UG/KG	50000	3600	120			
Pesticide							
alpha-BHC	UG/KG	110				3.3	
4,4'-DDE	UG/KG	2100					
Endosulfan II	UG/KG	900	3.7				

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

R - Rejected.

(1) - Value for trans-1,2-Dichloroethene was used.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-15
SOUTH PARCEL
SEDIMENT ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			SED-01	SED-02	SED-03	SED-04	SED-05
Sample I.D.			GR-SED-1	GR-SED-2	GR-SED-3	GR-SED-4	GR-SED-5
Matrix			Soil	Soil	Soil	Soil	Soil
Sample Depth			0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled			07/30/99	07/30/99	07/30/99	07/30/99	07/30/99
Parameter	Units	Criteria*					
Pesticide							
Endrin	UG/KG	100					
Endrin aldehyde	UG/KG	NV					
Endrin Ketone	UG/KG	NV	12				
Dieldrin	UG/KG	44	3.9				
PCB							
Aroclor-1016	UG/KG	1000	220				
Aroclor-1254	UG/KG	1000	460				
Aroclor-1260	UG/KG	1000	72				

l results reported.

oncentration exceeds criteria.

ans-1,2-Dichloroethene was used.

GM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.

TABLE 4-15
SOUTH PARCEL
SEDIMENT ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			SED-06	SED-07	SED-09
Sample I.D.			GR-SED-6	GR-SED-7	GR-SED-9
Matrix			Soil	Soil	Soil
Sample Depth			0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled			07/30/99	07/30/99	08/05/99
Parameter	**Units**	**Criteria***			
Volatiles					
Methylene Chloride	UG/KG	100		19	
Toluene	UG/KG	1500		11	R
1,2-Dichloroethene (total)	UG/KG	300 (1)			
Semivolatiles					
4-Methylphenol	UG/KG	900			
Naphthalene	UG/KG	13000	130	1200	1600
2-Methylnaphthalene	UG/KG	36400	180	1400	2400
Acenaphthylene	UG/KG	41000		4600	850
Acenaphthene	UG/KG	50000		370	
Dibenzofuran	UG/KG	6200		820	860
Fluorene	UG/KG	50000		980	630
n-Nitrosodiphenylamine	UG/KG	NV			
Phenanthrene	UG/KG	50000	230	10000	3700
Anthracene	UG/KG	50000		3600	1100
Carbazole	UG/KG	NV		1300	320
Di-n-butylphthalate	UG/KG	8100			
Fluoranthene	UG/KG	50000	280	22000	3500
Pyrene	UG/KG	50000	200	18000	3200
Benzo(a)anthracene	UG/KG	224	120	11000	2600
Chrysene	UG/KG	400	240	14000	3200
Bis(2-ethylhexyl)phthalate	UG/KG	50000			430
Benzo(b)fluoranthene	UG/KG	1100	160	11000	2800
Benzo(k)fluoranthene	UG/KG	1100	140	7900	2200
Benzo(a)pyrene	UG/KG	61	120	9900	2200
Indeno(1,2,3-cd)pyrene	UG/KG	3200		4300	2200
Benzo(g,h,i)perylene	UG/KG	50000		3500	2400
Pesticide					
alpha-BHC	UG/KG	110			
4,4'-DDE	UG/KG	2100	5.7	60	9.0
Endosulfan II	UG/KG	900			

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

R - Rejected.

(1) - Value for trans-1,2-Dichloroethene was used.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-15
SOUTH PARCEL
SEDIMENT ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			SED-06	SED-07	SED-09
Sample I.D.			GR-SED-6	GR-SED-7	GR-SED-9
Matrix			Soil	Soil	Soil
Sample Depth			0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled			07/30/99	07/30/99	08/05/99
Parameter	Units	Criteria*			
Pesticide					
Endrin	UG/KG	100			7.0
Endrin aldehyde	UG/KG	NV			6.3
Endrin Ketone	UG/KG	NV			
Dieldrin	UG/KG	44			
PCB					
Aroclor-1016	UG/KG	1000			96
Aroclor-1254	UG/KG	1000		71	
Aroclor-1260	UG/KG	1000		54	

NOTES:

Only detected results reported.

(oval) - Concentration exceeds criteria.

NV - No Value.

R - Rejected.

(1) - Value for trans-1,2-Dichloroethene was used.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

TABLE 4-15
SOUTH PARCEL
SEDIMENT ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.					SED-01	SED-02	SED-03	SED-04	SED-05
Sample I.D.					GR-SED-1	GR-SED-2	GR-SED-3	GR-SED-4	GR-SED-5
Matrix					Soil	Soil	Soil	Soil	Soil
Sample Depth					0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled					07/30/99	07/30/99	07/30/99	07/30/99	07/30/99
Parameter	Units	Criteria*	Eastern USA Background*	Site Background**					
Metals									
Aluminum	MG/KG	SB	33000	8480	1630	5150	6010	5420	4810
Antimony	MG/KG	SB	NV	0.98	1.8				
Arsenic	MG/KG	7.5	3-12	2.8	1.6	7.6	6.5	8.6	2.6
Barium	MG/KG	300	15-600	95.2	82.9	120	91.7	138	74.1
Beryllium	MG/KG	0.16	0-1.75	0.44	0.12	0.63	0.63	0.75	0.39
Cadmium	MG/KG	10	0.1-1	NV		1.1	1.2	1.5	
Calcium	MG/KG	SB	130-35000	5680	1270	19900	17400	28000	30600
Chromium	MG/KG	50	1.5-40	11.9	390	30.1	17.1	13.5	12.5
Cobalt	MG/KG	30	2.5-60	4.5	2.5	8.2	5.0	5.6	4.3
Copper	MG/KG	25	1-50	13.5	34.3	49.3	43.4	45.6	32.2
Iron	MG/KG	2000	2000-55000	12400	10600	17300	12600	14400	27700
Lead	MG/KG	SB	NV	88.5	17.5	42.7	72.1	84.3	24.5
Magnesium	MG/KG	SB	100-5000	2110	734	2560	2560	2990	3310
Manganese	MG/KG	SB	50-5000	143	89.2	497	212	278	366
Mercury	MG/KG	0.1	0.001-0.2	0.12		0.26	0.33	0.32	
Nickel	MG/KG	13	0.5-25	11.1	476	77.1	49.8	31.6	53.6
Potassium	MG/KG	SB	8500-43000	1010	115	562	612	537	683
Selenium	MG/KG	2	0.1-3.9	0.90	1.1	4.2	4.2	5.1	
Silver	MG/KG	SB	NV	NV		0.82	0.86	1.1	1.6
Sodium	MG/KG	SB	6000-8000	47.2	101	1230	844	1090	1140
Thallium	MG/KG	SB	NV	NV	1.3			1.4	
Vanadium	MG/KG	150	1-300	16.0	7.6	26.2	25.5	25.8	20.2
Zinc	MG/KG	20	9-50	128	31.8	398	344	451	203

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

SB - Site Background.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

**** - Site-specific background sample SS-10.**

TABLE 4-15
SOUTH PARCEL
SEDIMENT ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.					SED-06	SED-07	SED-09
Sample I.D.					GR-SED-6	GR-SED-7	GR-SED-9
Matrix					Soil	Soil	Soil
Sample Depth					0' - 0.17'	0' - 0.17'	0' - 0.17'
Date Sampled					07/30/99	07/30/99	08/05/99
Parameter	Units	Criteria*	Eastern USA Background*	Site Background**			
Metals							
Aluminum	MG/KG	SB	33000	8480	4610	5790	5790
Antimony	MG/KG		NV	0.98			
Arsenic	MG/KG	7.5	3-12	2.8	10.7	9.8	10.9
Barium	MG/KG	300	15-600	95.2	131	80.0	85.8
Beryllium	MG/KG	0.16	0-1.75	0.44	0.56	0.47	0.61
Cadmium	MG/KG	10	0.1-1	NV	1.5	1.5	0.48
Calcium	MG/KG	SB	130-35000	5680	24000	22600	7660
Chromium	MG/KG	50	1.5-40	11.9	8.1	21.5	38.3
Cobalt	MG/KG	30	2.5-60	4.5	4.1	11.1	4.8
Copper	MG/KG	25	1-50	13.5	48.4	112	61.0
Iron	MG/KG	2000	2000-55000	12400	12500	16500	10400
Lead	MG/KG	SB	NV	88.5	143	134	89.6
Magnesium	MG/KG	SB	100-5000	2110	2130	2560	1580
Manganese	MG/KG	SB	50-5000	143	164	591	83.3
Mercury	MG/KG	0.1	0.001-0.2	0.12	0.39	0.56	0.13
Nickel	MG/KG	13	0.5-25	11.1	15.2	25.1	73.2
Potassium	MG/KG	SB	8500-43000	1010	380	950	354
Selenium	MG/KG	2	0.1-3.9	0.90	4.2	4.3	1.7
Silver	MG/KG	SB	NV	NV	1.2	2.0	0.66
Sodium	MG/KG	SB	6000-8000	47.2	611	512	187
Thallium	MG/KG	SB	NV	NV		2.1	
Vanadium	MG/KG	150	1-300	16.0	28.5	20.6	15.4
Zinc	MG/KG	20	9-50	128	491	561	149

NOTES:

Only detected results reported.

( ) - Concentration exceeds criteria.

NV - No Value.

SB - Site Background.

*** - NYSDEC TAGM: Determination of Soil Cleanup Objectives and Cleanup Levels; HWR-94-4046 January 24, 1994.**

**** - Site-specific background sample SS-10.**

TABLE 4-16
SOUTH PARCEL
GROUNDWATER ANALYTICAL RESULTS
SUMMARY OF DETECTIONS
GOLDEN ROAD DISPOSAL SITE

Location I.D.			GW-02	GW-05	GW-09	GW-10	GW-11
Sample I.D.			GR-GW-MW-2	GR-GW-MW-5	GR-GW-MW-9	GR-GW-MW-10	GR-GW-MW-11
Matrix			Water	Water	Water	Water	Water
Date Sampled			08/13/99	08/13/99	08/13/99	08/13/99	08/13/99
Parameter	Units	Criteria*					
Volatiles							
Acetone	UG/L	50			15		
Pesticide							
beta-BHC	UG/L	0.04			0.033		
Metals							
Aluminum	UG/L	NV	428	520	303	704	453
Arsenic	UG/L	25		8.2	8.4		2.5
Barium	UG/L	1000	54.2	18.4	24.7	108	81.6
Beryllium	UG/L	3	0.83	0.46	0.48	0.39	0.49
Cadmium	UG/L	5	1.2		0.40	0.48	
Calcium	UG/L	NV	169000	112000	105000	117000	136000
Chromium	UG/L	50	1.4	2.9	2.1	2.0	0.73
Cobalt	UG/L	NV	1.5				
Copper	UG/L	200	16.3				
Iron	UG/L	300	575	1710	943	1370	1050
Lead	UG/L	25	2.2				
Magnesium	UG/L	35000	48900	63400	52900	46700	44900
Manganese	UG/L	300	47.7	66.8	49.3	92.2	50.9
Nickel	UG/L	100	7.8	3.1	2.9	3.2	1.3
Potassium	UG/L	NV	2770	1670	2980	2810	2960
Sodium	UG/L	20000	59700	28100	23100	57400	55200
Thallium	UG/L	0.5	2.7				
Vanadium	UG/L	NV	1.2				
Zinc	UG/L	2000	62.1	8.2	10.0	11.9	33.8

NOTES:
Only detected results reported.
( ) - Concentration exceeds criteria.
NV - No Value.

*** - New York State Department of Environmental Conservation. 1998. Division of Water Technical and Operational Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June.**

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Attachment O

Incident/Near-Miss Investigation Form

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Infrastructure, environment, facilities

Incident / Near-Miss Investigation Report

☐ OSHA Recordable	☐ First Aid Injury	☐ Fire	Date of Incident:
☐ Lost Workday Injury	☐ Vehicle Accident	☐ Spill / Leak	
☐ Restricted Duty Injury	☐ Equipment Damage	☐ Near Miss	Incident Number:

Every employee injury, accident, and near miss must be reported within 24 hours of the injury. If the incident results in hospitalization, an immediate report must be made by telephone to the Project Manager and the Health and Safety Officer.

Project Information

Project Name:	Project #
Location of Incident:	

Employee

Name:	Employee Number:
Employment Status: ☐ Regular ☐ Part Time	How long in present job?

Injury or Illness Information

Where did the incident / near miss occur? (number, street, city, state, zip):

Employee's specific activity at the time of the incident / near miss:

Equipment, materials, or chemicals the employee was using when the incident / near miss occurred (e.g., the equipment employee struck against or that struck the employee; the vapor inhaled or material swallowed; what the employee was lifting, pulling, etc.):

Describe the specific injury or illness (e.g., cut, strain, fracture, etc.):

Body part(s) affected (e.g., back, left wrist, right eye, etc.):

Name and address of treatment provider (e.g., physician or clinic):	Phone No.:
If hospitalized, name and address of hospital:	Phone No.:

Date of injury or onset of illness: / /	Time of event or exposure: ☐ AM ☐ PM

Did employee miss at least one full shift's work? ☐ No ☐ Yes, 1st date absent (MM/DD/YYYY) / /

Has employee returned to work? ☐ Regular work ☐ Restricted work ☐ No
☐ Yes, date returned (MM/DD/YYYY) / /

To whom reported:	Other workers injured / made ill in this event? ☐ Yes ☐ No

Description of Incident / Near Miss: (Describe what happened and how it happened.)

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Infrastructure, environment, facilities

Incident / Near-Miss Investigation Report

Motor Vehicle Accident (MVA)									
Company Vehicle?	☐ Yes ☐ No								
Accident Location (street, city, state)									
Vehicle Towed?	☐ Yes ☐ No	Other Vehicle?	☐ Yes ☐ No	# Vehicles Towed:		# of Injuries:			

Spill		
Material Spilled:	Quantity:	Source:
Agency Notifications:		
Cost of Incident $		

Third Party Incidents			
Name of Owner:		Address:	Telephone:
Description of Damage:			
Witness Name:		Address:	Telephone:
Witness Name:		Address:	Telephone:

#	Root Cause and Contributing Factors: Conclusion (Describe in Detail Why Incident / Near Miss Occurred)
1	
2	
3	
4	
5	

Root Cause(s) Analysis (RCA):

1. Lack of skill or knowledge.
2. Lack of or inadequate operational procedures or work standards.
3. Inadequate communication of expectations regarding procedures or work standards.
4. Inadequate tools or equipment.
5. Correct way takes more time and / or requires more effort.
6. Short-cutting standard procedures is positively reinforced or tolerated.
7. Person thinks there is no personal benefit to always doing the job according to standards.
8. Uncontrollable.

#	RCA #	Solution(s): How to Prevent Incident / Near Miss From Reoccurring	Person Responsible	Due Date	Closure Date

Investigation Team Members		
Name	Job Title	Date

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Infrastructure, environment, facilities

Incident / Near-Miss Investigation Report

Results of Solution Verification and Validation

Reviewed By

Name	Job Title	Date
	Project Manager	
	Health and Safety Reviewer	

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Attachment P

Loss Prevention Observation Form

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Infrastructure, environment, facilities

Loss Prevention Observation

Observer Name	Observer Title	Project/Project Number
Date _____ Time ____ ☐ AM ☐ PM	Project Type / Task Observed	

Background Information

List Critical Work Procedures

List Issue/Items Requiring Corrective Action

Root Cause Analysis

1. Employee lacks the skill or knowledge to carry out duties
2. Procedures, work standards, or expectations were not communicated
3. Procedures or work standards were not developed or were inadequate
4. Equipment, systems, or tools were inadequate
5. Employee chose not to take the time or put forth the effort to do the job properly
6. Supervisor did not require the employee to follow the standard procedure
7. Employee doesn't see any advantage to doing the job to standard.
8. Uncontrollable.

Criterion #	RCA #	Corrective Action Identified	Responsible Individual	Due Date	Closure Date

Results of Corrective Action

Reviewed by	Date	Reviewed by	Date

	PRE-TASK PREPARATION	Correct	Questionable	Comments
1.	Health and Safety Plan / MSDSs on site			
2.	Employee familiar / trained on task			
3.	OSHA-required training/medical surveillance			
4.	Utility mark out / check performed			
5.	Traffic hazard addressed / work area marked			
6.	Walking / working surfaces free of hazards			
7.	Tailgate safety meeting performed			
8.	Impact on nearby residence/business evaluated			
9.	Communicates intentions to other personnel			
10.	Knowledge of emergency procedures			
11.	Distance between equipment and power lines			
12.	Personal protective equipment			
13.	Air monitoring equipment on site, calibrated			
14.	First aid kit / fire extinguisher on site			
15.	One person trained in first aid / CPR			
16.	Work zones established and marked			
	PERFORMING TASK			
17.	Employee trained in task to be performed			
18.	Correct body positioning			
19.	Proper lifting / pushing / pulling techniques			
20.	Keep hands / body away from pinch points			
21.	Walking / working surfaces kept clear of debris			
22.	Faces traffic as appropriate			
23.	Vehicles/ barricades to protect against traffic			
24.	Drill rig located properly, blocked / chocked			
25.	Drill rig moved only with derrick lowered			
26.	Excavator located on stable ground			
27.	Eye contact made with equipment operator			
28.	Spoil at least 2 feet back from edge of excavation			
29.	Excavation shored/sloped/benched			
30.	Excavation entry controlled			
31.	Equipment/tools used properly			
32.	Electrical equipment connected through GFCI			
33.	Power tools handled properly			
34.	Electrical cords inspected / in good condition			
35.	Follows lockout / tagout procedures			
36.	Air monitoring conducted/action levels understood			
37.	Equipment decontaminated properly			
38.	Personnel decon prior to eating/drinking/smoking			
39.	Decontamination effective			
	POST – TASK			
40.	Procedures / JSA adequate			
41.	Equipment / tools stored properly			
42.	Proper storage of soil / water / waste material			
43.	Work area secured			
44.	Other			

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Attachment Q

Lockout/Tagout Equipment-Specific Control Form

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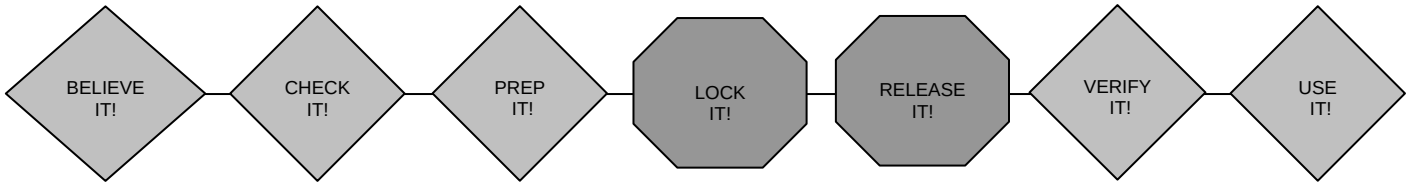
Lockout / Tagout Equipment-Specific Energy Control Procedure



Equipment Identification:

_____

_____

Hazardous Energy Source		Isolation Device			Verifying Lockout Means of Verification of Lockout
Type and Magnitude	Function	Type	Location	I.D. No.	
Electrical 120v					
Pneumatic					
Hydraulic					
Mechanical					
Potential					
Gravity					
Other					
Other					
Other					
Area:		Date of Last Review:			Authorized by:

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Attachment R

Investigative-Derived Waste SOP

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Imagine the result

Standard Operating Procedure:

Investigation-Derived Waste Handling and Storage for Chevron Projects

ARCADIS BBL

Approval Signatures

Prepared by: _____
Signature 1 Name
Title

Reviewed by: _____
Signature 2 Name
Technical Expert

Reviewed by: _____
Signature 3 Name
Editorial Review

Reviewed by: _____
Signature 3 Name
Quality Assurance Review

Approved by: _____
Signature 3 Name
Project Manager

Standard Operating Procedure: Investigation Derived Waste Handling and Storage for Chevron Projects

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Table of Contents

Standard Operating Procedure: Investigation Derived Waste Handling and Storage for Chevron Projects

I. Scope and Application

The objective of this Standard Operating Procedure (SOP) is to describe the procedures to manage investigation-derived wastes (IDW) generated during drilling, well sampling, and decontamination procedures. IDW may include soil, groundwater, drilling fluids, decontamination liquids, personal protective equipment (PPE), and disposable sampling materials that may have come in contact with potentially impacted materials. All IDW will be collected at the point of generation and taken to a storage area onsite or to a disposal facility. Soil and water will be containerized in DOT-approved drums and analyzed for constituents of concern to evaluate proper disposal methods. PPE and disposable sampling equipment will be placed in DOT-approved drums prior to disposal. This SOP describes the necessary equipment, field procedures, materials, and documentation procedures necessary to do so, as well as the handling of these materials up to the time they are properly disposed. The procedures for handling IDW are based on the United States Environmental Protection Agency's *Guide to Management of Investigation Derived Wastes* (USEPA, 1992). IDW is assumed to be contaminated with the site constituents of concern until analytical evidence indicates otherwise.

IDW will be managed to ensure the protection of human health and the environment and will comply with all local, state, federal, BBL, and Chevron applicable or relevant and appropriate requirements (ARAR). Samples of the waste will be collected in accordance with ARAR and the IDW containers will be labeled and staged on site. If an injured employee has gross contamination, emergency decontamination may be required prior to transportation to a treatment facility. At this site, the worst case scenario would be an employee who was covered/soaked with COCs containing fuel and fuel byproducts. Steps for emergency decontamination are:

1) Remove the outer protective layer of clothing (if employee has a suspected neck/back injury, carefully cut the clothing off so as to not cause further injury

2) Wipe off any remaining gross contamination with clean clothes/towels

A BBL employee must accompany the injured person to the hospital to provide information to the examining/treating medical professional. The accompanying BBL employee must bring the MSDSs for the COPCs involved with site work. The

accompanying employee should be prepared to provide information regarding site conditions, potential exposures, and a description of the incident causing the injury or exposure.

The onsite waste staging area will be in a secure and controlled area. Pending characterization, IDW will be stored appropriately within each area of contamination (AOC). Waste characterization involves collecting and sending composite samples for each media to a Chevron-approved laboratory for waste characterization analysis.

Wastes judged to potentially meet the criteria for hazardous wastes shall be stored in DOT approved 55 gallon steel drums. Waste material classified as non-hazardous may be handled and disposed of as an industrial waste.

This is a standard (i.e., typically applicable) operating procedure which may be varied or changed as required, dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. The ultimate procedure employed will be documented in the project work plans or reports. If changes to the sampling procedures are required due to unanticipated field conditions, the changes will be discussed with the Chevron project manager as soon as practicable and documented in the report.

II. Personnel Qualifications

BBL field sampling personnel will have current health and safety training including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and CPR, as needed. In addition, BBL field sampling personnel will be versed in the relevant SOPs and posses the required skills and experience necessary to successfully complete the desired field work.

III. Equipment List

- Appropriate personal protective equipment as specified in the Site Health and Safety Plan;
- 55-gallon steel drums, DOT 1A2 or equivalent;
- ¾-inch socket wrench;
- Hammer;

- Leather gloves;
- Drum dolly;
- Appropriate drum labels (outdoor waterproof self adhesive);
- Polyethylene storage tank;
- Appropriate labeling, packing, chain-of-custody forms, and shipping materials as specified in the *Chain-of-Custody SOP* (No. 1663199) and *Field Sampling Handling, Packing, and Shipping SOP* (No. 1223199);
- Indelible ink and/or permanent marking pens;
- Plastic sheeting;
- Appropriate sample containers, labels, and forms;
- Stainless-steel bucket auger;
- Stainless steel spatula or knife;
- Stainless steel hand spade;
- Stainless steel scoop; and
- Field logbook

IV. Cautions

- Filled drums can be very heavy, always use appropriate moving techniques and equipment.
- Similar media will be stored in the same drums to aid in sample analysis and disposal.
- Drum lids must be secured to prevent rainwater from entering the drums.
- Drums containing solid material may not contain any free liquids.

- All drums must be DOT approved shipping containers and in good condition to prevent potential leakage and facilitate subsequent disposal. Inspect the drums for dents and rust, and verify the drum has a secure lid prior to use.

V. Health and Safety Considerations

- Appropriate personal protective equipment must be worn by all field personnel within the designated work area.

- Air monitoring may be required during construction activities as required in the Site Health and Safety Plan (BBL,).

- If excavating in potentially hazardous areas is possible, contingency plans should be developed to address the potential for encountering gross contamination or non-aqueous phase liquids.

VI. Procedure

Waste storage and handling procedures to be used depend upon the type of generated waste. For this reason, IDW will be stored in a secure location onsite in separate 55-gallon storage drums, soil can be stockpiled on poly-sheeting and covered onsite, and purge water may be stored in polyethylene tanks with lids. Waste materials such as broken sample bottles or equipment containers and wrappings will be included in the 55-gallon drums unless they were not in contact with sample media. In the event that the IDW (broken sample bottles or equipment containers and wrappings) does not come in contact with the sample media, the waste may be disposed of with general refuse.

Management of IDW

Minimization of IDW should be considered by the Project Manager during all phases of the project. Site managers may want to consider techniques such as replacing solvent-based cleaners with aqueous-based cleaners for decontamination of equipment, reuse of equipment (where it can be decontaminated), limitation of traffic between exclusion and support zones, and drilling methods and sampling techniques that generate little waste. Alternative drilling and subsurface sampling methods may include the use of small diameter boreholes, as well as borehole testing methods such as a core penetrometer or direct-push technique instead of coring (EPA, 1993).

Drum Labeling

IDW drums will be labeled on both the side and lid of the drum using a permanent marking pen. Old drum labels must be removed to the extent possible, descriptions crossed out should any information remain, and new labels affixed on top of the old labels. IDW drums will be labeled as follows:

- Appropriate Chevron waste characterization label (Testing In Progress, Hazardous, or Non-Hazardous);
- Waste generator's name (e.g., BBL);
- Project name (e.g.,);
- Name and telephone number of BBL/Chevron project manager;
- Composition of contents (e.g., used oil, acetone 40%, toluene 60%);
- Media (e.g., solid, liquid);
- Accumulation start date; and
- Drum number of total drums.

Drilling Soil Cuttings and Muds

Soil cuttings are solid to semi-solid soils generated during trenching activities, subsurface soil sampling, or installation of monitoring wells. Depending on the drilling method, drilling fluids known as "muds" may be used to remove soil cuttings. Drilling fluids flushed from the borehole must be directed into a settling section of a mud pit. This allows reuse of the decanted fluids after removal of the settled sediments. Soil cuttings will be labeled and stored in 55-gallon drums with bolt-sealed lids.

All 55-gallon steel drums will have a containment system that can contain at least 10% of the volume of the largest container, be closed during storage, and be in good condition in accordance with the *Guide to Management of Investigation-Derived Wastes* (USEPA, 1992).

Excavated Soil

Excavated soil may be temporarily stockpiled onsite as long as the soil is a RCRA non-hazardous waste and the soil will be treated onsite pursuant to a certified, authorized, or permitted treatment method. Excavated soil may be stockpiled and maintained in a secure area onsite. At a minimum, the floor of the stockpile area will be covered with a 20-mil high density polyethylene liner that is supported by a foundation or at least a 60-mil high density polyethylene liner that is not supported by a foundation. The excavated material will not contain free liquids. The owner/operator provides controls for windblown dispersion, run-on control, and precipitation runoff. The run-on control system will prevent flow onto the active portion of the pile during peak discharge from at least a 25-year storm and the run-off management system will collect and control at least the water volume resulting from a 24-hour, 25-year storm (EPA, 1992). Additionally, the stockpile area will be inspected on a weekly basis and after storm event. Stockpiled material will be covered with a 6-mil polyvinyl chloride (PVC) liner. Excavated soil may also be placed in roll off containers and covered with a 6-mil PVC liner pending results for waste characterization.

Decontamination Solutions

Decontamination solutions are generated during the decontamination of personal protective equipment and sampling equipment. Decontamination solutions may range from detergents, organic solvents and acids used to decontaminate small field sampling equipment to steam cleaning rinsate used to wash heavy field equipment. These solutions are to be labeled and stored in 55-gallon drums with bolt-sealed lids.

Disposable Equipment

Disposable equipment includes personal protective equipment (tyvek coveralls, gloves, booties and APR cartridges) and disposable sampling equipment such as trowels or disposable bailers. If the media sampled exhibits hazardous characteristics per results of waste characterization sampling, disposable equipment will also be disposed of as a hazardous waste. These materials will be stored onsite in labeled 55-gallon drums pending analytical results for waste characterization.

Purge Water

Purge water includes groundwater generated during well development, groundwater sampling, or aquifer testing. The volume of groundwater generated will dictate the

appropriate storage procedure. Monitoring well development and groundwater sampling may generate three well volumes of groundwater or more. This volume will be stored in labeled 55-gallon drums. Aquifer tests may generate significantly greater volumes of groundwater depending on the well yield and the duration of the test. Therefore, large-volume portable polyethylene tanks will be considered for temporary storage pending groundwater-waste characterization.

Purged Water Storage Tank Decontamination and Removal

The following procedures will be used for inspection, cleaning, and offsite removal of purge water in storage tanks. These procedures are intended to be used for rented portable tanks such as Baker Tanks or Rain for Rent containers. Storage tanks will be made of inert polyethylene materials.

The major steps for preparing a rented tank for return to a vendor include characterizing the purge water, disposing of the purge water, decontaminating the tank, final tank inspection, and mobilization. Decontamination and inspection procedures are describe in further detail below.

- **Tank Cleaning**: Most vendors require that tanks be free of any sediment and water before returning, a professional cleaning service may be required. Each specific vendor should be consulted concerning specific requirements for returning tanks.

- **Tank Inspection**: After emptying the tank, purged water storage tanks should be inspected for debris, chemical staining, and physical damage. The vendors require that tanks be returned in the original condition (i.e., free of sediment, staining and no physical damage).

VII. Waste Characterization Sampling

Waste characterization will be conducted in accordance with waste hauler, waste handling facility, and state/federal and Chevron requirements.

Composite soil sample will be collected at a frequency of one sample per 10 cubic yard basis for stockpiled soil or one per 55-gallon drum for containerized or as directed under state specific regulatory guidelines. Sample frequencies may be adjusted in accordance with the waste handling facility's requirements. Waste characterization samples will be analyzed for the total concentration of petroleum hydrocarbons, TAL

metals, volatile organic compounds, semi-volatile organic compounds, polychlorinated biphenyls, reactivity, corrosivity, and ignitability or as directed under state specific regulatory guidelines. Additional samples may be collected and analyzed by the laboratory on a contingency basis. Typical analytical methods are described below:

- Total Petroleum Hydrocarbons by USEPA Method 8015;
- TAL Metals by USEPA Method 6010A;
- Volatile Organic Compounds by USEPA Method 8260B;
- Semi-Volatile Organic Compounds by USEPA Method 8270C; and
- Polychlorinated Biphenyls by USEPA Method 8082.

Analytical results will be compared to the criteria in the Threshold Limit Concentrations in Table 1. If the total concentration of a compound exceeds 20 times the TCLP threshold, TCLP analyses will be performed. If the TCLP concentration of a compound exceeds the TCLP threshold concentration, the material must be disposed of as a RCRA hazardous waste. This SOP does not address the handling or disposal of hazardous waste.

Wastewater Characterization

Waste characterization will be conducted in accordance with the requirements of the waste hauler, waste handling facility, and state/federal governments. In general, purge water should be analyzed by methods appropriate for the known contaminants, if any, have been historically detected in the monitoring wells. Samples will be collected in accordance with the requirements of the waste disposal facility.

Wastewater characterization samples will be analyzed for the total concentration of petroleum hydrocarbons, TAL metals, volatile organic compounds, semi-volatile organic compounds, polychlorinated biphenyls, reactivity, corrosivity, and ignitability. Additional samples may be collected and analyzed by the laboratory on a contingency basis. Typical analytical methods are described below:

- Total Petroleum Hydrocarbons by USEPA Method 8015;
- TAL Metals by USEPA Method 6010A;

- Volatile Organic Compounds by USEPA Method 8260B;
- Semi-Volatile Organic Compounds by USEPA Method 8270C; and
- Polychlorinated Biphenyls by USEPA Method 8082.

Analytical results will be compared to the criteria in the Threshold Limit Concentrations in Table 1. If the total concentration of a compound exceeds the TCLP threshold, the material must be disposed of as a RCRA hazardous waste. This SOP does not address the handling or disposal of hazardous waste.

All hazardous waste should be containerized, manifested, and transported by a licensed waste hauler to a Chevron-approved permitted treatment, storage, or disposal facility within 90 days of waste generation.

Wastewater with concentrations less than the applicable threshold criteria may be managed as non-hazardous waste.

Sample Handling and Shipping

All samples will be appropriately labeled, packed, and shipped, and the chain-of-custody will be filled out in accordance with the *Chain-of-Custody SOP* (No. 1663199) and *Field Sampling Handling, Packing, and Shipping SOP* (No. 1223199).

VIII. Data Recording and Management

Waste characterization sample handling, packing, and shipping procedures will be documented in accordance with *Quality Assurance Project Plan* (BBL, 2004a). Copies of the chains-of-custody forms will be maintained in the project file.

Following waste characterization, IDW drums will be re-labeled with the appropriate waste hazardous or non-hazardous waste labels and the client will initiate disposal at the appropriate waste disposal facility.

IX. Quality Assurance

The chain-of-custody and sample labels for waste characterization samples will be filled out in accordance with the *Quality Assurance Project Plan* (BBL, 2004a).

X. References

Blasland, Bouck & Lee, Inc. (BBL). 2004. *Health and Safety Plan*. Prepared for Gaylord Container Corporation, Antioch, California (February 2004).

Blasland, Bouck & Lee, Inc. (BBL). 2004a. *Quality Assurance Project Plan*. Prepared for Gaylord Container Corporation, Antioch, California (February 2004).

California Environmental Protection Agency (CalEPA). 1995. *Representative Sampling of Groundwater for Hazardous Substances.* Guidance Manual for Ground Water Investigations. July 1995.

United States Environmental Protection Agency (USEPA). 1992. *Guide to Management of Investigation-Derived Wastes*. Office of Remedial and Emergency Response. Hazardous Site Control Division. January 1992.

USEPA. 1991. *Guide to Discharging CERCLA Aqueous Wastes to Publicly Owned Treatment Works (POTWs)*. Office of Remedial and Emergency Response. Hazardous Site Control Division 0S-220W. March 1991.

Threshold Limit Concentrations

Constituent	Soluble Threshold Limit Concentration (STLC) mg/L	Toxicity Characteristic Leaching Procedure (TCLP) mg/L	Total Threshold Limit Concentration (TTLC) mg/kg
Aldrin	0.14	-	1.4
Chlordane	0.25	0.03	2.5
2-4 Dichlorophenoxyacetic Acid	10	-	100
DDT, DDE, DDD	0.1	-	1
Dieldrin	0.8	-	8
Dioxin	0.001	-	0.01
Endrin	0.02	0.02	0.2
Heptachlor	0.47	0.008	4.7
Kepone	2.1	-	21
Lead Compounds, Organic	-	-	13
Lindane	0.4	0.4	4
Methoxychlor	10	10	100
Mirex	2.1	-	21
Pentachlorophenol	1.7	100	17
Polychlorinated Biphenyls	5	-	50
Toxaphene	0.5	0.5	5
Trichloroethene	204	0.5	2,040
2,4,5-Trichlorophenoxypropionic Acid	1	-	10
Antimony	15	-	500
Arsenic	5	5	500
Asbestos	-	-	*1.0%*
Barium	100	100	10,000
Beryllium	0.75	-	75
Cadmium	1	1	100
Chromium (VI)	5	-	500
Chromium	5	5	2,500
Cobalt	80	-	8,000
Copper	25	-	2,500
Fluoride Salts	180	-	18,000
Lead (inorganic)	5	5	1,000
Mercury	0.2	0.2	20
Molybdenum	350	-	3,500
Nickel	20	-	2,000
Selenium	1	1	100
Silver	5	5	500
Thallium	7	-	700
Vanadium	24	-	2,400
Zinc	250	-	5,000

Notes: Units are in milligram per liter (mg/L) or milligram per gram (mg/kg)

ARCADIS BBL

Attachment S

Air Monitoring Log

ARCADIS BBL
Infrastructure, environment, facilities

Air Monitoring Log

Project:	**Date:**
Monitoring Instruments:	
Air Monitor:	**Activity:**
Level of Protection:	

Time	Location	Instrument Reading	Comments

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Attachment T

Safety Inspection Form

ARCADIS BBL
Infrastructure, environment, facilities

Health and Safety Inspection Form

Project Name:	**Date:**			
Project Number:	**Location:**			
Prepared By:	**Project Manager:**			
Auditor:	**HSS On Site:**			
	YES	**NO**	**N/A**	**COMMENTS**
GENERAL				
Is the HASP on site?				
Is the HASP finalized and approved?				
Is the OSHA poster displayed?				
Are emergency telephone numbers posted?				
Is emergency eyewash immediately available?				
Is an emergency shower immediately available?				
Are emergency notification means available (radio, telephone)?				
Is a first-aid kit immediately available?				
Is the first-aid kit adequately stocked?				
Is there a proper sanitation facility on site?				
DOCUMENTATION AND RECORDKEEPING				
Are only personnel listed and approved in the HASP on site?				
Are all personnel properly trained? (Check company-issued wallet cards.)				
Is the daily field log kept by the Site Manager?				
Are levels of PPE recorded?				
Are contaminant levels recorded?				
Are site surveillance records kept by HSS?				
Is a copy of current fit test records on site?				
Are calibration records maintained for air monitoring equipment?				
Are accident / incident forms on site?				
Are field team review sheets signed?				
Are additional hospital route directions available?				
Is the visitors' logbook being accurately maintained?				
Are MSDSs available for all chemicals on site?				
Are HASP revisions recorded?				
Is the first-aid kit inspected weekly?				
Are daily safety meetings held?				
Are emergency procedures discussed during safety meetings?				

ARCADIS BBL
Infrastructure, environment, facilities

Health and Safety Inspection Form

	YES	NO	N/A	COMMENTS
EMERGENCY RESPONSES				
Is a vehicle available on site for transportation to the hospital?				
Are fire extinguishers on site and immediately available at designated work areas?				
Is at least one person trained in CPR and first aid on site at all times during work activities?				
Do all personnel know who is trained in CPR / first aid?				
PERSONAL PROTECTIVE EQUIPMENT (PPE)				
Is proper PPE being worn as specified in HASP?				
Level of PPE being worn.				
Is PPE adequate for work conditions?				
If not, give reason.				
Upgrade/downgrade to PPE level.				
Does any employee have facial hair that would interfere with respirator fit?				
If yes, willing to shave, as necessary?				
Fit-tested within the last year? (Documentation present)				
If Level B, is a back-up / emergency person suited up (except for air)?				
Does the HSS periodically inspect PPE and equipment?				
Is the PPE not in use properly stored?				
Is all equipment required in the HASP on site?				
Properly calibrated?				
In good condition?				
Used properly?				
Other equipment needed?				
List.				
Is monitoring equipment covered with plastic to minimize contamination?				
PERSONNEL AND EQUIPMENT DECONTAMINATION				
Is the decontamination area properly designated?				
Is appropriate cleaning fluid used for known or suspected contaminants?				
Are appropriate decontamination procedures used?				
Are decontamination personnel wearing proper PPE?				
Is the equipment decontaminated?				

ARCADIS BBL
Infrastructure, environment, facilities

Health and Safety Inspection Form

	YES	NO	N/A	COMMENTS
PERSONNEL AND EQUIPMENT DECONTAMINATION (continued)				
Are sample containers decontaminated?				
Are disposable items replaced as required?				
WORK PRACTICES				
Was proper collection and disposal of potentially contaminated PPE performed?				
Was proper collection and disposal of decontamination fluid performed?				
Is water available for decontamination?				
Is the buddy system used?				
Is equipment kept off drums and the ground?				
Is kneeling or sitting on drums or the ground prohibited?				
Do personnel avoid standing or walking through puddles or stained soil?				
Are work zones established?				
If night work is conducted, is there adequate illumination?				
Is smoking, eating, or drinking in the exclusion or CRZ prohibited?				
To the extent feasible, are contaminated materials handled remotely?				
Are contact lenses not allowed on site?				
Is entry into excavations not allowed unless properly shored or sloped?				
Is a competent person on site during excavation?				
Are all unusual situations on site listed in HASP?				
If not, when?				
Action taken?				
HASP revised?				
CONFINED SPACE ENTRY				
Are employees trained according to 1910.146 – Confined Space Entry?				
Are all confined spaces identified? If not, list:				
Is all appropriate equipment available and in good working order?				
Is equipment properly calibrated?				
Are confined space permits used?				
Are confined space permits completely and correctly filled out?				

*N/A = Not Applicable

ARCADIS BBL

Attachment U

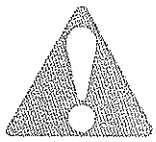
Daily Safety Meeting Log/Permit-to-Work Form

ARCADIS BBL
Infrastructure, environment, facilities

Safety Meeting Log

Project:	**Location:**
Date / Time:	**Activity:**
1. Work Summary	
2. Physical / Chemical Hazards: Has JSA been reviewed/modified to address changing conditions?	
3. Protective Equipment/Procedures	
4. Emergency Procedures	
Is there anyone with any medical conditions that they would like the team to know about? For example: Medic Alert, Allergic to bee stings, nitro for chest pains, etc.	
Location of medical equipment: fire extinguishers, first aid kit, route to hospital, auto-injectors, etc.	
5. Signatures of Attendees	

General Permit to Work Form / Tailgate Safety Meeting



Project Name: _____ Chevron Facility #: _____

ect Location (Address): _____ Total # On-site Workers: _____

Chevron Project Manager: _____ Project Type: _____

Valid Date: _____ Time Written: _____ Time Closed-out: _____

1.	a. Have necessary work permits been obtained (including those for subcontractors)?	☐ Yes	☐ No	☐ N/A
	b. If CONFINED SPACE activities are to be conducted has the CONFINED SPACE portion of the HIGH RISK WORK PERMIT been completed?	☐ Yes	☐ No	☐ N/A
	c. If EXCAVATION/TRENCHING activities are to be conducted has the EXCAVATION/TRENCHING portion of the HIGH RISK WORK PERMIT been completed?	☐ Yes	☐ No	☐ N/A
	d. If HOTWORK activities are to be conducted has the HOTWORK portion of the HIGH RISK WORK PERMIT been completed?	☐ Yes	☐ No	☐ N/A
	e (i). If LOCK OUT / TAG OUT (LO/TO) activities are to be conducted has the LO/TO portion of the HIGH RISK WORK PERMIT been completed? *See e (ii) below.*	☐ Yes [*See e(ii)*]	☐ No	☐ N/A
	e (ii). Has the LO/TO Equipment-Specific Energy Control Procedure form been completed?	☐ Yes	☐ No	☐ N/A
2.	Have all sections of the HASP applying to today's tasks been reviewed?	☐ Yes	☐ No	☐ N/A
3.	Has the Health & Safety Plan been signed by appropriate on-site personnel?	☐ Yes	☐ No	☐ N/A
4.	Has the scope of work or work plan been reviewed and fully understood?	☐ Yes	☐ No	☐ N/A
5.	Where will the scope of work or work plan be kept on site?	☐ Yes	☐ No	☐ N/A
6.	Are appropriate tools on-site to complete tasks safety and appropriately?	☐ Yes	☐ No	☐ N/A
7.	Have Operational Excellence Tenants been discussed and highlighted during the daily health and safety meeting?	☐ Yes	☐ No	☐ N/A
8.	Has everyone reviewed the applicable SOPs and JSAs for their assigned work duties?	☐ Yes	☐ No	☐ N/A
9.	Where will the HASP be kept on site?	**Location:**		
10.	Have the action levels and work zones been identified and reviewed?	☐ Yes	☐ No	☐ N/A
11.	What level of PPE is required (See note on following page)?	☐ A ☐ B ☐ C ☐ D ☐ Other		
12.	a. If monitoring is required, what type of monitoring will be performed at the site?	**Type:**	*(See 12c.)* ☐ N/A	
	b. Is monitoring equipment present and properly calibrated?	☐ Yes	☐ No	☐ N/A
	c. Have HASP requirements for air monitoring been reviewed?	☐ Yes	☐ No	☐ N/A
	d. Has HASP Appendix T – Air Monitoring Log been completed?	☐ Yes	☐ No	☐ N/A
13.	Will work conducted by others in the area affect/conflict your work area?	☐ Yes	☐ No	☐ N/A
14.	Have you communicated with others in the work area to understand their tasks?	☐ Yes	☐ No	☐ N/A
15.	Are above-ground utilities identified and clearly visible by equipment operators?	☐ Yes	☐ No	☐ N/A
16.	Have underground utilities been clearly marked?	☐ Yes	☐ No	☐ N/A
17.	Has the underground/overhead utilities checklist been completed?	☐ Yes	☐ No	☐ N/A
18.	Have shutoff switches/valves been located?	☐ Electric	☐ Gas	☐ Water
19.	Are proper traffic and/or fire control measures in-place?	☐ Traffic	☐ Fire Prevention	
20.	Who is the designated Site Safety Officer?	**Name:**		
21.	Has an on-site emergency response coordinator been determined?	☐ Yes	☐ No	☐ N/A
22.	Does everyone know the location, directions, and name of the nearest hospital?	☐ Yes	☐ No	☐ N/A
23.	Has the route to the hospital and emergency contact numbers been confirmed?	☐ Yes	☐ No	☐ N/A
24.	Has a plan been established to ensure emergency responders can easily locate or be escorted to the work site?	☐ Yes	☐ No	☐ N/A
25.	In the event of the emergency, where will personnel meet?	**Location:**		
26.	Has an evacuation signal (i.e. emergency alarm, hand signal) been communicated to personnel?	☐ Yes	☐ No	☐ N/A
27.	Where is the nearest working phone located (non-cell phone)	**Location:**		
28.	What is the local emergency phone number?	**Location:**		
29.	Where is the location of the first aid kit (to include portable eyewash & CPR shield)?	**Location:**		
31.	Has the location of the closest fire extinguisher been identified?	**Location:**		
32.	Have modifications to safety procedures or documentation (ie. JMP, TCP) been made and communicated to onsite personnel?	☐ Yes	☐ No	☐ N/A
33.	Has all waste material been collected, stored and disposed, and/or labeled properly?	☐ Yes	☐ No	☐ N/A

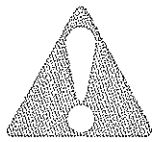
Special Safety Concerns For Today

sonnel having allergies/ailments/illnesses AND list of contact lens wearers:

Weather Conditions:

(Continue on page 2)

General Permit to Work Form / Tailgate Safety Meeting



Personnel Training & Qualifications

Supervisor's Training	Competent Person	First Aid/CPR	Confined Space

Short Service Employee

Short Service Employees On-Site	Short Service Mentor

Chevron Hand Safety Glove Color Schedule

January – April – July - October	February - May - August - November	March – June – September - December
Work Glove Color: Green	Work Glove Color: Yellow	Work Glove Color: Orange
Chemical Resistant Glove Color: Green	Chemical Resistant Glove Color: Blue	Chemical Resistant Glove Color: Purple

Additional Comments:

Stop Work Authority – **As an employee or contractor for Chevron, you are responsible and authorized to stop any work that is not safe or does not comply with the OE tenets. There will be NO repercussions for initiating Stop Work Authority.**

b Safety Analysis – By signing below, you agree that you have read and fully understand the JSAs applicable to you and your assigned duties.

Name	Company	Before Work (Time)	Signature	Mid Day (Time)	Initial
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

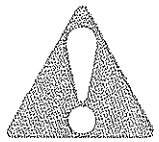
Call the **ARCADIS BBL Near Miss Hotline** to report all near misses!! : **866-242-4304**

I have assessed the risks posed by work activities planned for today and steps to mitigate those risks (e.g. HASP, JSA, PTW, tailgate meeting, coordination with other parties on site, etc.) have been completed to the best of our ability. Work is safe to proceed. If site conditions change, Stop Work Authority will be used until reassessment is completed.

ermit Writer/Holder: _____ **Date (__/___/___)**

[redacted]

HIGH RISK WORK PERMIT



Project Name: _____ Chevron Facility #: _____

Project Location (Address): _____ Total # On-site Workers: _____

Chevron Project Manager: _____ Project Type: _____

Valid Date: _____ Time Written: _____ Time Closed-out: _____

Complete Applicable Sections Below:

CONFINED SPACE

Confined Space = Space with restricted entry/exit, large enough to contain worker and not intended for worker occupancy.
Permit-required Confined Space = Confined space with a hazard to health or life associated with it.

1.	Location and Description of Confined Space:	
2.	Entry objectives:	
3.	Equipment / Materials required for entry:	
4a.	Time of entry:	4b. Expiration of entry:
5.	Type of respirator:	6. Level of PPE protection: ☐ Level A ☐ Level B ☐ Level C ☐ Level D
7.	Air monitoring interval: ☐ Continuous ☐ 5 minutes ☐ 10 minutes ☐ 15 minutes	
8.	Monitor for: ☐ % Oxygen ☐ % LEL ☐ H_2S ☐ CO ☐ Other:	
9.	Has each entrant developed / reviewed JSA for scope of work in confined space?	☐ Yes ☐ No ☐ N/A
10.	Have entrants and attendants agreed upon hand signals?	☐ Yes ☐ No ☐ N/A
11.	Do entrants have any medical conditions or currently taking medication that could affect their safety in the confined space?	☐ Yes (Stop Work) ☐ No ☐ N/A
9a.	Number of Entrants:	9b. Number of Attendants:
10.	Name of Entrants	Name of Attendants
	Health & Safety Site Supervisor (PRINT):	Health & Safety Site Supervisor (SIGNATURE):
12.	Chevron PM acceptance? *Must be approved by Chevron PM or pre-approved company representative*	☐ E-mail ☐ Fax ☐ Phone (w/ documentation) ☐ No
13.	ARCADIS BBL PM or above approval?	☐ E-mail ☐ Fax ☐ Phone (w/ documentation) ☐ No

EXCAVATION / TRENCHING

Required for excavations deeper than 4 feet, excavations or drilling within 10 feet of a buried high pressure gas line, excavation or drilling within 3 feet of a buried active product line or active electric line, or work involving equipment (such as pulling unit, mast truck, backhoe or excavator) within 15 feet of active overhead electrical line or pole supporting an electric line.

1.	Soil classified as:	☐ Stable rock ☐ Type A ☐ Type B ☐ Type C		
2a.	Soil classified on:	2b. Soil classified by:		
3.	Type of protection system in use: ☐ Sloping ☐ Shoring ☐ Other :			
4.	Description:			
5.	Have underground utilities been marked by contracted utility locating company?	☐ Yes	☐ No	☐ N/A
6.	Are underground installations protected from damage?	☐ Yes	☐ No	☐ N/A
7.	Document if the following are present:			
	☐ Electric Power Line (method of marking [i.e. red flags]):	☐ Drain Line (method of marking):		
	☐ Natural Gas Line (method of marking):	☐ Underground storage tank (method of marking):		
	☐ Telephone Line (method of marking):	☐ Underground Cable (method of marking):		
	☐ Water Line (method of marking):	☐ Overhead Power Line (method of marking):		
	☐ Product Line (method of marking):	☐ Overhead Product Line (method of marking):		
	☐ Sewer Line (method of marking):	☐ Other 1 - specify (method of marking):		
	☐ Steam Line (method of marking):	☐ Other 2 - specify (method of marking):		
8.	Health & Safety Site Supervisor (PRINT):	Health & Safety Site Supervisor (SIGNATURE):		
	Chevron PM acceptance? *Must be approved by Chevron PM or pre-approved company representative*	☐ E-mail ☐ Fax ☐ Phone (w/ documentation) ☐ No		
10.	ARCADIS BBL PM or above approval?	☐ E-mail ☐ Fax ☐ Phone (w/ documentation) ☐ No		

HIGH RISK WORK PERMIT

HOT WORK

1.	Location and Description of Hot Work:	
2.	Objective of Hot Work:	
3.	Equipment / Material used:	
4a.	Time of Hot Work:	4b. Time of Hot Work Completion:
5.	Available fire suppression: ☐ Fixed water supply ☐ Fire blanket ☐ Portable extinguisher (*See 5b.→*)	5b. Quantity, size, and type of extinguisher:
6.	Are fire barriers in place to control sparks?	☐ Yes ☐ No ☐ N/A
6.	Air monitoring interval: ☐ Continuous ☐ 5 minutes ☐ 10 minutes ☐ 15 minutes	
7.	Monitor for: ☐ % Oxygen ☐ % LEL ☐ H2S ☐ CO ☐ Other:	
9.	Have workers developed / reviewed JSA for scope of work?	☐ Yes ☐ No ☐ N/A
10.	Have workers been trained on using fire suppression system at site?	☐ Yes ☐ No ☐ N/A
11.	Has fire monitor been determined to ONLY monitor hot work activity and check for potential fire condition AFTER hot work has ended?	☐ Yes ☐ No (Stop Work) ☐ N/A
12a.	Name of Employees Performing Hot Work	12b. Name of Dedicated Fire Monitors

13. FIRE MONITOR ACTIVITY LOG

13a.	Time of pre-work survey:	Pre-work LEL%:
	Pre-work Oxygen %:	LEL% after _____ minutes of work:
	Oxygen % after _____ minutes of work:	
14.	Have hot work areas been monitored for up to an hour after completion of hot work activity?	☐ Yes ☐ No ☐ N/A
15.	Health & Safety Site Supervisor (PRINT):	Health & Safety Site Supervisor (SIGNATURE):
16.	Chevron PM acceptance? *Must be approved by Chevron PM or pre-approved company representative*	☐ E-mail ☐ Fax ☐ Phone (w/ documentation) ☐ No
	ARCADIS BBL PM or above approval?	☐ E-mail ☐ Fax ☐ Phone (w/ documentation) ☐ No

LOCKOUT / TAGOUT

1.	Have authorized and affected employees been training in the Lockout / Tagout (LO/TO) program?	☐ Yes ☐ No ☐ N/A
2.	Are there multiple keys for the lock?	☐ Yes (Stop Work) ☐ No ☐ N/A
3.	Equipment Identification:	

Hazardous Energy Source		Isolation Device			Verifying Lockout Means of Verification of Lockout
Type & Magnitude	Function	Type	Location	ID #	
Electrical 120V					
Electrical (over 120V)					
Pneumatic					
Hydraulic					
Mechanical					
Potential					
Gravity					
Other					

4.	Have current LO/TO locations been inspected by an employee not involved in the energy control process periodically?	☐ Yes ☐ No ☐ N/A
5.	PERMISSION TO REMOVE LOCKOUT / TAGOUT FROM AUTHORIZED EMPLOYEE (PRINT NAME):	☐ E-mail ☐ Fax ☐ Phone (w/ documentation) ☐ No (STOP WORK) OSHA allows removal of LO/TO devices only if worker that applied the lock is not available and permission has been given by that individual. If permission has not been given, documentation of efforts to obtain permission must be kept. The worker that applied the LO/TO must be notified of its removal prior to returning to the work site. This notification and acceptance should be documented.
6.	Health & Safety Site Supervisor (PRINT):	Health & Safety Site Supervisor (SIGNATURE):
	Chevron PM acceptance? *Must be approved by Chevron PM or pre-approved company representative.* ***Exception: O&M performed AT LEAST Quarterly.***	☐ E-mail ☐ Fax ☐ Phone (w/ documentation) ☐ No
8.	ARCADIS BBL PM or above approval?	☐ E-mail ☐ Fax ☐ Phone (w/ documentation) ☐ No

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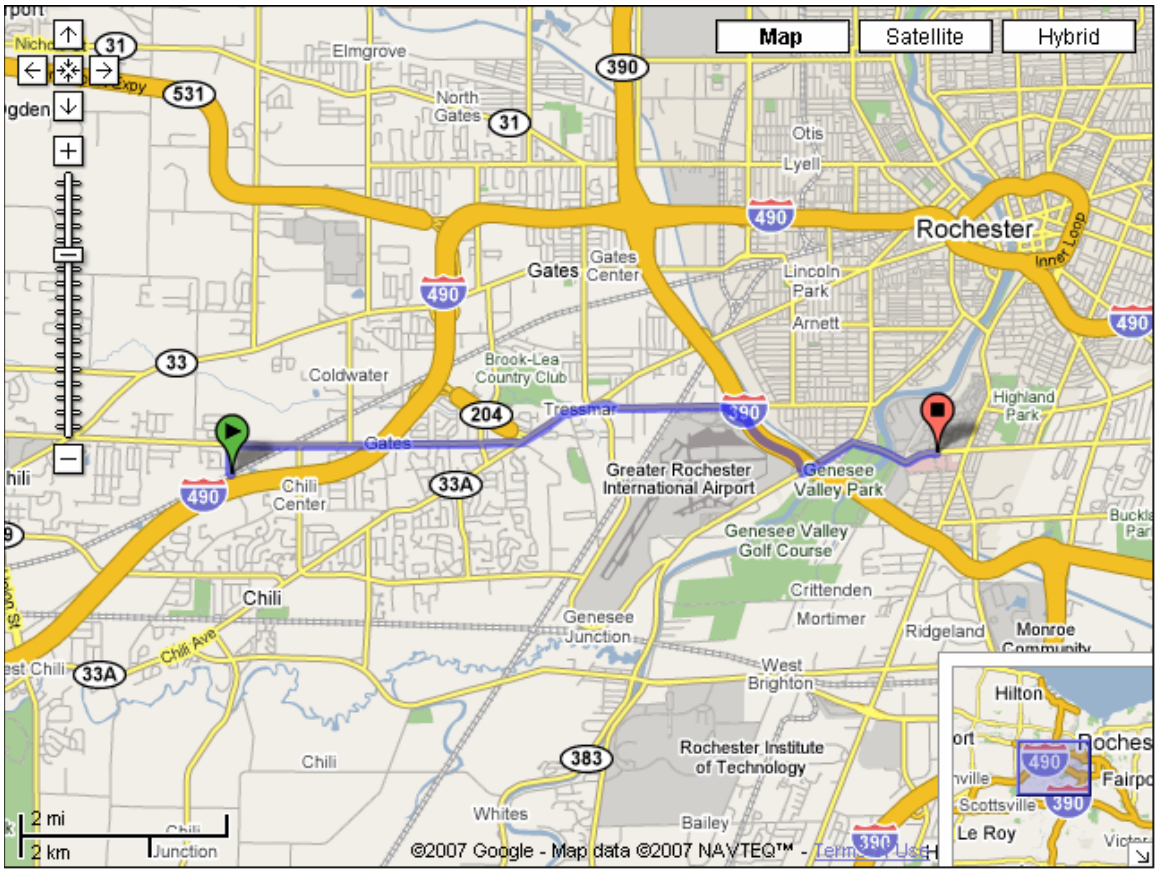
Attachment V

Map to Hospital and Evacuation Route Map

HOSPITAL:
Name: Strong Memorial Hospital
Address: 601 Elmwood Avenue
City, State: Rochester, NY
Telephone Number: (585) 275-2100 (main #), (585) 275-4551 (emergency room #)

Map to hospital with written directions is included in Attachment Y.

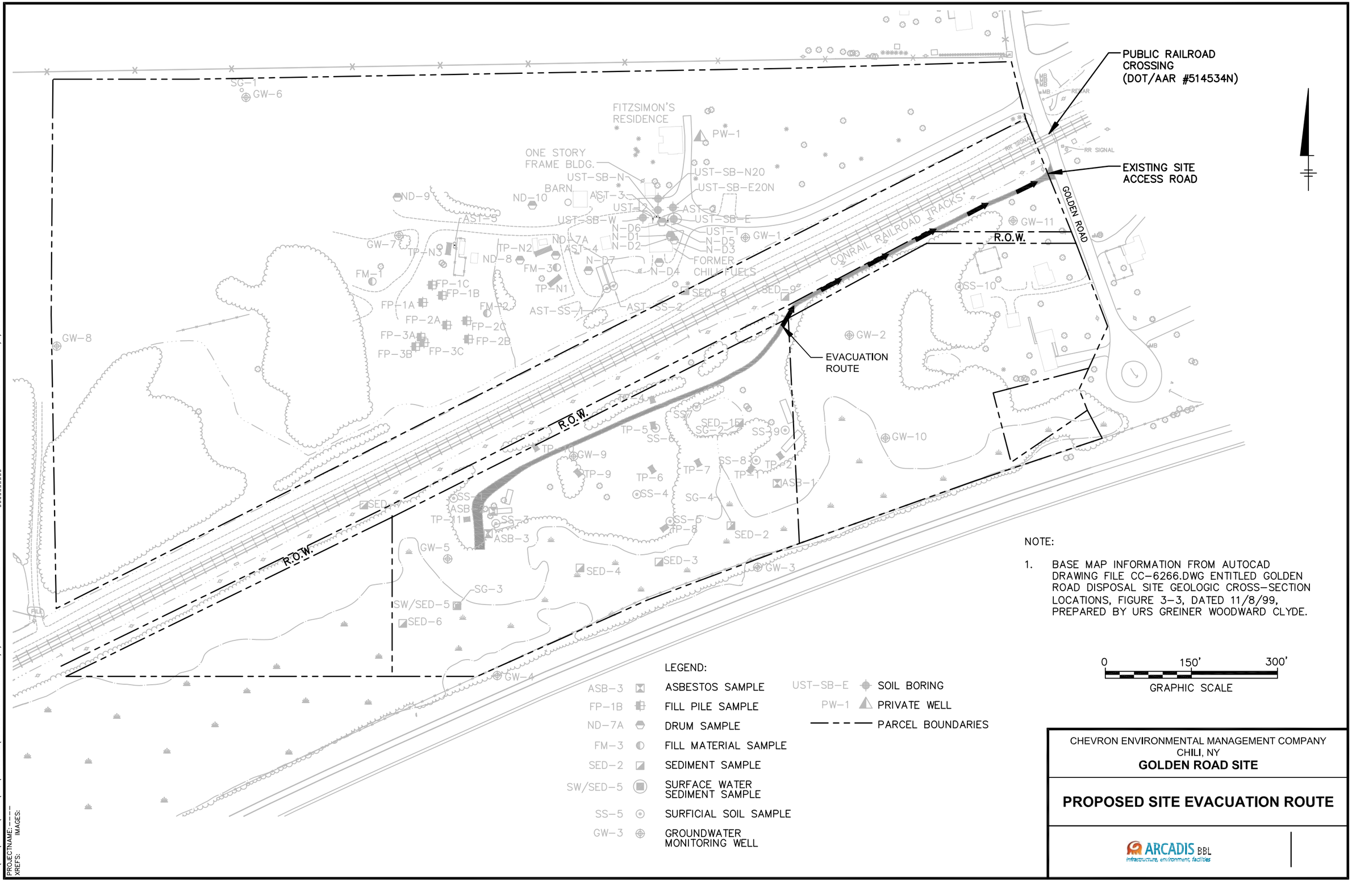


Summary: 7.8 miles (17 minutes)

Mile	Instruction	For	Toward
0.0	Head NORTH on Golden Road	0.3 mi	Stone Barn Road
0.3	Turn RIGHT at Westside Drive	2.8 mi	
3.1	Turn LEFT at Chili Avenue / RT-33A	0.9 mi	
4.0	Turn RIGHT at Brooks Avenue / RT-204	1.2 mi	
5.2	Take the ramp onto I-390 SOUTH	0.9 mi	
6.1	Take the Scottsville Road / RT-383 – EXIT 17	0.2 mi	
6.3	Turn LEFT at RT-383 / Scottsville Road	0.6 mi	
6.9	Slight RIGHT at Elmwood Avenue	0.9 mi	
7.8	End at 601 Elmwood Avenue		

SUMMARY

Driving distance: 7.8 miles
Trip duration: 17 minutes
Driving time: 17 minutes



NOTE:

1. BASE MAP INFORMATION FROM AUTOCAD DRAWING FILE CC-6266.DWG ENTITLED GOLDEN ROAD DISPOSAL SITE GEOLOGIC CROSS-SECTION LOCATIONS, FIGURE 3-3, DATED 11/8/99, PREPARED BY URS GREINER WOODWARD CLYDE.

LEGEND:

ASB-3	ASBESTOS SAMPLE
FP-1B	FILL PILE SAMPLE
ND-7A	DRUM SAMPLE
FM-3	FILL MATERIAL SAMPLE
SED-2	SEDIMENT SAMPLE
SW/SED-5	SURFACE WATER SEDIMENT SAMPLE
SS-5	SURFICIAL SOIL SAMPLE
GW-3	GROUNDWATER MONITORING WELL
UST-SB-E	SOIL BORING
PW-1	PRIVATE WELL
	PARCEL BOUNDARIES

0 150' 300'

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
CHILI, NY
GOLDEN ROAD SITE

PROPOSED SITE EVACUATION ROUTE

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Attachment W

BBL Chevron Client-Team Hand Safety Program

BBL Chevron Client-Team Hand Safety Program

Over the past two years we have experienced too many hand injuries. Following Chevron RTBU's recent initiative, BBL's RTBU Team will be adopting a Hand Safety Program to reduce the frequency of hand injuries. This policy is applicable to all BBL staff and subcontractors on RTBU projects.

Our Hand Safety Program will focus on two areas which are outlined below. Program Managers and Project Managers will be reviewing the details of these programs with staff during the first week of November. If you have any questions regarding these programs or have recommendations, please contact the PIC or your Portfolio Manager.

"Where are Your Hands?" Program

- We will be selecting brightly colored gloves (when ever possible) for wear to increase visibility and awareness of hand positions. Glove colors will be changed once per month.
- Glove type must be appropriate for the task (e.g., disposable nitrile gloves do not provide adequate protection from broken glassware, cut resistant gloves are to be worn for final tightening of glass vials)
- "Hand stickers" are to be placed on equipment that have hand hazards to remind everyone of pinch points (to be provided by CVX)
- ***Work Commentary***– Helps with communicating to each other what is going on and what your co-worker(s) will be doing next (daily when working in teams) talk through the highest hand hazard for the day in tailgate or at the start of the task
- ***Stop and Lock*** – All moving parts must have stopped before placing hands on them, let the energy out of moving parts, make sure hands are away from potentially moving part before adding energy (e.g., Drillers may not grab moving cables)
- JSA revisions to accurately define work task risks to hands. JSAs should specifically define what is the minimum level of PPE for the job (e.g., Nitrile, cotton, leather, vinyl coated, Kevlar, steel mesh gloves). Not simply have "PPE as appropriate."

FBOK Policy

You should not use any Fixed Open Blade Knives (FBOK) without written approval from your Program Manager. If you are working on an RTBU site, you must also receive written approval of RTBU. You must use an alternative cutting tool that is suitable for the job whenever possible.

Always perform a through Job Safety Analysis (JSA) to define the proper cutting tool for the task. If an FOBK is the defined alternative then an FOBK Exception Permit must be submitted to your Program Manager for approval. If you are working on an RTBU site, the FOBK Exception permit must be signed by the RTBU PM and approved by the Area Manager before the task can occur.

If you observe the use of a FOBK exercise Stop Work Authority and verify that a FOBK Exception Permit has been issued or amend the JSA and use an acceptable tool.

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Appendix D

Community Air Monitoring Plan

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Imagine the result

Chevron Environmental Management Company

Community Air Monitoring Plan

Golden Road Disposal Site

December 2007

Table of Contents

1. Introduction

This *Community Air Monitoring Plan* (CAMP) has been prepared by ARCADIS of New York, Inc. (ARCADIS BBL, formerly known as Blasland, Bouck & Lee, Inc.) in support of the *Sampling and Analysis Plan* (SAP) for the Chevron Environmental Management Company (Chevron) Golden Road Disposal Site located in Chili, New York (site). This CAMP fulfills the requirements set forth by the New York State Department of Health (NYSDOH) *Generic Community Air Monitoring Plan*, dated June 2000 (Attachment A). The intent of this CAMP is to provide for a measure of protection of the downwind communities from potential airborne releases of constituents of concern during SAP activities. As such, this CAMP specifies the potential air emissions, as well as the air monitoring methods, action levels and abatement measures that will be implemented during SAP activities at the site.

1.1 Site Description

This site is located in a rural residential area of the Town of Chili. It consists of the southern portion of the property identified as 227 Golden Road, between the railroad tracks and Interstate 490. The site is mostly a vacant lot with some wooded areas and abandoned tanks and equipment.

The site was originally brought to the attention of the New York State Department of Environmental Conservation (NYSDEC) as a result of a citizen report called into the Monroe County Sheriff's Office. It was inspected and sampled in July 1983, at which time over 200 drums in various stages of decay were noted on the south side of the railroad tracks. The NYSDEC completed an interim remedial measure (IRM) drum removal in June 1985, with the removal of 562 drums and containers and 75 cubic yards of contaminated soil and debris from the south parcel.

A Phase II investigation showed elevated levels of heavy metals and low levels of volatile organic compounds (VOCs) in shallow groundwater. A petroleum-contaminated soil removal north of the railroad tracks near the former Chili Fuels building was carried out in early 2001. The remedial investigation/feasibility study (RI/FS) was completed in late 2001.

1.2 Summary of Selected Site Remedy

The Record of Decision signed in October 2002 calls for hot spot removal of waste and associated contaminated subsurface soils from the south parcel, regrading the south

parcel to improve drainage and long-term groundwater monitoring. No consequential amounts of hazardous waste were identified on the property north of the railroad tracks and that portion of the property has subsequently been removed from the site description.

The first phase of the remedy implementation includes mobilizing to the site to implement the SAP to fully delineate the areas of excavation, as well as to provide pre-excavation confirmatory samples.

1.3 Potential Air Emissions Related to Sampling Activities

The SAP specifies that multiple test pits will be excavated at the site to perform the sampling activities. Excavation of these test pits presents the potential to generate localized impacts to air quality.

2. Air Monitoring Procedures

As required by the NYSDOH CAMP, ambient air monitoring will be implemented at the site to quantify total VOCs and particulate matter less than 10 microns in diameter (PM_{10}). Air monitoring will occur during any site activity that may generate fugitive dust emissions. Total VOCs and PM_{10} levels in ambient air will be continuously measured in real-time using portable instruments. The sample location rationale, sample methods, action levels and abatement procedures are discussed below.

2.1 Sampling Location Selection

One upwind and two downwind air monitoring sample locations will be selected based on the established work zone area, proximity to potential community receptors and the prevailing wind direction. In general, the initial air monitoring stations will be located along the perimeter of the work zone as defined in the site *Health and Safety Plan* (HASP). If VOC or PM_{10} action levels (discussed below) are exceeded at the downwind work zone perimeter, then the downwind air monitoring location will be moved to the nearest downwind community receptor.

Note that the air monitoring locations may change throughout the day based on changes in wind direction and work zone areas.

2.2 Sampling Methods

Total VOCs in ambient air will be monitored and recorded using a portable organic vapor analyzer (OVA) equipped with a photoionization detector (PID) with data-logging capabilities (MiniRae2000 or equivalent). The OVA PID will be housed in a watertight shelter attached to a tripod and set at a height of approximately 5 feet above the ground. Total VOC levels will be measured continuously and recorded at 15-minute average intervals.

PM_{10} levels in ambient air will be monitored and recorded using a portable dust monitor capable of particle size fractionization of less than 10 microns in diameter (TSI Dust TRAK or equivalent). The dust monitor will be housed with the OVA PID in a watertight shelter attached to a tripod and set at a height of approximately 5 feet above the ground. PM_{10} levels will be measured continuously and recorded at 15-minute average intervals.

On-site personnel will monitor the total VOC and PM_{10} levels within the work zone as part of the HASP. If VOC or PM_{10} levels within the work zone increase, then the upwind and downwind perimeter air monitoring stations will be checked at 15-minute intervals to determine if the VOC levels or PM_{10} are increasing at the work zone perimeter. If the downwind levels are greater than the upwind levels, then it will be assumed that the emissions are the result of work zone activities. If the difference between the downwind and upwind VOC or PM_{10} level is greater than their respective action level (discussed below), then monitoring will commence at the nearest downwind community receptor.

2.3 Action Levels

The action levels provided below are based on the values provided in the NYSDOH generic CAMP and will be used to initiate response actions, if necessary, based on real-time monitoring.

2.3.1 Total Volatile Organic Compound Action Levels

The following total VOC action levels and responses, based on the NYSDOH generic CAMP, will be implemented during any IRM activity that may generate emissions.

- If the ambient air concentration of total VOCs exceeds 5 parts per million (ppm) above the background (upwind location) for the 15-minute average, intrusive site activities will be temporarily halted while monitoring continues. If the total VOC concentration readily decreases (through observation of instantaneous readings) below 5 ppm above background, then intrusive site activities will resume with continuous monitoring.

- If the ambient air concentrations of total VOCs persist at levels in excess of 5 ppm above background but less than 25 ppm above background, intrusive site work activities will be halted, the source of the elevated VOC concentrations identified, corrective actions to reduce or abate the emissions undertaken and air monitoring will continue. Once these actions have been implemented, intrusive site work activities will resume provided the following two conditions are met:

    - the 15-minute average VOC concentrations remain below 5 ppm above background

- the VOC level 200 feet downwind of the sample location or half the distance to the nearest potential receptor or residential/commercial structure (whichever is less but in no case less than 20 feet) is less than 5 ppm over background for the 15-minute average

- If the ambient air concentration of total VOCs is more than 25 ppm above background, intrusive site activities will stop and emission control measures will be implemented.

2.3.2 PM_{10} Action Levels

The following PM_{10} action levels and responses, based on the NYSDOH generic CAMP, will be implemented during any IRM activity that may generate emissions:

- If the average ambient air concentration of PM_{10} at any one (or more) of the sampling locations exceeds 100 micrograms per cubic meter ($\mu g/m^3$) above the background (upwind location) for a 15-minute interval, or if airborne dust is observed leaving the work area, intrusive site activities will be temporarily halted. The source of the elevated PM_{10} concentration is to be identified, corrective actions to reduce or abate the emissions will be undertaken, and air monitoring will continue. Work may continue following the implementation of dust suppression techniques provided the PM_{10} levels do not exceed 150 $\mu g/m^3$ above background, and provided no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, PM_{10} levels are greater than 150 $\mu g/m^3$ above background, work will stop and site activities will be re-evaluated. Work will only resume after dust suppression measures and other controls are implemented and PM_{10} levels are less than 150 $\mu g/m^3$ above background and no visible dust is migrating from the work area.

2.4 Emission Control Measures

The following emission control measures may be used if action levels are exceeded during SAP activities:

- apply water to exposed soil/material piles

- cover excavated soil/material piles with plastic sheeting or other appropriate material
- reduce surface area of exposed material/soil area
- containerize excavated material
- use foam suppressants
- implement methods to eliminate emissions that could occur after site work ceases

2.5 Meteorological Monitoring

Wind direction and wind speed will be monitored and recorded at least once per hour during intrusive activities. Wind direction will be determined using a windsock, wind vane, multi-purpose wind meter or other appropriate equipment. Wind speed will be determined using a handheld wind speed meter.

2.6 Instrument Calibration

Calibration of the VOC and PM_{10} instrumentation will occur in accordance with each of the equipment manufacturer's calibration and quality assurance requirements. The VOC and PM_{10} monitors will be calibrated at least daily, and calibrations will be recorded in the field activity logbook.

3. Monitoring Schedule and Data Collection and Reporting

Air monitoring schedule and data collection and reporting requirements to be followed throughout the SAP activities are presented below.

3.1 Monitoring Schedule

Real-time VOC and PM_{10} monitoring will be performed continuously throughout the SAP activities during excavation and materials handling activities. VOC monitoring will also be performed during non-intrusive sampling-type activities. Meteorological monitoring will be performed continuously during the SAP activities.

3.2 Data Collection and Reporting

Air monitoring data will be collected continuously from VOC and PM_{10} monitors during intrusive site activities via real-time monitoring devices. All readings will be recorded and archived for review by NYSDOH and NYSDEC personnel (if necessary).

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Attachment A

Generic Community Air Monitoring Plan

New York State Department of Health
Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

June 20, 2000

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