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FINAL REMEDIATION PLAN

**NMDOT Cliff Patrol Yard
Facility # 29647; Release ID # 1869
Cliff, Grant County, New Mexico**

Prepared for:



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ACRONYMS AND ABBREVIATIONS

AQB	Air Quality Bureau
AS	air sparge
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CFM	cubic feet per minute
CGI	combustible gas indicator
COC	contaminant of concern
EPA	Environmental Protection Agency, United States
FRP	Final Remediation Plan
ft	feet <i>or</i> foot
INTERA	INTERA Incorporated
ITRC	Interstate Technology & Regulatory Council
LNAPL	light non-aqueous phase liquid
NMAC	New Mexico Administrative Code
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the State Engineer
NMWQCC	New Mexico Water Quality Control Commission
NPR	no permit required
O&M	operation and maintenance
P&ID	pipng and instrumentation diagram
PID	photoionization detector
ppm	parts per million
PSTB	Petroleum Storage Tank Bureau
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
scfm	standard cubic feet per minute
Site	NMDOT Cliff Patrol Yard in Cliff, New Mexico
SVE	soil vapor extraction
UST	underground storage tank

ACRONYMS AND ABBREVIATIONS (Continued)

TPH total petroleum hydrocarbons

VOC volatile organic compound

Work Plan Work Plan and Cost Estimate for Final Remediation Plan Development

1.0 INTRODUCTION

On behalf of the New Mexico Department of Transportation (NMDOT), INTERA Incorporated (INTERA) is submitting this Phase 4 Final Remediation Plan (FRP) for the NMDOT Patrol Yard in Cliff, New Mexico (Facility # 29647; Release ID # 1869) (Site). The location of the Site is illustrated in **Figure 1**. This FRP is being submitted for technical approval by the New Mexico Environment Department (NMED) Petroleum Storage Tank Bureau (PSTB) and was developed in accordance with the Work Plan and Cost Estimate for Final Remediation Plan Development, submitted on March 3, 2020, revised March 11, 2020 (INTERA, 2020a), and subsequently approved by PSTB on April 13, 2020. Notice to proceed was granted by NMDOT on April 14, 2020. The deliverable identification for this FRP is 18786-1. The proposed corrective action activities described in this FRP are in accordance with local, state, and federal regulations, including 20.5.119.1923 New Mexico Administrative Code (NMAC) Section A through Section E and Title 29 Code of Federal Regulation Section 1910 for health and safety.

Investigation and remediation efforts at the Site date back to 1989. Sparge/vent remediation efforts executed between 1994 and 1999, coupled with natural attenuation processes, were successful in reducing petroleum hydrocarbon concentrations in soil and groundwater to levels below New Mexico Water Quality Control Commission (NMWQCC) Standards in the southern portion of the Site. A small area of petroleum hydrocarbon contamination persists in the northern portion of the Site. This FRP details a proposed small-scale soil vapor extraction (SVE) remediation system that targets this localized contamination. Light non-aqueous phase liquid (LNAPL) has been vertically redistributed as the water table has dropped to historical low levels. As a result, a relatively thick interval of impacted soil is now unsaturated, presenting an opportunity for remediation by SVE.

The SVE system discussed herein uses a staged approach to achieving the remediation goals discussed in Section 3.2. A staged approach is being implemented to better inform SVE well placement and to account for the potential impact on NMDOT budgetary constraints for cleanup at NMDOT PSTB sites due to the current COVID-19 pandemic.

The rest of this section provides a summary of Site investigation and remediation activities, presents the geology and hydrogeology of the Site, and includes a discussion of the distribution of contaminants in the subsurface.

1.1 Site Summary

Until April 1989, unleaded gasoline and diesel fuels were stored in two 1,000-gallon underground storage tanks (USTs), and dispensed by underground distribution lines and a pump island (**Figure 2**). In April 1989, the dispensers, USTs, and lines were removed after the system failed tightness testing. Soil impacted with petroleum hydrocarbons was detected beneath the former

USTs and dispenser islands. Groundwater beneath the facility was also found to be impacted. The dissolved-phase hydrocarbon plume followed the local groundwater gradient and migrated north from the former dispenser area and away from the on-site water supply well (Duke Engineering & Services, 2001).

A Subsurface Volatilization and Ventilation System (U.S. Patent Nos. 5,221,159; 5,227,518; and 5,472,294) was installed at the Site in November 1994. Regular maintenance and operation of this system was discontinued in early 1996. The system continued to operate unattended until May 9, 1997, when it was shut down completely pending PSTB approval of continued operation, which was granted in October 1997 (Duke Engineering & Services, 2001). Between March and June 1998, the system operating in the southern portion of the Site was deactivated, general system repairs were made, and remedial action was focused on the northern portion of the Site where groundwater contamination persisted. The remediation system operated continuously in this modified configuration throughout the remainder of the second and most of the third quarter of 1998 (Duke Engineering & Services, 2001). The system was deactivated in September 1999, after it was determined that limited volatile organic compounds (VOCs) were being recovered, and decommissioned in April 2003 (INTERA, 2003).

Periodic groundwater monitoring from 2000 to present has documented the continued presence of benzene, toluene, ethylbenzene, total xylenes (BTEX), and total naphthalene at concentrations above their corresponding NMWQCC Standards in the northern portion of the Site. These constituents are considered the Site's contaminants of concern (COCs). Additionally, LNAPL has historically been detected in MW-13, although no measurable LNAPL has been measured during recent monitoring events. Contamination has never been detected in the on-site water supply well.

Monitoring wells installed in the northern portion of the Site from 2015 to 2019 refined the extent of the dissolved-phase plume to an estimated area of 7,700 square feet (ft). The magnitude of concentrations of the COCs in groundwater and field screening soil sample data collected from MW-20 reflect the presence of residual LNAPL. In August and September 2019, SVE and air sparge (AS) test wells were installed near MW-20 and pilot testing was conducted. Concentrations of VOCs in soil gas collected from the SVE test well provided further support for the presence of LNAPL in this area. The results of the pilot tests indicated that SVE is a viable technology to remove smeared hydrocarbons in unsaturated soils and protect groundwater from continued impacts due to leaching. Air sparging was determined to not be feasible (INTERA, 2019). Locations of monitoring wells, estimated extent of soil contamination, and the extent of the dissolved-phase plume are illustrated in **Figure 3**.

1.2 Geology and Hydrogeology

The Site is located on the southeastern edge of the Mogollon Rim, which marks the southern edge of the Colorado Plateau. Elevation of the Site is approximately 4,600 ft above sea level. The ground surface generally slopes from south to north.

The units encountered during investigations are part of the geologic formations mapped on the “Geologic Map of the Cliff Quadrangle, Grant, County New Mexico” as “Quaternary Alluvium” and “Older gravels of the Gila Conglomerate (Pleistocene and Pliocene)” (Finnell, 1987). At the location of SVE-1, the subsurface impacted with petroleum hydrocarbons is composed of unconsolidated to strongly cemented, fine- to coarse-grained sand with lesser amounts of gravels and cobbles (INTERA, 2002; INTERA, 2019). Units of fine-grained sand containing silt and clay are interbedded with these sand and gravel units at other nearby boring locations. A 2-inch thick, particularly competent calcium carbonate cemented layer of sand with gravel was noted at approximately 28.6 ft below ground surface (bgs) during drilling of AS-1. Thin cemented layers were also noted at other borehole locations and these cemented units, especially the unit noted in AS-1, which may confine fluid movement (INTERA, 2019). Cross sections illustrating the general stratigraphy at the Site are provided in **Figure 4a** and **Figure 4b**.

Groundwater flow direction is to the north/northeast towards an intermittent stream which flows into Duck Creek, a tributary to the Gila River. In February 2020, the groundwater potentiometric surface ranged from a low of 4,584.32 ft above mean sea level at MW-15 to a high of 4,598.73 in MW-1 (**Figure 5**). The gradient across the Site was estimated to be 0.066 ft/ft in February 2020 but has consistently been approximately an order of magnitude steeper in the northern portion of the Site relative to the gradient in the southern portion. Historical fluctuations in groundwater levels also differ in wells located in the northern portion of the Site relative to those in the southern portion. For example, the depth to water in MW-15 dropped 5.16 ft from 16.48 ft in April 2008 to 21.64 ft when last measured in February 2020. During this same period, the water level in MW-1 rose 0.34 ft from 17.86 ft to 17.52 ft (INTERA, 2020b) (**Figure 2**). As discussed below, this greater than 5 ft drop in the water table in the northern portion of the Site has vertically redistributed LNAPL, creating an LNAPL body that is immobile (residual LNAPL) and has exposed a relatively thick highly contaminated unsaturated zone, creating an opportunity for the use of SVE to remove petroleum hydrocarbon mass (**Figures 4a** and **4b**).

1.3 Distribution of Contamination

1.3.1 Contaminants of Concern

Field and laboratory analytical data collected from the numerous investigations completed at the Site has confirmed that soil and groundwater at the Site have been impacted with petroleum

hydrocarbons. COCs at the Site include total petroleum hydrocarbons (TPH), gasoline range organics and diesel range organics, in soil and benzene, toluene, ethylbenzene, total xylenes, and total naphthalene in groundwater (**Table 2**).

1.3.2 Soil

Soils highly impacted with petroleum hydrocarbons were confirmed during recent investigations in the northern portion of the Site (e.g., INTERA, 2019). Soil contamination in the northern portion of the Site is a result of the transport of LNAPL and dissolved-phase contaminants originating from the source area in the southern portion of the Site. For this discussion, highly impacted soils are defined as soils containing VOC concentrations greater than 500 parts per million (ppm) as measured with a photoionization detector (PID) using the heated headspace method. This criterion has been cited by the Interstate Technology & Regulatory Council (ITRC) as a potential LNAPL indicator for recent releases, with LNAPL potentially being present at much lower PID readings for older (weathered) releases (ITRC, 2018). The highest concentrations of VOCs are present in soil and soil vapor in the vicinity of wells SVE-1, MW-8, MW-20, and AS-1. The horizontal extent of soil containing VOCs greater than 500 ppm is estimated to be 5,500 ft² (0.13 acres) (**Figure 3**). The vertical extent of soils containing, based on field heated headspace methods of soil samples collected from this well cluster, extends from approximately 15 ft bgs to a depth of 22 ft bgs, which roughly coincides with the historic high and low water table depths (**Figures 4a** and **4b** and **Table 1**). Although soil data does not exist for MW-13, the southern extent of soil contamination includes MW-13 because LNAPL was measured in this well as late as 2013 and groundwater is impacted at this location. Refinement of the western edge of highly impacted soils between SVE-1 and MW-7 is hampered by the presence of an open-air building used by NMDOT for equipment storage.

1.3.3 Light Non-Aqueous Phase Liquid

LNAPL was observed in monitoring well MW-13 from April 2003 to January 2013. Since January 2013, LNAPL has not been measured in MW-13 (INTERA, 2013), and the magnitude of the detected VOCs in groundwater samples collected from MW-13 during the recent monitoring events suggests that mobile LNAPL is not present at or in the vicinity of MW-13. The magnitude of VOCs detected in groundwater samples collected from MW-20 suggests that LNAPL may be present in the vicinity of MW-20 (INTERA, 2016a, 2016b, 2018). As suggested by ITRC (2018), the presence of LNAPL in the vicinity of MW-20 is further supported by PID readings greater than 500 ppm in soil samples recently collected from pilot test wells SVE-1 and AS-1, which were installed immediately adjacent to MW-20 (INTERA, 2019).

1.3.4 Groundwater

The estimated areal extent of groundwater contamination covers an area of 7,700 ft² (0.18 acres) with the dissolved-phase contaminant plume remaining on-site (**Figure 3**). Concentrations of COCs in groundwater are highest at monitoring wells MW-13 and MW-20, with lower

concentrations of COCs noted in MW-21. This is the area that will be targeted for remediation and is coincident with the area containing highly impacted soils (**Figure 3**). The magnitude of the concentrations of COCs at MW-20 is indicative of residual LNAPL. Analysis of temporal trends show a slight decrease of benzene concentrations in groundwater samples collected from MW-21, but little change in samples collected from MW-13 and MW-20 (INTERA, 2020b). COCs have never been detected in the on-site NMDOT Water Supply Well.

2.0 CONTRACTOR QUALIFICATIONS

INTERA is a licensed contractor in the State of New Mexico and holds GS-29 (Soil and Groundwater Remediation) and GB-98 (General Building) licenses (License #87101). Existing monitoring and SVE wells were installed by a drilling company licensed in New Mexico. Once technical approval is granted to implement the FRP, a general contractor will be selected and INTERA will coordinate any necessary mobilization of major remediation equipment and utility connections. All work will be performed under the supervision of a professional engineer licensed in the State of New Mexico.

3.0 EXPOSURE PATHWAYS AND REMEDIATION GOALS

This section discusses the potential exposure pathways for the COCs present at the Site with respect to potential environmental receptors based on the current property use. This evaluation was instrumental in identifying the remediation goals for the Site.

3.1 Exposure Pathways

No complete exposure pathways currently exist at the Site. Ingestion of contaminated groundwater poses the highest risk potential since a potable water supply well exists on Site. The risk of impact to this well is low since the water supply well is outside of the estimated areal extent of groundwater contamination, and the flow direction of the contaminated groundwater is away from the water supply well. Moreover, no COCs have been detected in groundwater samples collected from this well and no plans are known for installing a new water supply well. The nearest off-site water supply wells are located 0.12 miles southeast of the Site and 0.15 miles northwest of the Site and are not at risk of impact. Continued impacts to groundwater caused by leaching of COCs sorbed to soil above the water table is probable. Dermal contact with contaminated soils is a low risk because highly impacted soils are deeper than what is typically encountered during normal business or construction activities. Vapor intrusion risk is minimal since no enclosed occupied buildings are located over the residual LNAPL and the vertical separation between the residual LNAPL and building is 15 feet.

3.2 Remediation Goals and Objectives

The remediation goal is to reduce the concentrations of dissolved-phase COCs to levels below NMWQCC Standards so that the Site can obtain a no further action status from the PSTB. To achieve this goal in a timely manner, the proposed SVE system will target residual LNAPL located in the area illustrated on **Figure 3**, which is a continuing source for the dissolved-phase plume. The objective of the proposed SVE system detailed in the following sections is to remove the residual LNAPL mass above the water table to the extent practicable and decrease the VOC composition of the residual LNAPL so that the partitioning and leaching of VOCs into groundwater from the remaining LNAPL is minimized. The following metrics will be used to evaluate the progress of the SVE system towards meeting this objective:

- Reduction in VOC removal rates by the SVE system to the point that an asymptotic curve is reached, indicating that further recovery of vapor-phase residual LNAPL is impracticable.
- A declining groundwater plume as evidenced by a statistically proven reduction in COC concentrations within the limits of the plume identified in **Figure 3**.

4.0 DESCRIPTION OF PROPOSED SYSTEM

An SVE system has been sized and designed to operate on a skid that can be moved around the Site and extract vapors from one well at a time. The decision to implement SVE has been based on several criteria including:

1. SVE can be used to specifically target residual LNAPL, vapor-phase contaminants, and dissolved-phase contaminants in the smear zone above the current water table.
2. SVE is a proven technology with readily available infrastructure that can be procured and installed in a relatively short period of time.
3. Capital and operation and maintenance (O&M) costs are low compared to other alternatives. There is an opportunity to incorporate used equipment from the PSTB's equipment inventory, which could provide added value to the State of New Mexico.

Initially, the SVE system will extract from a dedicated SVE well (SVE-1). If the water table does not significantly rebound and contaminant recovery rates decline from SVE-1, the system will have the capacity to be connected to one of the existing groundwater monitoring wells or to other SVE wells considered for installation. The remediation system is designed to achieve the goals outlined in Section 3. The SVE system will include a skid-mounted blower, a moisture knockout container, particulate filter, instrumentation, controls, and ancillary appurtenances. Off-gas treatment is not required for this system, given the magnitude and rate of discharged hydrocarbons from the SVE system.

Details of the proposed remediation system are included in the engineering drawings provided in **Appendix C** and products cut sheets for major remediation components are included as **Appendix D**.

4.1 Design Basis

To verify the applicability of SVE as a viable remediation method, a pilot test was conducted in 2019 and the collected data were used to inform the design of the SVE system described herein. A full description of the work and a detailed summary of the pilot test data are included in a separate reported entitled Well Installation, 1st Semiannual Groundwater Monitoring, and Pilot Test Report (INTERA, 2019). Specific design parameters gleaned from the SVE pilot test include the following:

- A maximum flow rate of 9.25 standard cubic feet per minute (scfm) was induced at a vacuum of 122 inches of water. This is a relatively low flow rate for the induced vacuum. Additionally, the water table in the extraction well mounded steadily

throughout the test with a maximum rise of nearly 8 ft. The open screen of SVE-1 prior to the test was 11.6 ft, resulting in a minimum of 4 to 5 ft of available open screen at maximum vacuum. These data indicate that SVE can be applied at the Site to induce pore volume exchanges and mass removal; however, the system will have to operate at relatively high vacuum and low flow and water table mounding will need to be monitored to make sure the screen does not get occluded. The optimum vacuum is projected to be approximately 80 to 100 inches of water. This vacuum is projected to achieve flow rates of 4 to 6 scfm with water table mounding in the extraction well of approximately 5 ft.

- Vacuum influences were recorded at all four observation wells, which were spaced at distances of 9.7, 9.8, 39.5 and 42.5 ft from SVE-1, indicating that the geologic system is laterally connected and suitable for SVE. Plotting of the vacuum response relative to the distance from the extraction well consistently indicated that 3% of the applied vacuum could be exerted at approximately 15 ft radially from SVE-1. This equates to a volume of over 7,000 cubic ft of undisturbed soil volume through the approximate 10 ft of exposed screen (assumed static water level). A vacuum response of approximately 0.1 inches of water was interpolated to extend to approximately 34 to 37 ft at vacuums greater than 70 inches of water.
- Maximum TPH concentrations of over 25,000 ppm (volumetric) were observed indicating a TPH mass removal rate of 2.26 pounds per hour.
- Measurements for carbon dioxide and oxygen from vented vapors during the pilot test show an increase and decrease in these compounds, respectively. This confirms that in addition to volatilization and removal of hydrocarbons from the subsurface, the SVE system will also induce in situ respiration and biodegradation of the COCs. Additionally, the steady decrease in oxygen supports the assumption that short circuiting of vacuum to the surface was minimal. The oxygen leveled off and increased slightly at vacuums of 100 to 122 inches of vacuum, suggesting that the targeted vacuum for operation should be maintained at or below 100 inches of water.
- The water table elevation has declined for nearly 20 years, suggesting that this condition is likely to persist for several years, even if drought conditions improve. This provides the opportunity to apply the remediation efforts in a staged manner, using appropriately sized equipment to extract vapors from individual wells and monitor the impacts. Given the age of the release, the volatile component of the fuel may be readily depleted after system startup. The proposed action will allow for mass removal without the commitment of large capital expenditures on high vacuum/flow equipment and extensive plumbing and infrastructure commitments.

4.2 Aboveground Treatment Equipment

Several different SVE equipment packages were evaluated for this remediation effort. The challenge was to select a blower system that would satisfy the conditions of the design basis at competitive capital and O&M costs. The selected system has been engineered to connect to one extraction well at a given time and direct discharge to the atmosphere. The system will be skid-mounted (see **Appendix C, Sheet 5**) and temporarily placed in a location near the north end of the plume area (see **Appendix C, Sheet 2**). This location will provide the flexibility to connect to alternate groundwater monitoring or future SVE wells without moving the equipment. The treatment process, described in detail below, shall include instrumentation, vacuum/flow control valving, condensate removal equipment, an air dilution inlet with silencer (optional), the blower control panel and interlocks, and the blower. A piping and instrumentation diagram (P&ID) for the system is provided in the engineering drawings provided in **Appendix C**.

The components will be procured and installed on a skid. INTERA, on behalf of the NMDOT, has been communicating with the PSTB to determine if the State of New Mexico owns an existing SVE skid with desired components in its unused equipment inventory. If suitable equipment is available, it will be integrated into the system design and shown in the as-builts after construction.

4.2.1 SVE Blower

Based on the SVE pilot test, the vacuum needed at the extraction wellhead(s) to achieve optimum vacuum response is 80 to 100 inches of water. This vacuum is at the upper end of the capacity for regenerative blowers. Because of the remoteness of the Site, the selected equipment needs to be able to operate reliably between infrequent O&M visits. Rotary lobe blowers would provide better capacity for a multi-well SVE system; however, this option was rejected due to the typical requirement of a belt-driven system to frequently lubricate bearings and other components.

The selected blower for this system will be a 3.0-horsepower Rotron regenerative blower (Model No. EN523) capable of delivering a flow of at least 10 scfm at 100 inches of water. The blower will be mounted on the skid and connected to a manual dilution air valve (bleeder valve) with an intake filter and silencer. The blower inlet will be protected by an inline particulate filter. Elevated blower operating temperatures are anticipated, which will require galvanized steel pipe to be connected to the blower inlet and discharge. An adjustable vacuum relief valve will be plumbed into the system between the particulate filter and the blower and be set at a vacuum break point recommended by the blower manufacturer.

4.2.2 Vapor-liquid Separator

The piping manifold will connect to a moisture separator with an integrated demister, which is essential to the protection of the SVE blower from corrosion and mineralization. The moisture

separator will be a Rotron Model MS200PS (or equivalent, if available in the PSTB's equipment inventory) with 200 cubic feet per minute (CFM) capacity and liquid storage capacity of 7 gallons. The vessel will be equipped with an integrated adjustable vacuum relief valve (which will be set to a vacuum point that is protective of the vessel), vacuum gauge (discharge side – 0 to 160 inches of water gauge), and a liquid level switch. The level switch will be wired into the control panel and will turn the system off if the vessel reaches the liquid capacity, thus preventing the particulate filter and blower from flooding. The moisture separator is outfitted with a drain at the base to facilitate the removal of recovered condensate. The recovered condensate will be manually drained during routine O&M Site visits.

4.2.3 Instrumentation and Controls

The blower system will be controlled by a motor starter mounted on a panel. As described above, the only alarm interlock will be the high-level setting on the moisture separator. All instrumentation will be analog, with direct reading gauges for vacuum and flow. A control manifold will connect between the extraction well and the blower skid. The manifold will include (in the direction of flow) a vacuum gauge, a 1/4-inch sample port, a throttling valve to control vacuum and flow, and an inline rotameter (Omega FLD 109). Vacuum gauges (0 to 160 inches of water) will be installed on either side of the inline particulate filter. A fresh air dilution valve (bleeder valve) will be installed in the system upstream of the moisture separator to ensure that the blower operates within the specified range of optimum efficiency. A submersible pressure transducer will be installed in the extraction well during initial startup and operation at each extraction well (SVE-1 and subsequent wells at a later time). The transducers will be vented to the well pressure for accurate measurement of mounding of the water table. Vacuum on the extraction well will be adjusted to maintain approximately 5 ft of available screen.

4.2.4 SVE Conveyance Line Piping

The conveyance line between the wellhead and the manifold will be Kanaflex® suction hose (or equivalent) with ultraviolet and chemical resistance. The hose will lay flat on the ground. Soil or gravel may be used to slope the hose towards the well to prevent condensate from occluding flow. Based on the expected extraction flow rate, the pipe diameter shall be no smaller than 2 inches, which is adequate for minimal pressure losses and prevention of excessive noise through the pipe. The flexible hosing shall be attached to the well by sliding it over the pipe installed on the rigid wellhead assembly and tightly secured with a hose clamp. Use of solvent welding shall be limited where possible for this application. The rigid plumbing used to construct the wellhead fittings and the manifold will be schedule 40 polyvinyl chloride (PVC) with threaded (National Pipe Thread) fittings. Some components (e.g. selected throttling and bleeder valves) may be fabricated from schedule 80 PVC, based on their only being available in that material. Thread tape (Teflon® or equivalent) will be used on threaded connections.

4.3 Vertical Wells

One existing 4-inch well (SVE-1) will be connected to a mobile extraction unit, with the option to connect to three existing 2-inch diameter monitoring wells (MW-8, MW-13, and MW-20) or any SVE wells which may be installed in the future. Details on well construction and historic fluid levels for these wells are provided in **Table 1**. Well connections will be made with a flexible fitting or reducing fitting (Fernco or equivalent). As shown in **Appendix C, Sheet 5**, the top of the Tee fitting will be used for the temporary installation of a transducer, and the horizontal entry will be used for connecting to the remediation equipment.

4.4 Utility Requirement/Utility Clearances

Based on the treatment equipment discussed in Section 4.2, three-phase power will be required for the 60-hertz, 230/460-volt SVE blower. According to the NMDOT Patrol Yard Supervisor, three-phase power is available on-site, and a service box has been installed near groundwater monitoring well MW-19. INTERA has elected to have the blower vendor provide and fabricate all electrical components on the SVE skid. These will include power connection termination for connecting to the NMDOT's power supply station, conductors and conduit to the motor starter panel and to the blower motor, level switch wiring and interlocks with the motor starter, motor starter actuator (Hand/Off/Auto), alarm enunciator (High Liquid Level) with reset, circuit breaker, and fuse(s)(as needed). The vendor will develop and provide electrical one-line drawings and wiring/control design drawings after approval of the FRP and upon receipt of a purchase order. Provided drawings will be included in the as-built record drawing set. The skid will be fabricated by the vendor prior to delivery. No wiring is anticipated on-site; however, if conditions are different than anticipated, a licensed electrician will be used to execute this work.

No utility clearances shall be required, as no excavation is necessary for the remediation system installation. A detailed site survey was not performed during preparation of this FRP; therefore, the locations of utilities in the installation area shown on the design drawings are approximate. Following construction, the As-Built report and drawings will include accurate descriptions of the electrical service.

4.5 As-Built Report

Following construction of the system described in the FRP, record drawings will be prepared, signed, and sealed by INTERA's Engineer of Record. The record drawings will be submitted to the NMED PSTB Project Manager as part of an As-built Report. The report will conform to the requirements of 20.5.119.1925.D NMAC and will include, but not be limited to, the following:

- Area/vicinity map.

- Detailed site diagram with locations of underground utilities and other subsurface structures on or adjacent to the site's property boundaries, buildings, monitoring wells, storage tanks and lines, sumps, impoundments, pit areas, water lines, and other relevant structures.
- Summary of site conditions.
- Any deviations from the drawings and specifications included in the FRP.
- Tabulation of pertinent data including, but not limited to, flow rates, pressures, contaminant concentrations, and groundwater elevations at startup.
- Boring logs and well completion diagrams.
- Inventory of purchased equipment.
- Discussion of the data collection methods.
- Laboratory results with chain-of-custody records and laboratory quality assurance/quality control (QA/QC) results for any samples collected during startup and initial operations.
- Information and documentation of all major remediation equipment that will be owned by the State of New Mexico, including but not limited to serial number, model and manufacturer, description, warranty information, operating manuals, maintenance requirements, and purchase price.

4.6 Optimization and Contingency Planning

Operation of the remediation system will include initial startup activities, regular maintenance, and on-going assessment to evaluate system optimization. Collected data will be used to make decisions regarding when removal efficiencies warrant switching the operation of the system to different wells. Significant changes in system operation will be communicated to the NMED and NMDOT prior to implementation. System monitoring objectives include on-going analysis of mass removal and documenting discharge concentrations to comply with air permitting regulations.

Progress of the smear zone reduction will be evaluated by monitoring the concentration of VOCs in the extracted vapor from the source SVE well. The total mass of VOCs and chemical composition of extracted vapors will be quantified and documented.

Modifications to the system may be needed once adequate data is obtained after startup. The proposed design is based on pilot test data and professional judgement; however, conditions may vary from those previously observed. INTERA has identified the following items that will be closely monitored and may require system modifications to optimize operation:

- Monitoring condensate generation rates during startup will help in determining if integration of an automated pump-out system will be necessary. The system design assumes that manual draining of the moisture separator is adequate to maintain system operation.
- Additional noise abatement may be necessary depending on whether dilution mixing is required to operate the blower. The nearest residence is over 500 ft from the proposed location of the equipment. Normally, this would be an adequate distance to abate nuisance noises; however, the Site is in a very rural area where ambient noises are minimal. If the NMDOT receives complaints regarding the system operation, additional noise abatement measures may be required. A muffler has been identified in the equipment list, as an optional accessory.
- Off-gas treatment is not included in the design. The stack height will disperse the exhausted vapors at a height of 10 ft or greater. Nuisance or hazardous vapors are not anticipated, but conditions around the remediation skid will be monitored during startup. Modifications will be made to the system if conditions are different than assumed.
- The volatile component of the residual LNAPL and contaminants in the soil vapor may be rapidly reduced after startup. In addition to having the option of connecting the system to alternate Site wells, other operational enhancements will be considered. These could include cycling the system operation or reducing vacuum on the extraction point to enhance aerobic degradation of COCs adsorbed to soil particles.
- A challenge identified with aboveground plumbing is ensuring that condensate does not form in the conveyance piping and occlude flow. Because the anticipated extraction flow rate is relatively low, the velocity in the conveyance pipe may not be great enough to move all liquid to the moisture separator. Condensate control design and procedures may need to be modified if the system is connected to alternate wells after placement of the skid.
- Water table mounding in the extraction points could impair optimal contaminant removal efficiencies. Mounding was measured during the pilot test, and these data have been used to make design assumptions. A long-duration pilot test was not executed, and mounding conditions did not stabilize during the step tests. The data from the installed transducer in the extraction point will be used to ensure that mounding effects do not occlude the well screens.

INTERA will monitor the above conditions and communicate needed design modifications with the PSTB and NMDOT, as required. Annual evaluation of the remediation approach will be completed in accordance with 20.5.120.2040 NMAC, and the results will be presented in delivered compliance reports.

5.0 REMEDIATION SYSTEM OPERATION AND MAINTENANCE AND MONITORING

5.1 Overview

O&M of the remediation system and monitoring of Site contamination is required at regular intervals to confirm the remediation system is operating as designed, perform preventative maintenance on general equipment (e.g., the SVE blower), collect the necessary data to assess and document system performance, select active treatment zones, and optimize system configuration.

As discussed in Section 4.6, performance criteria such as flow, vacuum, and mass removal will be utilized to evaluate if the remediation skid should be connected to a different extraction well. The overall mass recovery (rate and cumulative totals) of the SVE remediation system will be plotted to determine progress. It is expected that mass removal rates will decrease along a first-order (exponential) decay curve with high initial removal rates. Mass removal rates often level out at some “asymptote” level that reflects inherent limitations in mass transfer from the subsurface. System operation and mass removal shall be re-evaluated when stable and reduced (asymptotic) rates are observed.

5.2 SVE System Operation and Maintenance

System startup and shakedown and routine O&M events will be conducted according to the following schedule:

- Daily during system startup and shakedown, which is anticipated to last 2 to 4 days.
- Weekly thereafter for the first month.
- Biweekly for the second month.
- Monthly for long-term operation.

The above O&M schedule will be restarted after each major change in system operation, including changing the point of extraction. O&M frequency may be performed more or less frequently based on observed conditions.

Because of the remoteness of the Site, a key design criterion was installing a system that could operate with minimal equipment maintenance. Regenerative blowers require very little maintenance if operated within design tolerances. According to the blower manual, the only routine maintenance required for the selected blower is the replacement of the bearings every 15,000 to 20,000 operating hours (Ametek, 2005). Ancillary equipment will be installed on the SVE skid to protect the blower from operating outside of design metrics, including a vacuum relief

valve, an air dilution (bleeder) valve, a moisture separator, and a particulate filter. Routine maintenance will include, respectively, manual manipulation of the vacuum relieve valve (if possible), adjusting vacuum and flow with the throttling valve and air dilution valve, draining the moisture separator, and cleaning/replacing the particulate filter. Fluids recovered from the moisture separator will be containerized in an evaporation vessel to be placed in the Patrol Yard enclosure. The particulate filter cleaning/replacement will be performed when a specified differential pressure across the filter is observed. A new/cleaned air filter will be the only spare part maintained on-site.

Routine operations will include monitoring vapor movement and treatment metrics using the instrumentation installed on the system and field equipment supplied by INTERA. Operating the blower within its design range will be achieved by balancing the settings on two Y- Pattern Needle valves. One will be installed on the manifold, and the other will be installed before the blower (air dilution/bleeder valve) with the intake open to ambient/fresh air (See **Appendix C, Sheets 3 and 5**). A vacuum of 90 to 100 inches of water will be maintained on the extraction well. If the blower provides a vacuum greater than 100 inches of water, the air dilution valve will be opened to supply fresh air to the blower to ensure that it operates efficiently and within the design curve. Minor adjustments to flow and vacuum will be made with the throttling valve on the manifold to achieve operational goals (e.g. control mounding of the water table).

At initial startup of the system on an extraction point, a rented submersible pressure transducer will be installed in the well to measure mounding of the water table. This will be necessary to ensure that adequate open well screen is maintained (approximately 5 ft). Data from the transducer will need to be downloaded and analyzed during the shakedown period and the initial weekly O&M visits. Once the mounding has stabilized, the transducer will be removed from the well, and the passthrough fitting on the well cap will be sealed.

Once long-term operation commences, the following field data will be collected (excluding routine groundwater monitoring and sampling) during each O&M visit:

- Vapor extraction flow rate.
- Valve positions.
- Wellhead vacuum at extraction and observation wells (SVE-1, MW-8, MW-20, and MW-21).
- VOCs (PID), carbon dioxide (colorimetric tubes), and oxygen (combustible gas indicator [CGI]) concentrations in extracted vapor.
- Fluid levels at adjacent monitoring wells.
- Fluid volume removed from the moisture separator.

- Barometric pressure (obtained from the closest weather station).
- Noise levels (phone application, or equivalent).
- Blower motor amperages.
- Duration of equipment operation (motor run time).
- Hydrocarbon levels in ambient air downwind of the system.
- Vacuum difference prior to and after the particulate filter.
- Condition of wells and equipment and changes to Site traffic patterns and use.
- Housekeeping requirements.

The type and frequency of vapor sampling is addressed in the following section.

5.3 Off-Gas Vapor Monitoring

Periodic emission vapor monitoring is required to document system effectiveness, regulatory compliance, and hydrocarbon recovery rates. Total ionizable volatile compound concentrations will be measured during each O&M event using a PID. INTERA proposes that vapor samples from the system be collected and analyzed for TPH and BTEX using United States Environmental Protection Agency (EPA) methods 8015B and 8260, respectively, on the following schedule:

- Startup and shakedown: Collect system influent/effluent samples within 4 hours of startup and again approximately 48 hours after startup.
- Following the first week of operation: Collect samples weekly until the end of the first month of operation.
- Remainder of first quarter (month 2 and 3) and subsequent quarters of O&M: Collect an effluent sample monthly.

Samples collected for laboratory analyses will be collected on the vacuum side of the blower, upstream of the bleeder valve. Samples will be collected using Tedlar® sample bags and a vacuum box (or equivalent). The sampling schedule, above, will be repeated when the system is connected to a different extraction point. The sample results will be used to confirm compliance with air quality discharge assumptions and reported to the appropriate regulatory agency(ies). All field measurements will be recorded in the field logbook or on field forms. An example of an O&M field form is included as **Appendix E**. A recent site-specific Health and Safety Plan is included in **Appendix I**. This plan will be updated accordingly and included in the work plan for system installation.

5.4 Groundwater Monitoring

Groundwater monitoring will be included under work approved and funded by the Corrective Action Fund and will be summarized under a separate Scope of Work.

6.0 PERMITS

6.1 NMED AQB No Permit Required Determination

Upon final approval of the FRP by the PSTB and prior to system operation, a request for a no permit required (NPR) determination status will be submitted to the NMED Air Quality Bureau. A copy of the application is provided as **Appendix F**.

6.2 Office of the State Engineer Well Permits

Permits from the New Mexico Office of the State Engineer (NMOSE) will be required for the new vertical wells planned to be constructed at the Site. Permit applications will be submitted upon approval of the work plan for well installation, and permit approvals will be provided with subsequent reports.

7.0 PUBLIC NOTICE

In accordance with 20.5.119.1923.D.10 NMAC, INTERA will provide public notice as follows:

- Legal notice of the submission of the FRP will be published twice in the Silver City Daily Press, a newspaper of general circulation in Grant County, on July 1, 2020 and July 7, 2020. The certified affidavit of publication for each legal notice will be provided to PSTB after the legal notices have been published. The format for the legal notice follows the guidelines dictated in 20.5.119.1923.D.10.b NMAC.
- A notice containing the specified information listed in the regulation will be posted at the front gate of the Site.
- In accordance with the above-cited regulation, INTERA will provide notice of submission of the FRP by certified mail to adjacent property owners. INTERA intends to mail a total of 11 certified letters.

A copy of the text of the legal notices (English and Spanish), certified affidavits of publication, a list of certified addresses, and a map indicating which residences and businesses will receive certified letters are provided in **Appendix G**. The list was compiled from Grant County Assessor data.

8.0 IMPLEMENTATION SCHEDULE

A proposed schedule for implementing this FRP includes the following:

- Public notice periods.
- Approval of the FRP.
- Receipt of public and PSTB comments.
- Procurement and Installation of remediation equipment.
- System startup.
- Weekly, biweekly, and monthly site visits.
- Submittal of the final as-built report.
- Quarterly O&M reports.

The proposed implementation schedule is provided as **Appendix H**. This schedule is contingent on receipt of approvals and other factors and is subject to change.

9.0 STATEMENT OF FAMILIARITY

Preparation of all engineering drawings and specifications was conducted under the direction and supervision of Jim Joseph, a New Mexico License Professional Engineer (License # 16227).



Jim Joseph, P.E.

SEPTEMBER 1, 2020

Date

10.0 REFERENCES

- Ametek. 2005. Service and Parts Manual for Blower Model EN454 – EN656. February.
- Duke Engineering & Services. 2001. Site Characterization Report, New Mexico Highway and Transportation Department, Cliff Patrol Yard, Cliff, New Mexico. November 30.
- Finnell, Tommy L. 1987. Geologic Map of the Cliff Quadrangle, Grant County, New Mexico. Miscellaneous Investigations Series, Map I-1768, U.S. Geological Survey.
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- . 2003. Facility # 5160019/29647; SID # 1869; NMSHTD – Cliff Patrol Yard; Letter Report for Monitoring Well Abandonment and Remediation System Decommissioning.
- . 2013. January 2013 Groundwater Monitoring Report, NMDOT Cliff Patrol Yard, Cliff, Grant County, New Mexico. March 14.
- . 2016a. January 2016 Additional Investigation and 1st Semiannual Groundwater Monitoring Report, NMDOT Cliff Patrol Yard, Cliff, Grant County, New Mexico. March 2.
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- . 2019. Well Installation, 1st Semiannual Groundwater Monitoring, and Pilot Test Report. October 28.
- . 2020a. Work Plan and Cost Estimate for Final Remediation Plan Development, NMDOT Cliff Patrol Yard, Facility # 29647; Release ID # 1869, Cliff, Grant County, New Mexico. Prepared for New Mexico Department of Transportation. Submitted March 3, 2020; revised March 11, 2020.
- . 2020b. 2nd Semiannual Groundwater Monitoring Report, NMDOT Cliff Patrol Yard, Facility # 29647; Release ID # 1869, Cliff, Grant County, New Mexico. Prepared for New Mexico Department of Transportation. March 30.



Interstate Technology & Regulatory Council (ITRC). LNAPL Site Management: LCSM Evolution, Decision Process, and Remedial Technologies (LNAPL-3). March 2018.

New Mexico Administrative Code. 2018. New Mexico Petroleum Storage Tank Regulations, 20.5 NMAC. December 27.

Figures

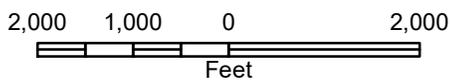
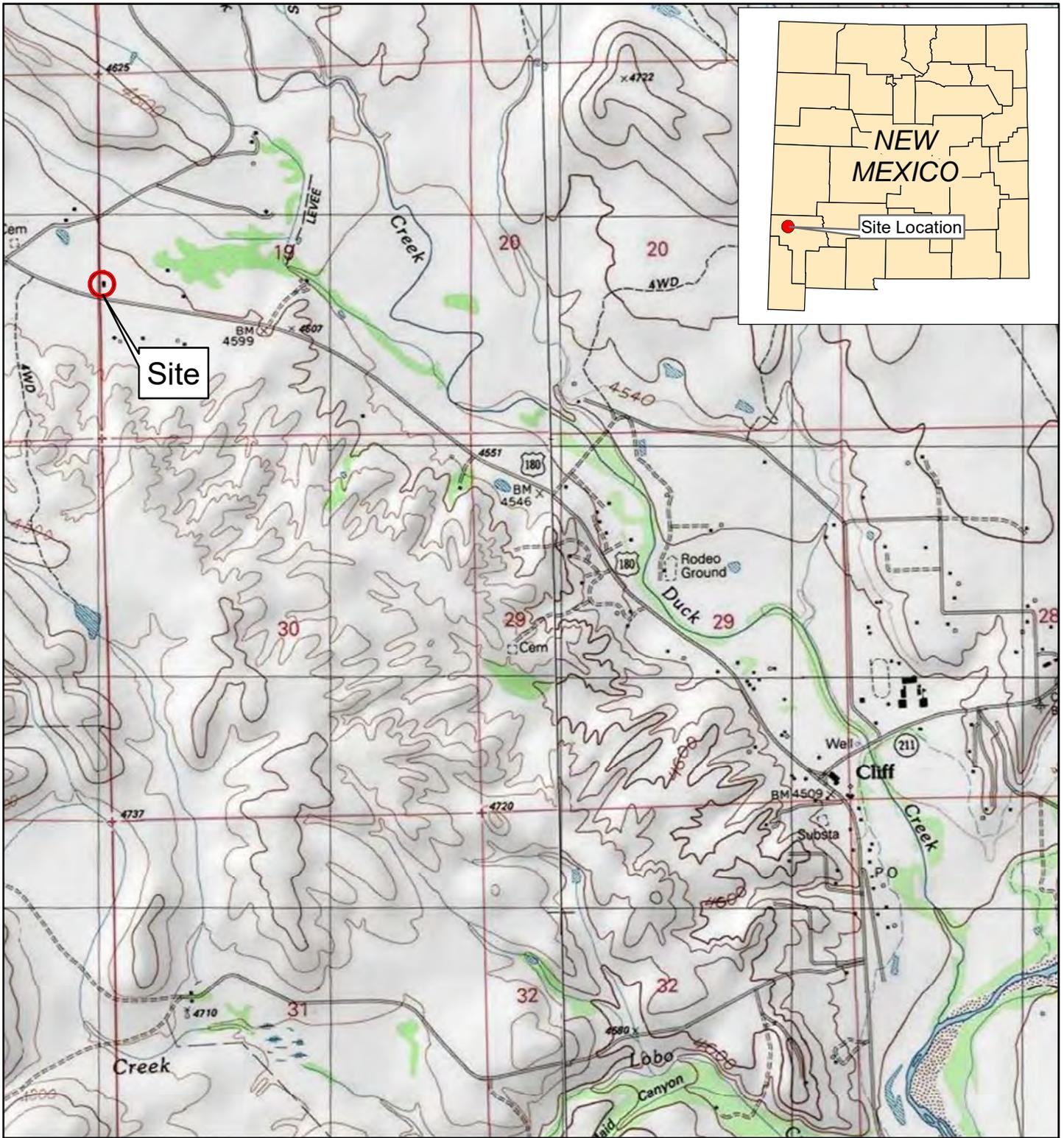


Figure 1
 Site Location
 Final Remediation Plan



Sources:
 Topo – ArcGIS online



Legend

	Existing Monitoring Well		Air Sparge Well
	Abandoned Monitoring Well		Water Supply Well
	Soil Vapor Extraction Well		

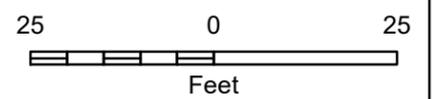
Figure 2
Site Plan
Final Remediation Plan



- Existing Monitoring Well
- Soil Vapor Extraction Well
- Air Sparge Well
- Potential SVE Extraction Well

Legend

- Estimated Extent of Vadose Zone Contamination >500 ppm (dashed where inferred); Residual LNAPL
- Estimated Extent of Actionable Dissolved-Phase Contamination

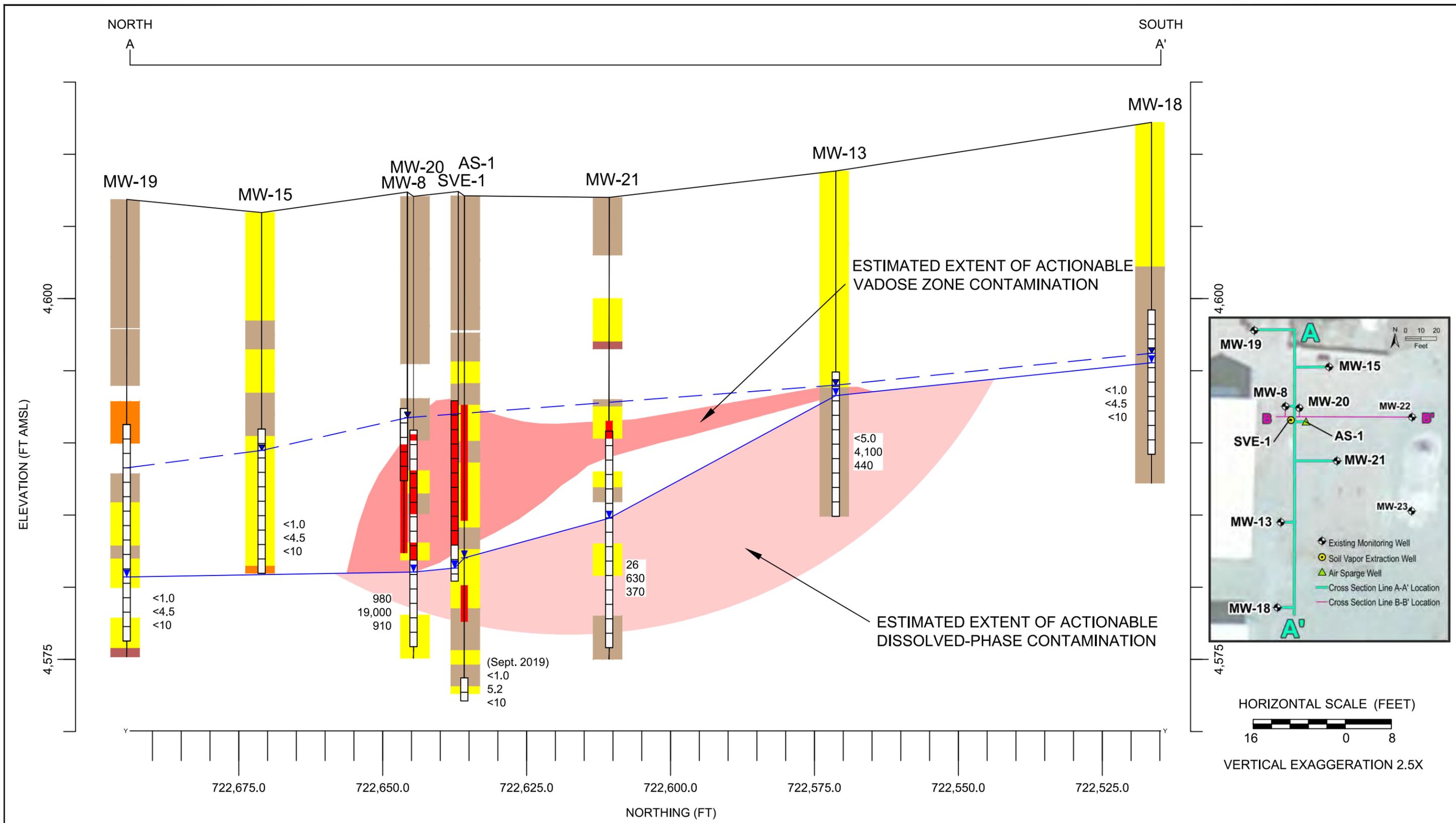


Note:
The estimated vadose zone extent for >100 ppm and >500 ppm is identical.

Figure 3
Distribution of Contaminants
Final Remediation Plan



Source(s): Aerial - ESRI ArcGIS online; well locations - Sun Mountain America, Inc., 7/24/01 and Z³ Planners & Surveyors, LLC, 1/21/16 & 9/9/19



Feb. 2020 Groundwater Results (µg/L)

980	Benzene
19,000	Σ BTEX
910	Σ Naphthalenes

Lithology Explanation

	Clay		Fines		Sand		Gravel
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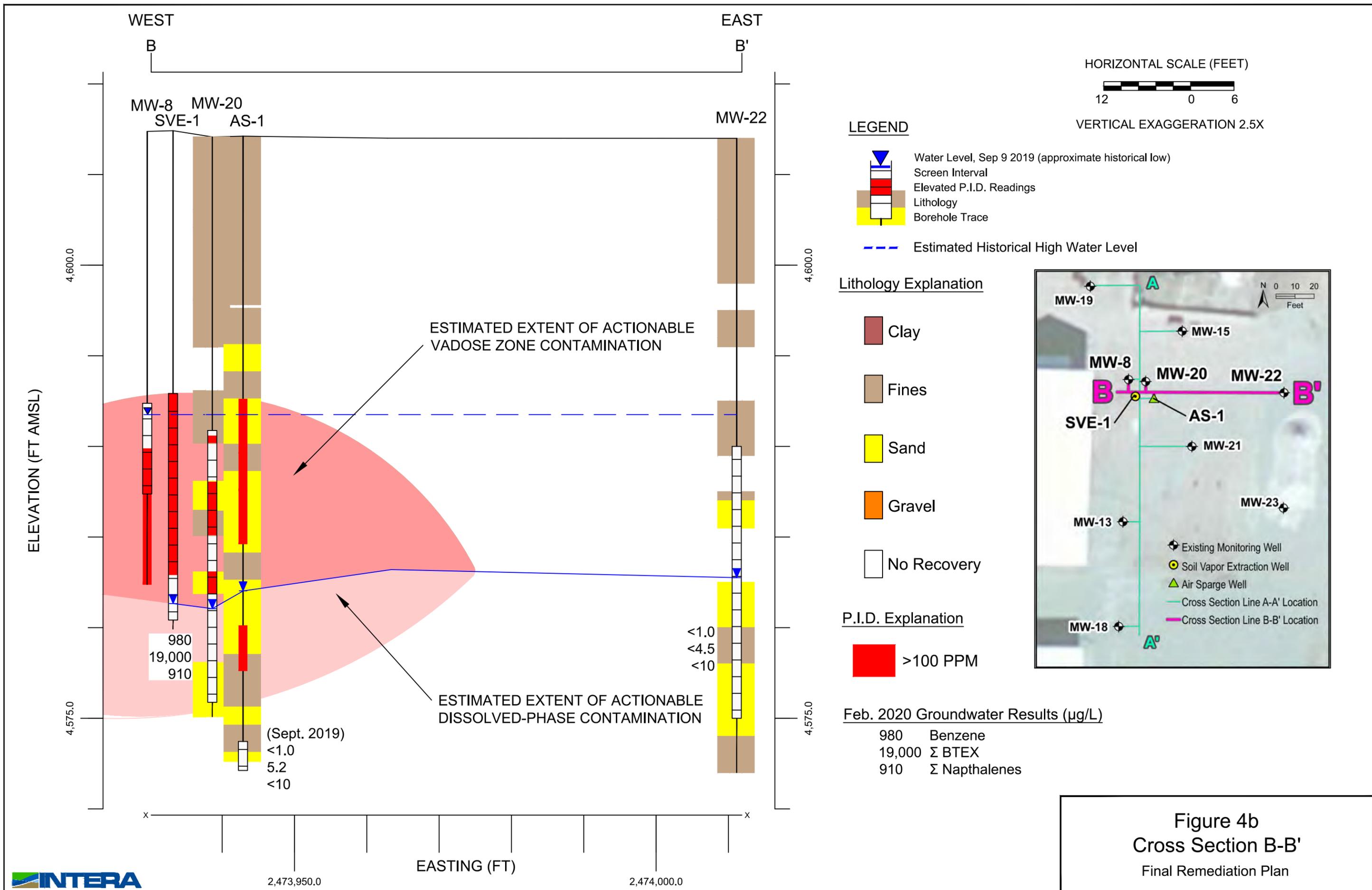
P.I.D. Explanation

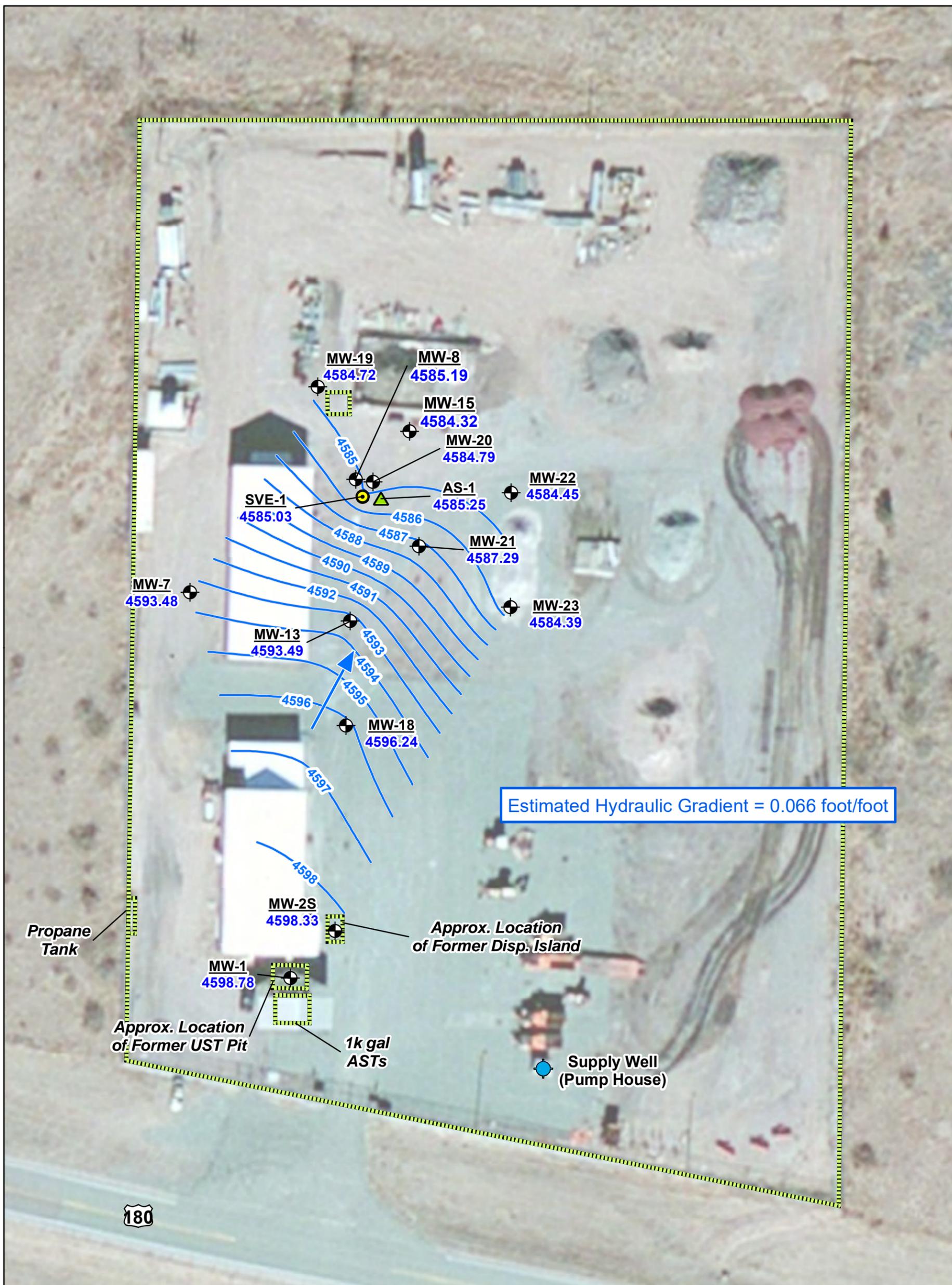
	No Recovery	>100 PPM symbol"/>	>100 PPM
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LEGEND

- Water Level, Sep 9 2019 (approximate historical low)
- Screen Interval
- Elevated P.I.D. Readings
- Lithology
- Borehole Trace
- Estimated Historical High Water Level

Figure 4a
Cross Section A-A'
 Final Remediation Plan





Estimated Hydraulic Gradient = 0.066 foot/foot

Propane Tank

Approx. Location of Former UST Pit

1k gal ASTs

Approx. Location of Former Disp. Island

Supply Well (Pump House)

180

- Existing Monitoring Well
- Soil Vapor Extraction Well
- Air Sparge Well
- Water Supply Well
- Potentiometric Surface Elevation, ft amsl

Legend

- Approximate Groundwater Flow Direction

MW ID
Potentiometric Surface Elevation, ft amsl

Note(s):
amsl = above mean sea level

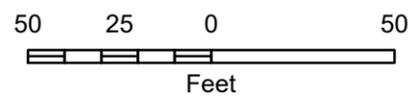


Figure 5
Potentiometric Surface Elevation Map,
February 19, 2020
Final Remediation Plan

Table

TABLE 1
Fluid Level Measurements
 Final Remediation Plan
 Cliff Patrol Yard, Cliff, Grant County, New Mexico

Well ID	Gauging Date	Screened Interval (ft bgs)	TOC Elevation (ft)	Depth to LNAPL (ft btoc)	Depth to Groundwater (ft btoc)	LNAPL Thickness (ft)	Potentiometric Surface Elevation (ft amsl)	Change in Fluid Level from Previous Event (ft)
MW-1	7/31/2012	15 to 30	4616.30	NM	19.19	0.00	4597.11	NA
	1/10/2013	15 to 30	4616.30	NM	19.37	0.00	4596.93	-0.18
	7/29/2014	15 to 30	4616.30	NM	18.96	0.00	4597.34	0.41
	1/28/2015	15 to 30	4616.30	NM	18.07	0.00	4598.23	0.89
	1/26/2016	15 to 30	4616.30	NM	17.65	0.00	4598.65	0.42
	7/19/2016	15 to 30	4616.30	NM	18.40	0.00	4597.90	-0.75
	3/27/2018	15 to 30	4616.30	NM	19.29	0.00	4597.01	-0.89
	9/9/2019	15 to 30	4616.30	NM	18.34	0.00	4597.96	0.95
2/19/2020	15 to 30	4616.30	NM	17.52	0.00	4598.78	0.82	
MW-2S	7/31/2012	15 to 30	4615.87	NM	19.14	0.00	4596.73	NA
	1/10/2013	15 to 30	4615.87	NM	19.33	0.00	4596.54	-0.19
	7/29/2014	15 to 30	4615.87	NM	18.91	0.00	4596.96	0.42
	1/28/2015	15 to 30	4615.87	NM	18.00	0.00	4597.87	0.91
	1/26/2016	15 to 30	4615.87	NM	17.55	0.00	4598.32	0.45
	7/19/2016	15 to 30	4615.87	NM	18.34	0.00	4597.53	-0.79
	3/27/2018	15 to 30	4615.87	NM	19.28	0.00	4596.59	-0.94
	9/9/2019	15 to 30	4615.87	NM	18.31	0.00	4597.56	0.97
2/19/2020	15 to 30	4615.87	NM	17.54	0.00	4598.33	0.77	
MW-7	7/31/2012	15 to 25	4609.37	NM	18.32	0.00	4591.05	NA
	1/10/2013	15 to 25	4609.37	NM	18.15	0.00	4591.22	0.17
	7/29/2014	15 to 25	4609.37	NM	17.81	0.00	4591.56	0.34
	1/28/2015	15 to 25	4609.37	NM	16.69	0.00	4592.68	1.12
	1/26/2016	15 to 25	4609.37	NM	15.96	0.00	4593.41	0.73
	7/19/2016	15 to 25	4609.37	NM	17.29	0.00	4592.08	-1.33
	3/27/2018	15 to 25	4609.37	NM	18.18	0.00	4591.19	-0.89
	9/9/2019	15 to 25	4609.37	NM	17.42	0.00	4591.95	0.76
2/19/2020	15 to 25	4609.37	NM	15.89	0.00	4593.48	1.53	
MW-8	7/31/2012	15 to 20	4607.64	NM	21.74	0.00	4585.90	NA
	1/10/2013	15 to 20	4607.64	NM	Dry	NA	NA	NA
	7/29/2014	15 to 20	4607.64	NM	21.73	0.00	4585.91	NA
	1/28/2015	15 to 20	4607.64	NM	19.92	0.00	4587.72	1.81
	1/26/2016	15 to 20	4607.38	NM	20.51	0.00	4586.87	-0.85
	7/19/2016	15 to 20	4607.38	NM	21.72	0.00	4585.66	-1.21
	3/27/2018	15 to 20	4607.38	NM	21.41	0.00	4585.97	0.31
	9/9/2019	15 to 20	4607.38	NM	Dry	0.00	NA	NA
2/19/2020	15 to 20	4607.38	NM	22.19	0.00	4585.19	NA	

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MW-13	7/31/2012	14 to 24	4608.84	NM	16.64	0.00	4592.20	NA
	1/10/2013	14 to 24	4608.84	NM	16.77	0.00	4592.07	-0.13
	7/29/2014	14 to 24	4608.84	NM	16.61	0.00	4592.23	0.16
	1/28/2015	14 to 24	4608.84	NM	15.82	0.00	4593.02	0.79
	1/26/2016	14 to 24	4608.84	NM	15.31	0.00	4593.53	0.51
	7/19/2016	14 to 24	4608.84	NM	16.13	0.00	4592.71	-0.82
	3/27/2018	14 to 24	4608.84	NM	16.64	0.00	4592.20	-0.51
	9/9/2019	14 to 24	4608.84	NM	15.56	0.00	4593.28	1.08
2/19/2020	14 to 24	4608.84	NM	15.35	0.00	4593.49	0.21	
MW-15	7/31/2012	15 to 25	4606.19	NM	22.90	0.00	4583.29	NA
	1/10/2013	15 to 25	4606.19	NM	21.09	0.00	4585.10	1.81
	7/29/2014	15 to 25	4606.19	NM	22.91	0.00	4583.28	-1.82
	1/28/2015	15 to 25	4606.19	NM	18.90	0.00	4587.29	4.01
	1/26/2016	15 to 25	4605.96	NM	19.60	0.00	4586.36	-0.93
	7/19/2016	15 to 25	4605.96	NM	22.56	0.00	4583.40	-2.96
	3/27/2018	15 to 25	4605.96	NM	20.50	0.00	4585.46	2.06
	9/9/2019	15 to 25	4605.96	NM	Dry	0.00	NA	NA
2/19/2020	15 to 25	4605.96	NM	21.64	0.00	4584.32	NA	
MW-18	7/31/2012	13 to 23	4612.21	NM	17.83	0.00	4594.38	NA
	1/10/2013	13 to 23	4612.21	NM	17.98	0.00	4594.23	-0.15
	7/29/2014	13 to 23	4612.21	NM	17.53	0.00	4594.68	0.45
	1/28/2015	13 to 23	4612.21	NM	16.74	0.00	4595.47	0.79
	1/26/2016	13 to 23	4612.21	NM	16.13	0.00	4596.08	0.61
	7/19/2016	13 to 23	4612.21	NM	16.89	0.00	4595.32	-0.76
	3/27/2018	13 to 23	4612.21	NM	17.35	0.00	4594.86	-0.46
	9/9/2019	13 to 23	4612.21	NM	16.66	0.00	4595.55	0.69
2/19/2020	13 to 23	4612.21	NM	15.97	0.00	4596.24	0.69	
MW-19	1/26/2016	15.6 to 30.6	4606.87	NM	20.18	0.00	4586.69	NA
	7/19/2016	15.6 to 30.6	4606.87	NM	23.25	0.00	4583.62	-3.07
	3/27/2018	15.6 to 30.6	4606.87	NM	21.04	0.00	4585.83	2.21
	9/9/2019	15.6 to 30.6	4606.87	NM	26.16	0.00	4580.71	-5.12
	2/19/2020	15.6 to 30.6	4606.87	NM	22.15	0.00	4584.72	4.01
MW-20	1/26/2016	16.2 to 31.2	4607.08	NM	20.43	0.00	4586.65	NA
	7/19/2016	16.2 to 31.2	4607.08	NM	23.22	0.00	4583.86	-2.79
	3/27/2018	16.2 to 31.2	4607.08	NM	21.32	0.00	4585.76	1.90
	9/9/2019	16.2 to 31.2	4607.08	NM	26.03	0.00	4581.05	-4.71
	2/19/2020	16.2 to 31.2	4607.08	NM	22.29	0.00	4584.79	3.74

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MW-21	1/26/2016	16.2 to 31.2	4607.01	NM	18.73	0.00	4588.28	NA
	7/19/2016	16.2 to 31.2	4607.01	NM	21.52	0.00	4585.49	-2.79
	3/27/2018	16.2 to 31.2	4607.01	NM	20.56	0.00	4586.45	0.96
	9/9/2019	16.2 to 31.2	4607.01	NM	22.23	0.00	4584.78	-1.67
	2/19/2020	16.2 to 31.2	4607.01	NM	19.72	0.00	4587.29	2.51
MW-22	9/9/2019	17 to 32	4605.45	NM	24.24	0.00	4581.21	NA
	2/19/2020	17 to 32	4605.45	NM	21.00	0.00	4584.45	3.24
MW-23	9/9/2019	18 to 33	4607.00	NM	23.33	0.00	4583.67	NA
	2/19/2020	18 to 33	4607.00	NM	21.61	0.00	4585.39	1.72
AS-1*	9/9/2019	33.4 to 35	4607.12	NM	25.09	0.00	4582.03	NA
	2/19/2020	33.4 to 35	4607.12	NM	21.87	0.00	4585.25	3.22
SVE-1	9/9/2019	14.5 to 27	4607.42	NM	26.09	0.00	4581.33	NA
	2/19/2020	14.5 to 27	4607.42	NM	22.39	0.00	4585.03	3.70

Notes:

Wellhead elevations from survey conducted on July 01, 2001.

Monitoring well survey completed at MW-8, MW-15, MW-19, MW-20, and MW-21 on January 26, 2016.

Monitoring well survey completed at MW-22, MW-23, AS-1, and SVE-1 on September 10, 2019.

* = Threaded coupling added on 9/11/2019 altered Z3 survey by 0.08 ft. All fluid level measurements post-9/11/2019 will use a top of casing elevation of 4607.20 ft amsl.

amsl = above mean sea level.

btoc = below top of casing.

ft = feet.

LNAPL = Light Non-Aqueous Phase Liquid.

NA = not applicable.

NM = none measured.

TOC = top of casing.

Z3 = Z3 Planners and Surveyors of Silver City, New Mexico.

TABLE 2
Laboratory Analytical Results - Groundwater
 Final Remediation Plan
 Cliff Patrol Yard, Cliff, Grant County, New Mexico

Monitoring Well	Date	Concentration (µg/L)								
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX ¹	MTBE	EDC	EDB ²	Total Naphthalene ³
NMWQCC Standard		5	1000	700	620	-	100	5	0.05	30
MW-1	1/10/2013	NOT SAMPLED								
	1/29/2015	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	1/27/2016	NOT SAMPLED								
	7/19/2016	NOT SAMPLED								
	3/28/2018	NOT SAMPLED								
	9/9/2019	NOT SAMPLED								
	2/19/2020	NOT SAMPLED								
MW-2s	1/10/2013	NOT SAMPLED								
	1/29/2015	<1.0	<1.0	1.5	4.9	6.4	<1.0	<1.0	<1.0	<4.0
	1/27/2016	NOT SAMPLED								
	7/19/2016	NOT SAMPLED								
	3/28/2018	NOT SAMPLED								
	9/9/2019	NOT SAMPLED								
	2/19/2020	NOT SAMPLED								
MW-7	1/10/2013	NOT SAMPLED								
	1/29/2015	NOT SAMPLED								
	1/27/2016	NOT SAMPLED								
	7/19/2016	NOT SAMPLED								
	3/28/2018	NOT SAMPLED								
	9/9/2019	NOT SAMPLED								
	2/19/2020	NOT SAMPLED								
MW-8	1/10/2013	INSUFFICIENT WATER								
	1/29/2015	560	310	1,700	8,600	11,000	<10	<10	<10	540
	1/26/2016	410	430	1,800	10,000	13,000	<10	<10	<10	490
	7/19/2016	NOT SAMPLED- INSUFFICIENT WATER								
	3/28/2018	2.6	<2.0	4.4	110	120	<2.0	<2.0	<2.0	6.2
	9/10/2019	NOT SAMPLED- INSUFFICIENT WATER								
	2/19/2020	NOT SAMPLED- INSUFFICIENT WATER								
MW-13	1/10/2013	11	160	830	6,200	7,200	<10	<10	<10	620
	1/29/2015	11	180	1,100	6,300	7,600	<5.0	<5.0	<0.010	730
	1/27/2016	<5.0	150	1,200	7,900	9,300	<5.0	<5.0	<5.0	260
	7/19/2016	7.0	140	870	7,900	8,900	<5.0	<5.0	<5.0	610
	3/28/2018	<5.0	9.0	1,200	5,300	6,500	<5.0	<5.0	<5.0	770
	9/10/2019	<5.0	26	330	1,500	1,900	<5.0	<5.0	<5.0	500
	2/19/2020	<5.0	26	700	3,400	4,100	<5.0	<5.0	<5.0	440

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NMWQCC Standard		5	1000	700	620	-	100	5	0.05	30
MW-15	1/10/2013	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	1/29/2015	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	1/27/2016	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	7/19/2016	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	3/28/2018	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	9/10/2019	NOT SAMPLED- INSUFFICIENT WATER								
2/19/2020	<1.0	<1.0	<1.0	<1.5	<4.5	<1.0	<1.0	<1.0	<10	
MW-18	1/10/2013	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	1/29/2015	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	1/27/2016	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	7/19/2016	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	3/28/2018	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	9/10/2019	<1.0	<1.0	<1.0	<1.5	<4.5	<1.0	<1.0	<1.0	<10
2/19/2020	<1.0	<1.0	<1.0	<1.5	<4.5	<1.0	<1.0	<1.0	<10	
MW-19	1/26/2016	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	7/19/2016	<2.0	<2.0	<2.0	<3.0	<3.0	<2.0	<2.0	<2.0	<8.0
	3/28/2018	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	9/10/2019	<1.0	<1.0	<1.0	<1.5	<4.5	<1.0	<1.0	<1.0	<10
	2/19/2020	<1.0	<1.0	<1.0	<1.5	<4.5	<1.0	<1.0	<1.0	<10
MW-20	1/26/2016	2,000	3,200	2,800	17,000	25,000	<10	<10	<10	1,000
	7/19/2016	1,500	1,100	2,600	13,000	18,000	<10	<10	<10	1,100
	3/28/2018	1,200	1,200	2,300	14,000	18,700	<10	<10	<10	1,000
	9/10/2019	220	100	740	5,500	6,600	<10	<10	<10	580
	2/19/2020	980	1,100	2,600	14,000	19,000	<10	<10	<10	910
MW-21	1/27/2016	210	200	1,200	6,100	7,700	1.2	5.1	<1.0	450
	7/19/2016	160	150	780	2,900	4,000	<10	<10	<10	500
	3/28/2018	31	26	490	1,100	1,600	<10	<10	<10	470
	9/10/2019	27	11	400	22	460	<10	<10	<10	310
	2/19/2020	26	17	440	150	630	<5.0	<5.0	<5.0	370
MW-22	9/9/2019	<1.0	<1.0	<1.0	<1.5	<4.5	<1.0	<1.0	<1.0	<10
	2/19/2020	<1.0	<1.0	<1.0	<1.5	<4.5	<1.0	<1.0	<1.0	<10
MW-23	9/9/2019	<1.0	<1.0	<1.0	<1.5	<4.5	<1.0	<1.0	<1.0	<10
	2/19/2020	<1.0	<1.0	<1.0	<1.5	<4.5	<1.0	<1.0	<1.0	<10
AS-1	9/10/2019	<1.0	<1.0	1.1	4.1	5.2	<1.0	<1.0	<1.0	<10
	2/19/2020	NOT SAMPLED								

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Monitoring Well	Date	Concentration (µg/L)								
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX ¹	MTBE	EDC	EDB ²	Total Naphthalene ³
NMWQCC Standard		5	1000	700	620	-	100	5	0.05	30
Supply Well	1/10/2013	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	1/28/2015	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<0.010	<4.0
	1/27/2016	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	7/19/2016	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	3/28/2018	<1.0	<1.0	<1.0	<1.5	<1.5	<1.0	<1.0	<1.0	<4.0
	9/10/2019	<1.0	<1.0	<1.0	<1.5	<4.5	<1.0	<1.0	<1.0	<10
	2/19/2020	<1.0	<1.0	<1.0	<1.5	<4.5	<1.0	<1.0	<1.0	<10

Notes:

* = NMWQCC Standards were updated effective December 21, 2018. Additionally, MTBE is now regulated by the NMWQCC.

Bolding indicates values or RLs in excess of the NMWQCC Standard. Historic data not compared to the new NMWQCC Standards.

¹ = Total BTEX includes sum of benzene, toluene, ethylbenzene, and total xylenes.

RL for BTEX = sum of all RLs for individual compounds when summing detections, values listed as "<" RL are assumed to be 0.

² = Analyzed by EPA Method 504.1 or Method 8260B.

³ = Total naphthalenes includes the sum of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

RL for Total Naphthalenes = sum of all RLs for individual compounds; when summing detections, values listed as "<" RL are assumed to be 0.

µg/L = micrograms per liter.

EDB = 1,2-dibromoethane.

EDC = 1,2-dichloroethane.

MTBE = methyl tertiary-butyl ether.

RL = Laboratory reporting limit.

NMWQCC = New Mexico Water Quality Control Commission.

NMWQCC Standard = Groundwater Standards as defined by the State of New Mexico Water Quality Control Commission (NMWQCC, December 2018).

Appendix A

INTERA Response to PSTB Comments

Responses to PSTB's Comments on the *Final Remediation Plan, NMDOT Cliff Patrol Yard, Cliff, Grant County, New Mexico*, dated July 2, 2020.

1. PSTB Comment #1: The remedial approach as presented cannot achieve the goal of remediation and target concentrations to be achieved in soil and groundwater per the requirements in 20.5.119.1923 D(1) described in Section 3.2 of the FRP. Please comment.

Response: Section 3.2 of the FRP indicates that it will be necessary "to reduce the concentrations of dissolved-phase COCs to levels below NMWQCC Standards so that the Site can obtain a no further action status from the PSTB". It is further stated in Section 3.2 that the specific goal of the proposed remediation system is to "remove the residual LNAPL mass above the water table to the extent practicable and decrease the VOC composition of the residual LNAPL so that the partitioning and leaching of VOCs into groundwater from the remaining LNAPL is minimized." The system, as designed, will be able to achieve this specific objective. The COC mass removed by vapor extraction will accelerate closure by reducing the amount of petroleum hydrocarbons that would otherwise have to attenuate naturally. Extended operation of the system would also provide the benefit of treating groundwater, as volatile components of the dissolved-phase plume will partition into vapor-phase and be extracted.

2. PSTB Comment #2: EPA's guidance document, "*How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites*", dated May 1995 states that a minimum of one pore volume exchange (PVE) per day is needed to clean up petroleum hydrocarbon contaminated soil via soil vapor extraction.

Utilizing equation found in Section II-18, based on the area extent of soil contamination and INTERA's estimated the vacuum radius of influence of 15', approximately 2 wells at a minimum would be necessary to achieve one PVE per day.

To achieve several PVE/day (e.g. approximately 5 PVEs) and using equation found in Section II-19 of the EPA guidance document:

- based on a treatment volume calculated using areal extent of soil contamination depicted in Figure 3 of FRP and thickness shown in cross-sections depicted in Figures 4a and 4b ;
- an estimated porosity of 0.35;
- and a flow rate of 6 scfm determined from AcuVac's 1 hr pilot test on MW-20
- the INTERA estimated vacuum radius of influence based on AcuVac's pilot test results.
- PSTB determined that approximately 10 wells would be necessary.

Please provide rationale for dropping from 5 SVE wells proposed in INTERA's Well Installation and Pilot Test Report, down to what is proposed in the FRP (extracting from one well at a time) when the minimum PVE/day recommended by the EPA can not be achieved with the remedial approach as presented.

Response: *There were several constraints that impacted design of the SVE system through the FRP process. The most significant constraints were funds available for capital expenditures and operation, and several key unknowns with regards to response to prolonged operation of the system.*

Funding for the remediation efforts will initially be through the NMDOT operating budget instead of through the PSTB's Corrective Action Fund. This voluntary action will place a demand on the NMDOT's limited operation budget, which has been additionally reduced by the COVID-19 pandemic. Design constraints to provide cost benefit included minimizing trenching and piping to multiple wells and proposing a staged operational strategy. Implementation of this strategy will reduce the financial burden on NMDOT

The pilot test data was used to select optimal equipment that would require less frequent maintenance and operate at the constrained vacuum and flow characteristics. The pilot test, however, was not operated long enough to provide useful data for two key parameters: 1) COC removal rates over a prolonged operational period, and 2) maximum groundwater mounding effects. Because of the age of the fuel release, the volatile portion of the residual LNAPL and vapor phase COCs may be proportionally less than a fresh fuel release. While the pilot test showed a positive potential for removing COCs, it is uncertain if the initial recovery rates will be sustained for a prolonged period. Executing the SVE remediation in a staged approach that includes recovery from one or more wells at a time will provided the needed data to determine if a more aggressive approach can be implemented or if short-term operation of a mobile system at select wells will provide greater value (as described in the FRP). A conservative and staged approach to investing in remediation infrastructure will help reduce exposure to installing a system that may only operate efficiently for only several months rather than an extended period.

The staged operation/design approach proposed includes installing an SVE system as described in the FRP and operating it for several months to several quarters to obtain the necessary operational data to make decisions regarding changes to number of wells operated at a time and/or modifications in equipment specifications to facilitate alternate operation objectives. A contingency that the NMDOT has been pursuing is the deployment of remediation equipment from the State's unused equipment inventory (maintained by the PSTB) in lieu of up-front purchasing of new equipment. This approach may result in the installation of equipment that does not meet optimum operating criteria (as established from the pilot test results) but would better-facilitate the staged operational approach. This approach would allow the NMDOT to obtain the data needed to evaluate long-term system operation without the initial purchase of select remediation equipment. Once the collected operational data is analyzed, an evaluation regarding number of wells and size of permanent equipment would be completed along with a cost benefit analysis based on available NMDOT budgets. At the date of this comment response document, some equipment from the PSTB's inventory has been identified as having potential for use at the Cliff Patrol Yard, but none has been fully evaluated for operation.

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3. **PSTB Comment #3: Why does INTERA estimate the radius of influence (ROI) to be 15' for SVE-1 using the 3% of applied vac criteria using a linear trend line? AcuVac estimated the ROI of SVE-1 to be only about half (e.g. roughly 8') using the 3% of applied vacuum criteria using an exponential trend line. Please provide justification for estimating a vacuum ROI of nearly double that which AcuVac estimated.**

Response: *The justification for an estimated 15 ft ROI for SVE-1 has been previously provided and accepted during the review and comment of the pilot test report. Please refer to INTERA's correspondence to the PSTB on behalf of the NMDOT dated December 4, 2019. The Correspondence addressed the PSTB's review comments of the report entitled "Well Installation, 1st Semiannual Groundwater Monitoring, and Pilot Test Report, NMDOT Cliff Patrol Yard, Cliff, Grant County, New Mexico - Deliverable ID# 18613-1". The staged approach described previously will provide an opportunity to assess long-term operation data and to re-evaluate the ROI for SVE-1. If additional wells are warranted, the operation data will be used to optimize the spacing from SVE-1.*

4. **PSTB Comment #4: In the FRP, INTERA states that the regenerative blower selected from the SVE equipment inventory would be operating at close to its maximum capacity at Cliff's elevation with one well plumbed to the blower. The blower curve provided in Appendix B: Product Cut Sheets for Rotron Regenerative Blower EN523M75L shows that at 80-90 inches of water vacuum, a flow rate of approximately 30 scfm could be achieved when operating the blower at sea level. However, even with blower inefficiencies accounted for due to Cliff's elevation, the blower should be able to operate a minimum of two wells (to achieve one PVE/day) or potentially three wells simultaneously (e.g. 4 to 6 scfm/well at an applied vacuum of 80-90 inches. Therefore, why not install at least one to two more SVE wells and hook them up to the skid-mounted blower and run them simultaneously after bringing one at a time on stream and monitoring for gw table responses, screen occlusion etc?**

Response: *The blower sizing took the following parameters into account during selection: 1) elevation inefficiencies, 2) minor head losses (fittings, tubing, etc.), and 3) major head losses (rotometer, knock-out pot, etc.). Additionally, blowers and motors operate less efficiently when they are operated at the extreme end of their performance curves; the blower selected should provide a bit more capacity than the design performance specifies, which may allow the blower to run while connected to more than one well at a time. The staged operation approach previously discussed will allow for evaluation of alternate well connections and alternate blower sizing (if suitable PSTB equipment can be located for startup).*

5. **PSTB Comment #5: It would seem that INTERA's rationale for the selection of the regenerative blower over a rotary lobe blower is based largely on the fact that the remoteness of this site calls for a blower that would require minimal maintenance. Since, INTERA is still planning on conducting monthly visits after the 2nd month of operation, the opportunity to manually adjust the dilution valve during these O&M monthly events make it feasible to operate at least two, if not three SVE wells simultaneously while ensuring that emission concentrations and rate (for untreated effluent) fall below the 10 lbs/hr; 10 tons/year air quality standard for**

Hazardous Air Pollutants. Therefore, why not plan for two to three wells operating simultaneously?

Response: *Maintenance required by rotary lobe blowers that is not needed by regenerative blowers includes lubrication of the blower (oil checks and oil changes), belt checks and replacements, lubrication of pillow block bearings (as frequently as several times a week for some systems). Most of these maintenance items could be conducted during routine site visits; however, equipment lubrication must be confirmed regularly. Ideally, maintenance is executed by a single trained operator; however there has been some consideration that supplemental maintenance could be performed by local personnel. The data collected during initial system operations will be evaluated to refine blower capacity and sizing and identification of ideal locations for new SVE wells. Using a staged approach will allow for informed and cost-effective decisions with regards to placement of future SVE wells. Proposed changes will be communicated to the PSTB prior to execution.*

6. **PSTB Comment #6: Extracting from one well at a time with the proposed regenerative blower, as stated in the FRP, will significantly increase the amount of time to get to ground water standards than if two or three wells were run simultaneously using the proposed regenerative blower, or alternatively, if a rotary lobe blower that multi-wells could be hooked up to down the road was selected. Please comment as it seems that not adopting the EPA Guidance to arrive at the appropriate number of wells that will be required to address the treatment volume, as well as not sizing the blower based on the pilot test results may end up costing the DOT more money to reach No Further Action status in the end.**

Response: *Given the design uncertainties previously discussed, a staged approach to operation is believed to be the best approach to installing and operating the SVE system. Operating a more robust SVE system to remediate the target treatment volume would likely reduce the overall treatment time; however, high initial capital expenditures for a larger system may not be warranted if the recovery of the volatile component of the residual LNAPL is rapidly reduced. As previously indicated, NMDOT's available budget also dictates how much initial capital can be committed to the voluntary remediation. An alternate approach may be more feasible if Corrective Action Fund money was committed to the project.*

7. **PSTB Comment #7: Please discuss how soil contamination south of the cluster of wells in the northern portion of soil contamination plume will be addressed? In particular, how will the contamination around MWs-21 and 13 be cleaned up with this remedial approach?**

Response: *As illustrated on Figure 3 of the FRP the southern limit of the soil contamination is uncertain. This uncertainty will be addressed during evaluation of the initial operation data. Based on the baseline performance of the system, the system could be moved to other locations (i.e. MW-21) or expanded to the south. Decisions will be made and communicated to the PSTB during the staged remediation approach.*

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8. **PSTB Comment #8: Please provide an estimate for the time it will take to reach gw standards extracting from one well at a time as proposed in the FRP per the requirements of PSTB Reg 20.5.119.1923 D(6)?**

Response: *A lot of uncertainty exists when determining an estimate for the time to reach clean-up standards. To reduce these uncertainties, the SVE system performance will be continuously evaluated upon startup. Once sufficient data has been collected, estimates for time will be evaluated.*

9. **PSTB Comment #9: The FRP states that in the future, additional SVE wells may be installed. Will additional SVE wells be installed after one quarter of system operations and after assessment of the ground water quality results from the 1st Quarter of GW Monitoring, or after one year of Quarterly System and GW Monitoring events?**

Response: *SVE system performance will be continuously evaluated upon startup. If adequate operation data is available after several months, then proposed changes to operation metrics, equipment sizing, and number of wells to connect to, number of wells to install, or movement of the system to other locations will be presented in the first quarterly groundwater monitoring report (or in subsequent quarterly reports, as warranted).*

10. **PSTB Comment #10: Given that INTERA estimated an SVE vacuum radius of influence of 15', should additional MWs should be installed in the center of the plume sometime before the 1st Quarterly Groundwater Monitoring event is conducted so that we can assess whether system operations has had any impact on the dissolved phase COC concentrations in this region of the dissolve phase plume?**

- i. **If so, should the MWs be constructed so that they could be used as SVE wells in the future?**

Response: *In the short term, INTERA will utilize groundwater monitoring data from monitoring well MW-20, located immediately adjacent to SVE-1, to assess impacts of system operation to dissolved-phase COC concentrations.*

11. **PSTB Comment #11: In collaboration with DOT, please address the comments provided by Mr. Hara Davis, in the email dated 7/19/20 and include INTERA's/DOT's responses under the new Appendix B : Response to Public Comments.**

Response: *Response to public comments are included in Appendix B of the revised FRP.*

12. **PSTB Comment #12: On Sheet 2 showing proposed location of the skid in relation to the highly contaminated vadose zone soil contamination contour, also show the following:**

- Actionable dissolved phase contour.
- Both INTERA's estimated anticipated ROI of 15' around SVE-1 and AcuVac's ROI.

Response: *These additions have been included on Sheet 2 of the revised FRP.*

13. **PSTB Comment #13: Please include in Table section of FRP, the historical groundwater quality concentrations.**

Response: *Historical analytical groundwater data is included as Table 2 of the revised FRP.*

14. **PSTB Comment #14: Please include a map depicting groundwater iso-contour elevation map and direction of groundwater flow.**

Response: *A potentiometric surface elevation map from the most recent groundwater monitoring event conducted in February 2020 is included as Figure 5 of the revised FRP.*

15. **PSTB Comment #15: Please clarify whether biweekly O&M visits will be conducted in the second month of operations and why effluent samples will only be collected for analysis monthly (See Sections 5.2 (3rd bullet) and 5.3 (2nd bullet)).**

Response: *As stated in Section 5.2 of the FRP, two O&M visits will be conducted during the 2nd month of operation. After the first month of operation, INTERA has elected to collect monthly effluent samples. If data collected during the first month of operation suggests more frequent monitoring may be beneficial, INTERA will evaluate the sampling frequency.*

16. **PSTB Comment #16: What height is the nearest Patrol yard building nearby? Will emitting from the stack (at 10' above ground surface) be adequate or should the stack be taller than building roof line? How will the stack be anchored/secured?**

Response: *According to the Western Region Climate Center (https://wrcc.dri.edu/Climate/comp_table_show.php?stype=wind_dir_avg), the prevailing wind direction for the Silver City area is from the west throughout most of the year, which directs exhausted vapors away from all site structures. The nearest occupied Site building is located approximately 140 feet to the south. The height of the building is unconfirmed, however there is an enclosed garage in the building that is likely 12 to 15 feet tall. The ground elevation of the occupied building is approximately 8 feet higher than the ground elevation of the proposed initial location of the SVE system. The stack would have to be extended to over 20 feet to exceed the elevation of the roof of the occupied building. This height would require a permanent installation of a structurally designed stack. Given the low expected discharge rates and the prevailing wind direction, a 10-foot stack should be adequate to disperse the vapor effluent. Conditions around the system discharge will be monitored during Site visits, and any recommended changes will be included in recommendations during the staged operation refinements.*

17. **PSTB Comment #17: Please include field data sheets for System Operations and Maintenance.**

Response: *Field data sheets for system O&M were included in the original FRP as Appendix C which is now Appendix E in the revised FRP.*

18. **PSTB Comment #18: As Groundwater Monitoring will be done under a separate cover, please include field data sheets for gauging and collection of gw samples when you submit the work plan for Groundwater Monitoring.**

Response: *Field data sheets for fluid levels and groundwater sampling will be included in the work plan for groundwater monitoring.*

19. **PSTB Comment #19: Please include any relevant INTERA site specific specification for installation of aboveground piping/hoses between the well head and the manifold and the manifold and the skid if not addressed fully on the drawings.**

Response: *Concrete jersey barriers will be used to restrict vehicle access to aboveground piping/hoses. If aboveground piping/hoses is in an area that needs to remain accessible, high load-bearing rubber ramps will be used to protect aboveground piping/hoses. The well head and manifold will be protected with jersey barriers to prevent damage.*

20. **PSTB Comment #20: Please provide a site-specific Health and Safety Plan to implement this Final Remediation Plan.**

Response: *A recent site-specific Health and Safety Plan is included as Appendix I in the revised FRP. INTERA will update this plan accordingly and include in the work plan for system installation.*

21. **PSTB Comment #21: Per PSTB reg 20.5.119.1923 E (f), the FRP must include a one line electrical diagram. A NM EE PE stamped one-line electrical diagram can be provided/captured in the As-built report.**

Response: *The blower vendor selected by the engineer will provide package system that includes many of the system components identified in the design drawings. Their services will include the development of an electrical one line diagram for their equipment during the procurement process. Upon receipt of requisite approvals, a purchase order will be released that will authorize the vendor to execute final design documents. A one line diagram can be submitted to the PSTB for review prior to delivery of the equipment.*

Alternatively, if an available PSTB blower system is used, an electrical engineer will be contracted to evaluate the system components and provide a one-line drawing of the system. The diagram will be provided in the as built report, as suggested.

Appendix B

INTERA Response to Public Comments

August 4, 2020

Mr. Tim Noger
NMED Petroleum Storage Tank Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505

RE: Response to Public Comments, Final Remediation Plan, NMDOT Cliff Patrol Yard, Grant County, New Mexico

Dear Mr. Noger,

- 1. Public Comment #1: Why not recapture all COCs instead of releasing to air? I live downwind as well as down stream and at present time can smell diesel fumes when the guys idle their engines. Toluene and benzene are lethal in air or water.**

During the design process for the soil vapor extraction remediation system (SVE System), calculations were completed to determine if concentrations of contaminants of concern (COC) in the SVE system effluent (the soil vapor extracted from the subsurface and subsequently released to the atmosphere) required treatment prior to discharging to the atmosphere. It was determined that the COC concentrations in the SVE system effluent will be much lower than those requiring treatment per New Mexico Environment Department (NMED) Air Quality Bureau (AQB) regulations; therefore, it was deemed appropriate to direct discharge the SVE system effluent into the atmosphere. INTERA will submit these calculations to the NMED AQB as part of the No Permit Required application. The No Permit Required application is not a regulatory requirement but rather a voluntary application which NMED AQB will provide a courtesy review and a letter of concurrence.

The effluent discharge point will be installed at a height greater than 10 ft to promote mixing with air to reduce or eliminate any nuisance odors. Additionally, the effluent will be routinely sampled to confirm that COC concentrations have not changed and direct discharge to the atmosphere is still deemed appropriate.

- 2. Public Comment #2: In "Lab Report", does the RL column represent the upper allowable limits of the contaminants? Example, page 5 of 11: Benzene. Result 32; RL 10. Does this mean there is 3x more Benzene than acceptable?**

RL is an acronym for "Reporting Limit," which is defined as the lowest concentration of an analyte (e.g., benzene) that can be reported reliably by a laboratory. If a contaminant is detected above the RL, then the numerical concentration (result) will be reported (i.e., benzene

result of 32 µg/L). If a contaminant is reported as non-detect, then the concentration of that contaminant is less than the RL. The acceptable levels of contaminants are set by the NMED and are presented in the tables in each report.

3. Public Comment #3: Also, are there no water samples? Samples say Air Matrix.

Laboratory analytical data provided in the Final Remediation Plan (FRP) are from the collection and analysis of soil vapor samples in support of determining if vapor treatment or permitting was required. The New Mexico Department of Transportation has performed comprehensive investigations of the magnitude and extent of dissolved-phase contaminant distribution (groundwater contamination) and is maintaining a routine groundwater monitoring and sampling program. The result of the groundwater investigations and the routine monitoring program are available to the public for review. Interested parties are encouraged to obtain access to these records through NMED.

4. Public Comment #4:

a. As for Operations, what is the decibel level?

The manufacturer's manual for the blower, which is the only mechanical component of the SVE system, has a noise level range rated between 82 and 83 decibels. Other components on the SVE system may also contribute noise but it is difficult to determine the noise level until the SVE system is installed and started.

It should be noted that the noise range of the blower is given for a distance of 1 to 3 feet from the blower. Noise levels naturally dissipate with distance from the source.

If a sound is generated at a point source in a free field, meaning there are no walls or other obstructions, the sound pressure level, will be reduced by 6 dBA each time the distance from the noise source is doubled.

Applying this attenuation rule to the manufacturer's product data provides the following results:

Distance from the SVE System (feet)	Sound Pressure Level (decibels)
1	83
50	49
100	43
500	29

Noise dissipation calculations are based on the OSHA Technical Manual, Section III, Chapter 5 - Noise, Appendix B. The indicated attenuation rule does not take into account meteorological conditions (e.g. wind), vegetation (ground level or as an obstruction), or physical obstructions. Decibels (dBA) are units of sound pressure levels.

During SVE system start-up, and subsequent operation and maintenance visits, INTERA will measure and record the decibel level emitted from the SVE system at various distances from the location of the SVE system. If noise is determined to be a nuisance, a silencer will be added to reduce the noise level.

b. How much lighting, including little red and green" engine on " lights?

The control panel for the SVE system may include up to three operation/alarm annunciators (e.g. lights). These lights are anticipated to be no larger than 1-1/2-inches in diameter. The annunciators will emit a muted red or green color and are not designed for area illumination. Additional flood lights or alarm strobes are not included in the design.

5. Public Comment #5: Does SVE suck water, or just vapor? If water how does it get clean?

The SVE system extracts contaminated soil vapor from the subsurface, no groundwater will be extracted. A very small volume of moisture entrained in the soil vapor will be removed from the vapor stream and disposed of in accordance with NMED requirements.

6. Public Comment #6: Do the monitoring wells or SVE wells break the caliche cap containing the plume?

A cemented sand and gravel layer was encountered during the drilling of AS-1 at 28.6 ft below ground surface. The total depth of the SVE well (SVE-1) does not extend to the cemented layer ("caliche cap"). Drilling of other nearby monitoring wells did not note a cemented layer at this depth. Groundwater monitoring at AS-1 indicates that COC concentrations are not present in groundwater at concentrations above NMED regulatory standards below this cemented layer.

7. Public Comment #7: Why the rush to end the comment period when you don't start till Nov.?

NMED Petroleum Storage Tank Bureau (PSTB) regulations sets the 21-day public comment period per Subsection D of 20.5.119.1923 NMAC.

8. Public Comment #8: I look forward to the remediation of this spill as we have clean, shallow water that needs to be protected. In the meantime, I don't want to breathe toluene or listen to a compressor 24/7 for a year because DOT is looking for the cheapest alternative.

Monitoring of the contaminants in groundwater have indicated that concentrations are naturally decreasing, and the extent of the contamination is isolated to an area inside of the NMDOT property. Because of the low risk that the plume presents to human health, the NMED has only required that the contamination be continuously monitored to ensure that the



conditions and risk do not change. To be proactive and a steward of the environment, NMDOT has elected to speed the process of remediating the contamination without the use of financial assistance available through the NMED's corrective action fund. This voluntary action has included the use of their own funds to design and install the SVE system discussed in the FRP. Furthermore, SVE is a proven technology for remediating the COCs found in the subsurface at the Cliff Patrol Yard and NMDOT is committed to monitoring effluent concentrations and noise levels during SVE system operation and address any nuisance concerns that may become apparent.

Sincerely,

INTERA Incorporated

Eileen Marcillo
Project Manager/Hydrologist

Jim Joseph, P.E.
Principal Engineer

cc: Mr. Larry Kemp, NMDOT
Ms. Katherine MacNeil, NMED PSTB

Appendix C

Engineering Drawings



FINAL REMEDIATION PLAN CLIFF PATROL YARD

PREPARED FOR
NEW MEXICO DEPARTMENT
OF TRANSPORTATION
JUNE 2020

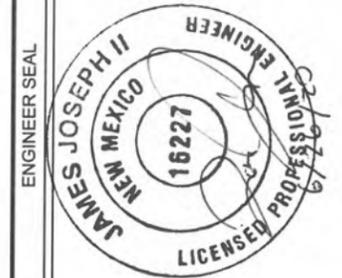


INDEX OF DRAWINGS:

SHEET NO.	TITLE	REVISION
1	COVER SHEET	0
2	SITE PLAN	0
3	PIPING AND INSTRUMENTATION DIAGRAM	0
4	MECHANICAL / SKID ELEVATION PLAN	0
5	DETAILS	0

GENERAL NOTES:

1. ALL WORK ON THIS PROJECT SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL LAWS, ORDINANCES, AND REGULATIONS CONCERNING CONSTRUCTION SAFETY AND HEALTH.
2. ACCESS TO THE SITE IS RESTRICTED AND MUST BE COORDINATED WITH THE NMDOT PATROL YARD SUPERVISOR.
3. THE LOCATION OF BURIED UTILITIES ARE BASED UPON INFORMATION PROVIDED TO THE ENGINEER BY OTHERS AND MAY NOT REFLECT ACTUAL FIELD CONDITIONS.
4. THE CONTRACTOR SHALL NOT INSTALL ITEMS AS SHOWN ON THESE PLANS WHEN IT IS OBVIOUS THAT FIELD CONDITIONS ARE DIFFERENT FROM WHAT IS SHOWN IN THE PLANS. SUCH CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IN A TIMELY MANNER. IN THE EVENT THAT THE CONTRACTOR DOES NOT NOTIFY THE ENGINEER IN A TIMELY MANNER, THE CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY AND EXPENSE FOR ANY REVISIONS NECESSARY, INCLUDING ENGINEERING DESIGN FEES.
5. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO PROJECT SPECIFICATIONS AND PLANS, AS AMENDED AND REVISED BY THE ENGINEER. ALL INSTALLATION DETAILS ARE TYPICAL AND MAY BE CHANGED TO BETTER FIT EXISTING CONDITIONS UPON APPROVAL BY THE ENGINEER/NMDOT PROJECT MANAGER.
6. THIS DESIGN IS BASED ON SURVEY INFORMATION PROVIDED BY OTHERS. THE ENGINEER CANNOT VALIDATE OR WARRANTY THIS INFORMATION. ANY DISCREPANCY BETWEEN THE DESIGN AND SITE SURFACE CONDITIONS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY.



NO.	DATE	REVISIONS	BY

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DRAWN BY: _____
CHECKED BY: _____
DATE: _____

DESIGN

Final Remediation Plan

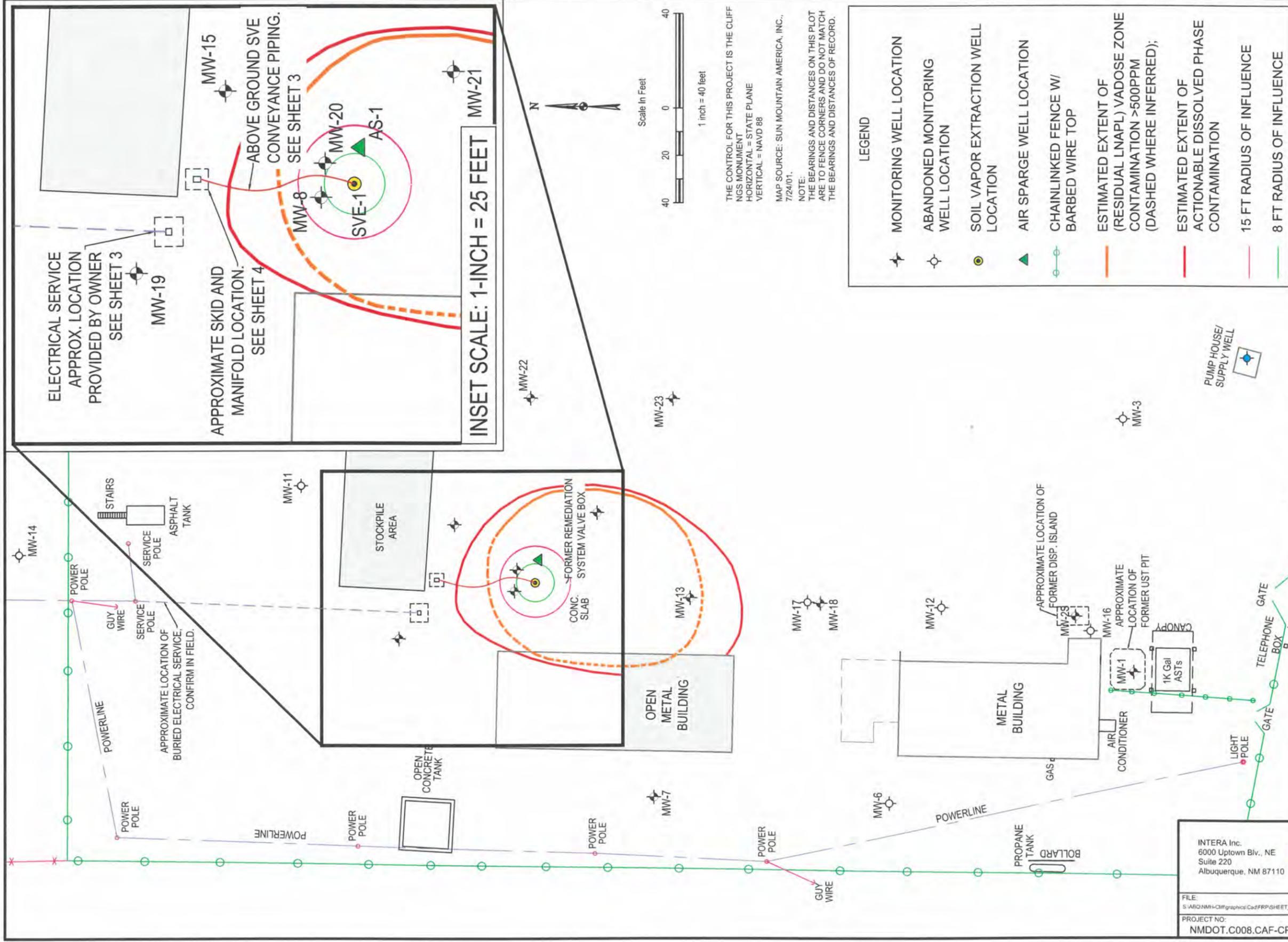
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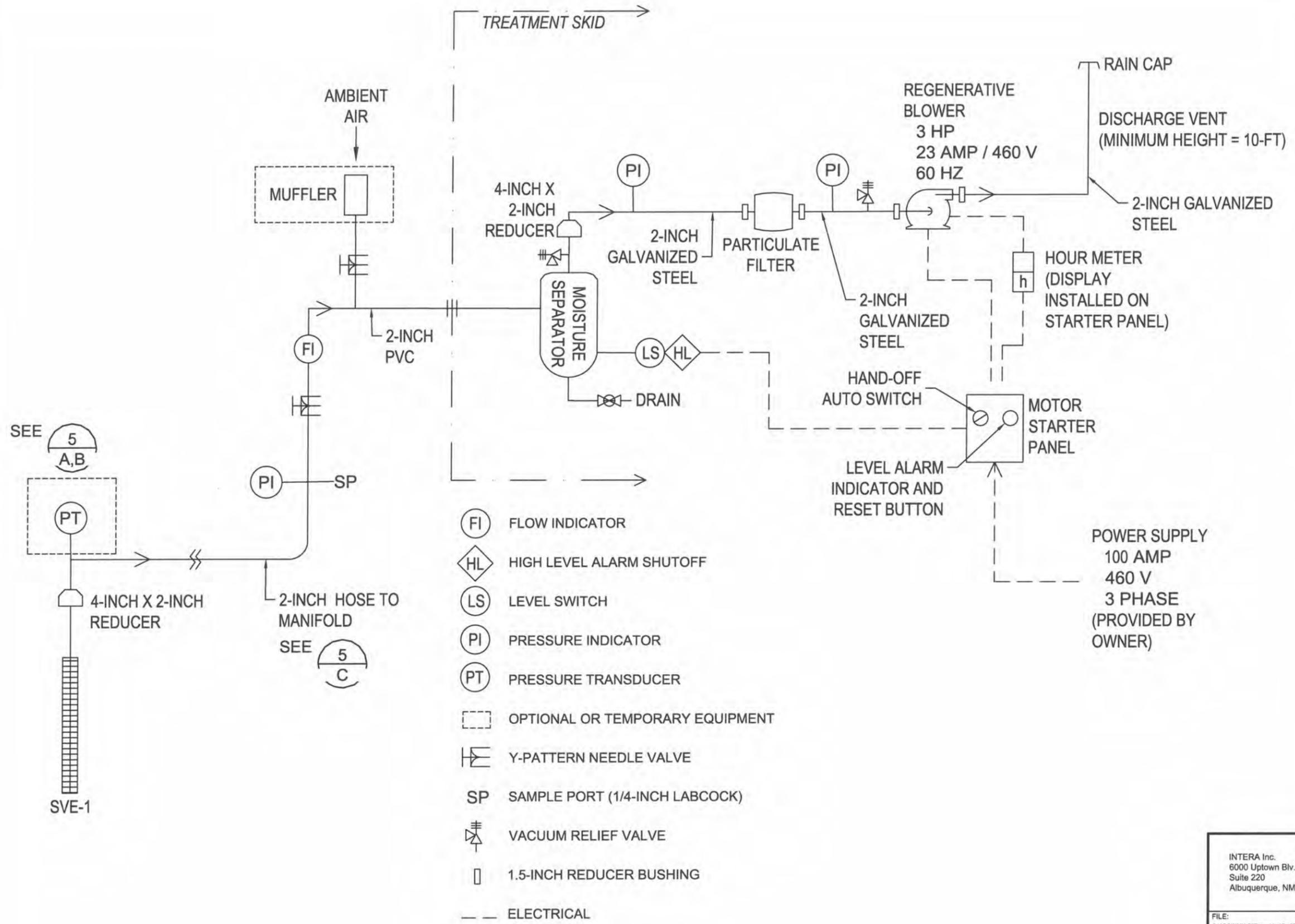
INTERA Inc.
6000 Uptown Blv., NE
Suite 220
Albuquerque, NM 87110

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PROJECT NO:
NMDOT.C008.CAF-CPY Task 2.1

SHEET:
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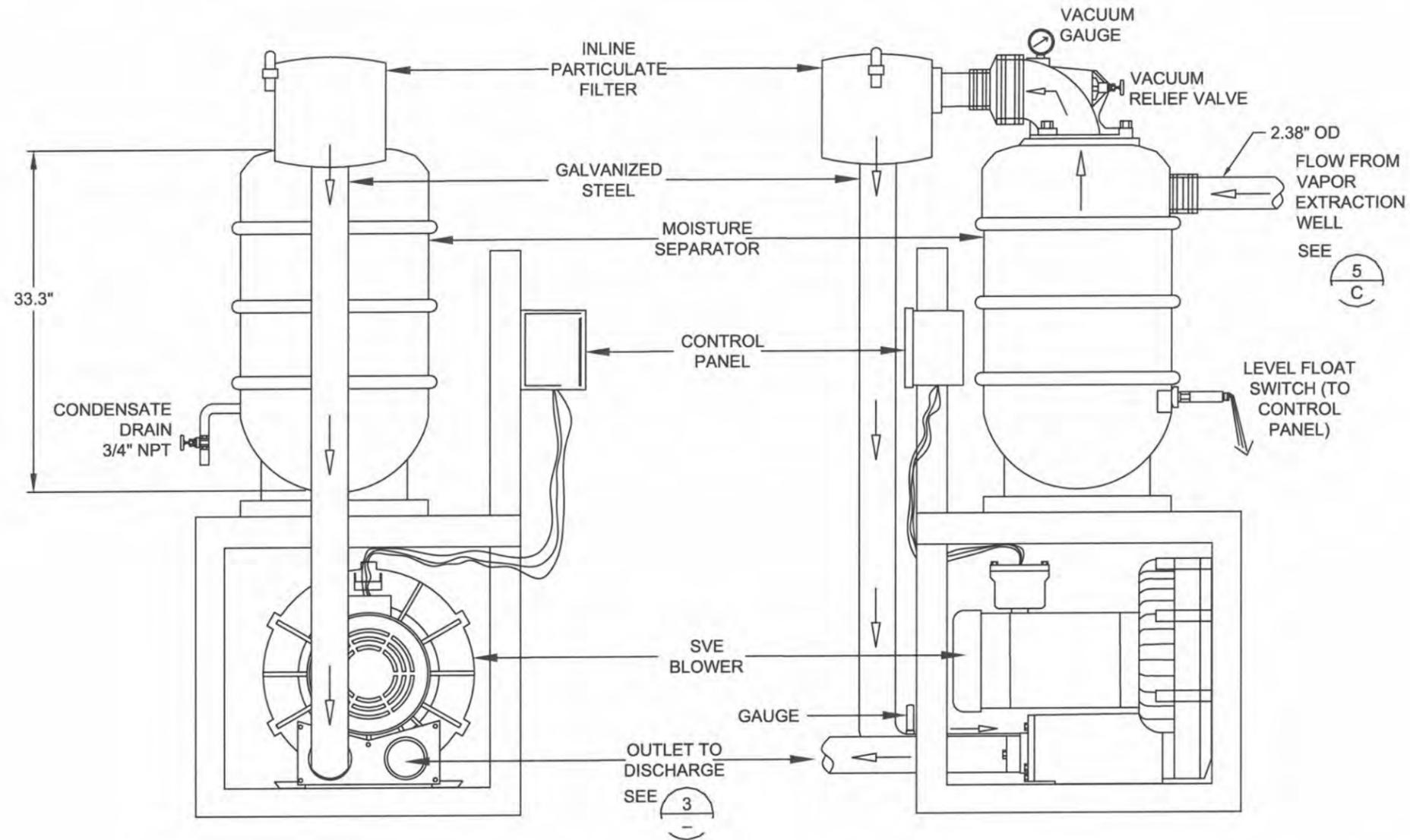
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			DESIGN

Final Remediation Plan

PIPING AND INSTRUMENTATION DIAGRAM

A
2,5 FRONT VIEW
DETAIL NTS

B
2,5 SIDE VIEW
DETAIL NTS



GENERAL NOTES:

1. SKID SHALL BE MOUNTED TO WOODEN PALLET OR SIMILAR TO AVOID SETTING DIRECTLY ON GROUND SURFACE
2. FOOTPRINT OF SKID IS APPROXIMATELY 1.5" X 2' (SEE SHEET 2)

ENGINEER SEAL



BY

REVISIONS

DATE

NO.

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DATE:

DESIGN

Final Remediation Plan

MECHANICAL / SKID ELEVATION PLAN

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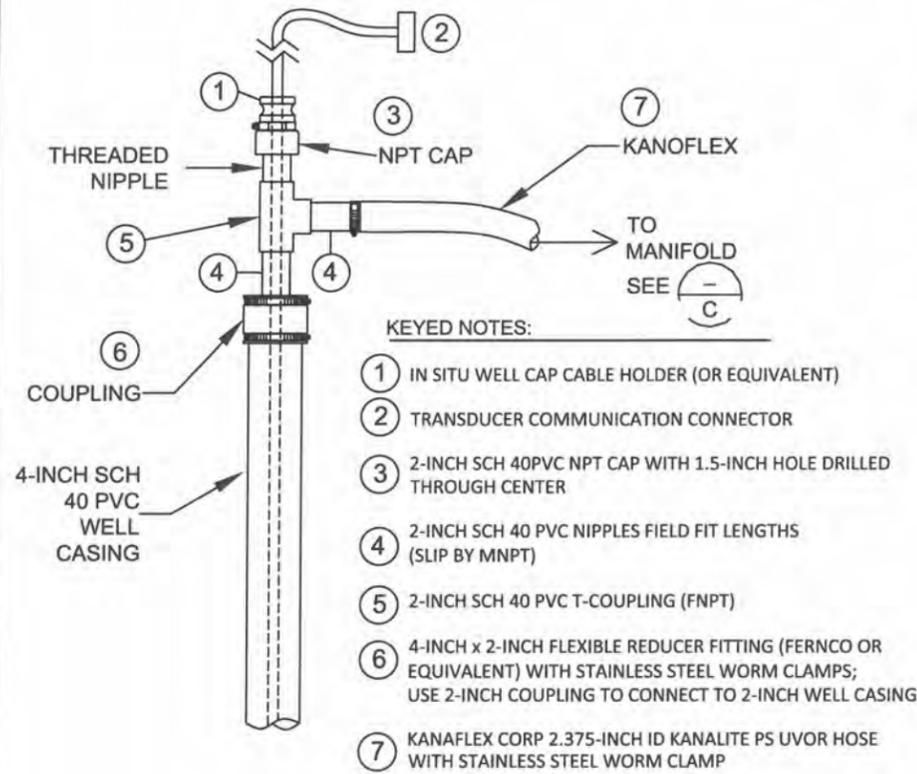


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PROJECT NO:
NMDOT.C008.CAF-CPY Task 2.1

SHEET:
4

A
3 WELL CONNECTION
DETAIL (TYP.) NTS



KEYED NOTES:

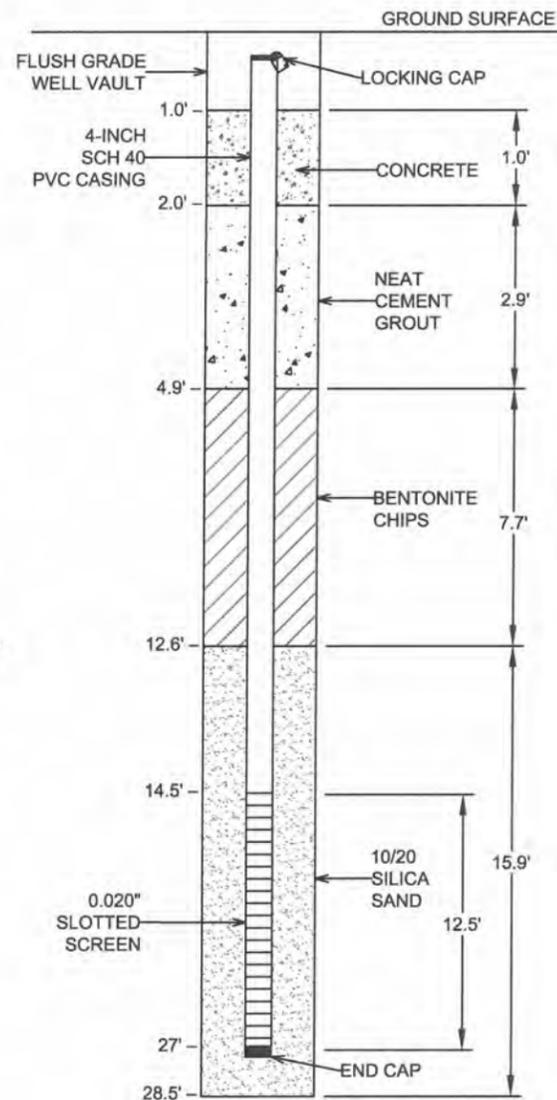
- 1 IN SITU WELL CAP CABLE HOLDER (OR EQUIVALENT)
- 2 TRANSDUCER COMMUNICATION CONNECTOR
- 3 2-INCH SCH 40PVC NPT CAP WITH 1.5-INCH HOLE DRILLED THROUGH CENTER
- 4 2-INCH SCH 40 PVC NIPPLES FIELD FIT LENGTHS (SLIP BY MNPT)
- 5 2-INCH SCH 40 PVC T-COUPLING (FNPT)
- 6 4-INCH x 2-INCH FLEXIBLE REDUCER FITTING (FERNCO OR EQUIVALENT) WITH STAINLESS STEEL WORM CLAMPS; USE 2-INCH COUPLING TO CONNECT TO 2-INCH WELL CASING
- 7 KANAFLEX CORP 2.375-INCH ID KANALITE PS UVOR HOSE WITH STAINLESS STEEL WORM CLAMP

GENERAL NOTES:

1. SOLVENT WELD FITTINGS UNLESS SHOWN.
2. ELEVATIONS SHALL BE ESTABLISHED IN THE FIELD BASED ON THE TRANSDUCER DEPTH AND SURFACE TOPOGRAPHY
3. THE TRANSDUCER SHALL BE INSTALLED DURING THE FIRST MONTH OF OPERATION TO ESTABLISH EXTENTS AND FLUCTUATIONS IN WATER TABLE MOUNDING IN THE EXTRACTION WELL. WHEN THE TRANSDUCER IS NOT DEPLOYED, THE PASSTHROUGH FITTING SHALL BE PLUGGED, OR A NEW FITTING FABRICATED FROM A 90-DEGREE ELBOW SHALL BE INSTALLED.
4. BERMS OR SANDBAGS SHALL BE PLACED UPHILL OF THE EXTRACTION WELL VAULT TO MINIMIZE CAPTURE OF STORM WATER RUNOFF ACCUMULATING IN THE WELL VAULT.
5. THE WELL TOP OF CASING SHALL NOT BE CUT, NOR SHALL FITTINGS BE SOLVENT WELDED TO THE CASING.
6. THE ELEVATION OF THE WELLHEAD T COUPLING SHALL BE SET SO THAT CONDENSATE CAN FREELY DRAIN BACK INTO THE WELL.
7. THE USE OF A VENTED TRANSDUCER WITH THE VENT EXPOSED TO THE SYSTEM VACUUM IS REQUIRED TO ACCURATELY MEASURE MOUNDING OF THE WATER TABLE.

B
3 SVE-1 CONSTRUCTION
DETAIL NTS

From Well Installation, 1st Semiannual Groundwater Monitoring, and Pilot Test Report, October 28, 2019. (INTERA, 2019)



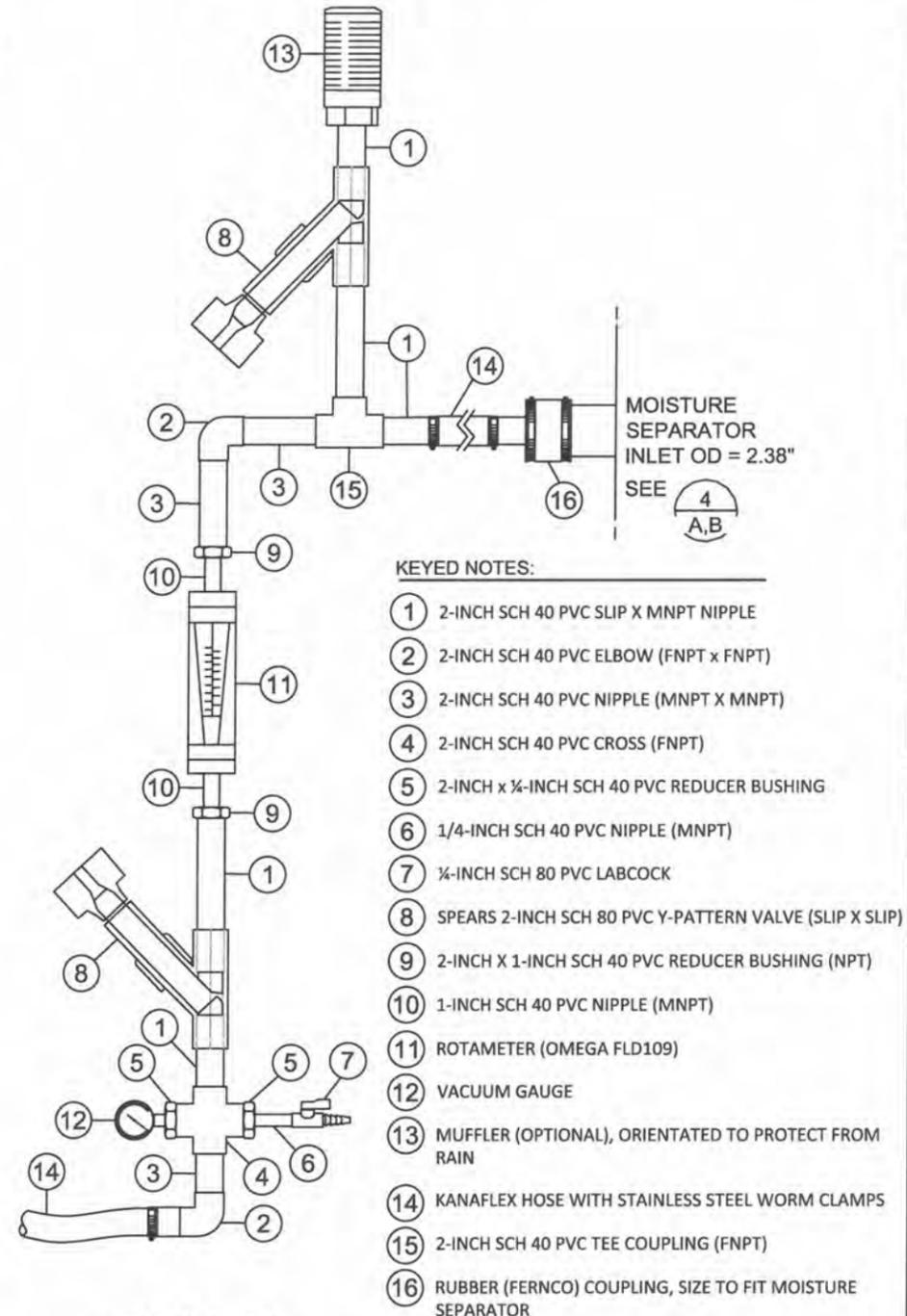
WELL DETAIL TABLE

ID	DIAMETER	SCREENED INTERVAL
SVE-1	4"	14.5'-27'
MW-8	2"	15'-20'
MW-20	2"	16.2'-31.2'
MW-13	2"	14'-24'

GENERAL NOTES:

1. A 2-INCH FERNCO FITTING WITH A NIPPLE, 2-INCH X 1/4-INCH REDUCER BUSHING AND DWYER LPG4-D7122N LOW PRESSURE 0-10 IN H2O VACUUM (OR EQUIVALENT) WILL BE USED ON SELECT MONITORING WELLS FOR OBSERVATION.

C
3,4 MANIFOLD
DETAIL NTS



KEYED NOTES:

- 1 2-INCH SCH 40 PVC SLIP X MNPT NIPPLE
- 2 2-INCH SCH 40 PVC ELBOW (FNPT x FNPT)
- 3 2-INCH SCH 40 PVC NIPPLE (MNPT X MNPT)
- 4 2-INCH SCH 40 PVC CROSS (FNPT)
- 5 2-INCH x 1/4-INCH SCH 40 PVC REDUCER BUSHING
- 6 1/4-INCH SCH 40 PVC NIPPLE (MNPT)
- 7 1/4-INCH SCH 80 PVC LABCOCK
- 8 SPEARS 2-INCH SCH 80 PVC Y-PATTERN VALVE (SLIP X SLIP)
- 9 2-INCH X 1-INCH SCH 40 PVC REDUCER BUSHING (NPT)
- 10 1-INCH SCH 40 PVC NIPPLE (MNPT)
- 11 ROTAMETER (OMEGA FLD109)
- 12 VACUUM GAUGE
- 13 MUFFLER (OPTIONAL), ORIENTATED TO PROTECT FROM RAIN
- 14 KANAFLEX HOSE WITH STAINLESS STEEL WORM CLAMPS
- 15 2-INCH SCH 40 PVC TEE COUPLING (FNPT)
- 16 RUBBER (FERNCO) COUPLING, SIZE TO FIT MOISTURE SEPARATOR

GENERAL NOTES:

1. SUPPORT ASSEMBLY MOUNTED TO POST OR SKID; DETERMINE IN FIELD



NO.	DATE	REVISIONS	BY	ENGINEER SEAL

Final Remediation Plan

DETAILS

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Albuquerque, NM 87110

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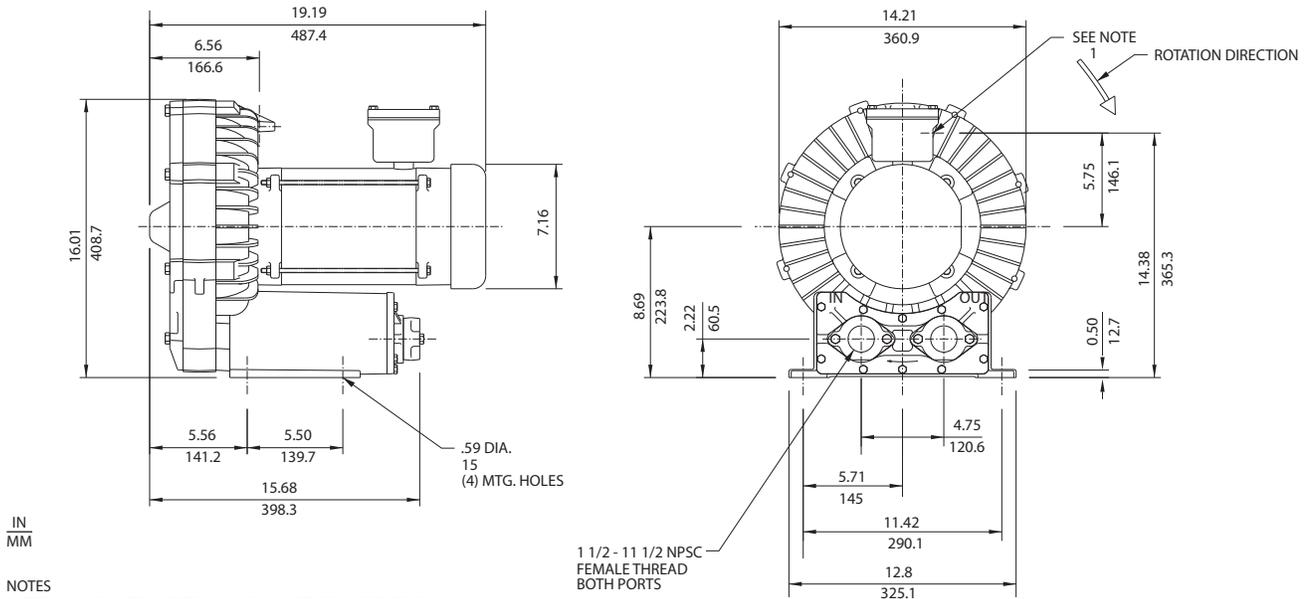
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NMDOT.C008.CAF-CPY Task 2.1

SHEET:
5

Appendix D

Product Cut Sheets

3.0 HP High Pressure Sealed Regenerative w/Explosion-Proof Motor



- NOTES
 1 TERMINAL BOX CONNECTOR HOLE 3/4" NPT FEMALE THREAD.
 2 DRAWING NOT TO SCALE, CONTACT FACTORY FOR SCALE CAD DRAWING.
 3 CONTACT FACTORY FOR BLOWER MODEL LENGTHS NOT SHOWN.

Specification	Units	Part/Model Number			
		EN523M5L 038223	EN523M72L 038184	CP523FU5LR TBD	CP523FU72LR 038968
Motor Enclosure - Shaft Mt.	-	Explosion-proof-CS	Explosion-proof-CS	CHEM XP-SS	CHEM XP-SS
Horsepower	-	3	3	3	3
Phase - Frequency Voltage	-	Single-60 hz	Three-60 hz	Single-60 hz	Three-60 hz
Motor Nameplate Amps	AC	230	230/460	230	230/460
Max. Blower Amps	Amps (A)	15.5-14.5	7.4/3.7	15.5-14.5	7.4/3.7
Locked Rotor Amps	Amps (A)	18.1-16.7	8/4	18.1-16.7	8/4
Service Factor	Amps (A)	94-88	62/31	94-88	62/31
Starter Size	-	1	0/0	1	0/0
Thermal Protection	-	1.0	1.0	1.0	1.0
XP Motor Class - Group	-	Class B - Pilot Duty			
	-	I-D	I-D	I-D	I-D
Shipping Weight	Lbs	126	126	150	126
	Kg	57.2	57.2	68	57.2

Voltage - ROTRON motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

Operating Temperatures - Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

Maximum Blower Amps - Corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

XP Motor Class - Group - See Explosive Atmosphere Classification Chart in Section I

This document is for informational purposes only and should not be considered as a binding description of the products or their performance in all applications. The performance data on this page depicts typical performance under controlled laboratory conditions. AMETEK is not responsible for blowers driven beyond factory specified speed, temperature, pressure, flow or without proper alignment. Actual performance will vary depending on the operating environment and application. AMETEK products are not designed for and should not be used in medical life support applications. AMETEK reserves the right to revise its products without notification. The above characteristics represent standard products. For product designed to meet specific applications, contact AMETEK Technical & Industrial Products Sales department.

FEATURES

- Manufactured in the USA - ISO 9001 and NAFTA compliant
- Maximum flow: 84 SCFM
- Maximum pressure: 140 IWG
- Maximum vacuum: 135 IWG
- Standard motor: 3.0 HP, explosion-proof
- Cast aluminum blower housing, impeller, cover & manifold; cast iron flanges (threaded); teflon® lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards

MOTOR OPTIONS

- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepower for application-specific needs

BLOWER OPTIONS

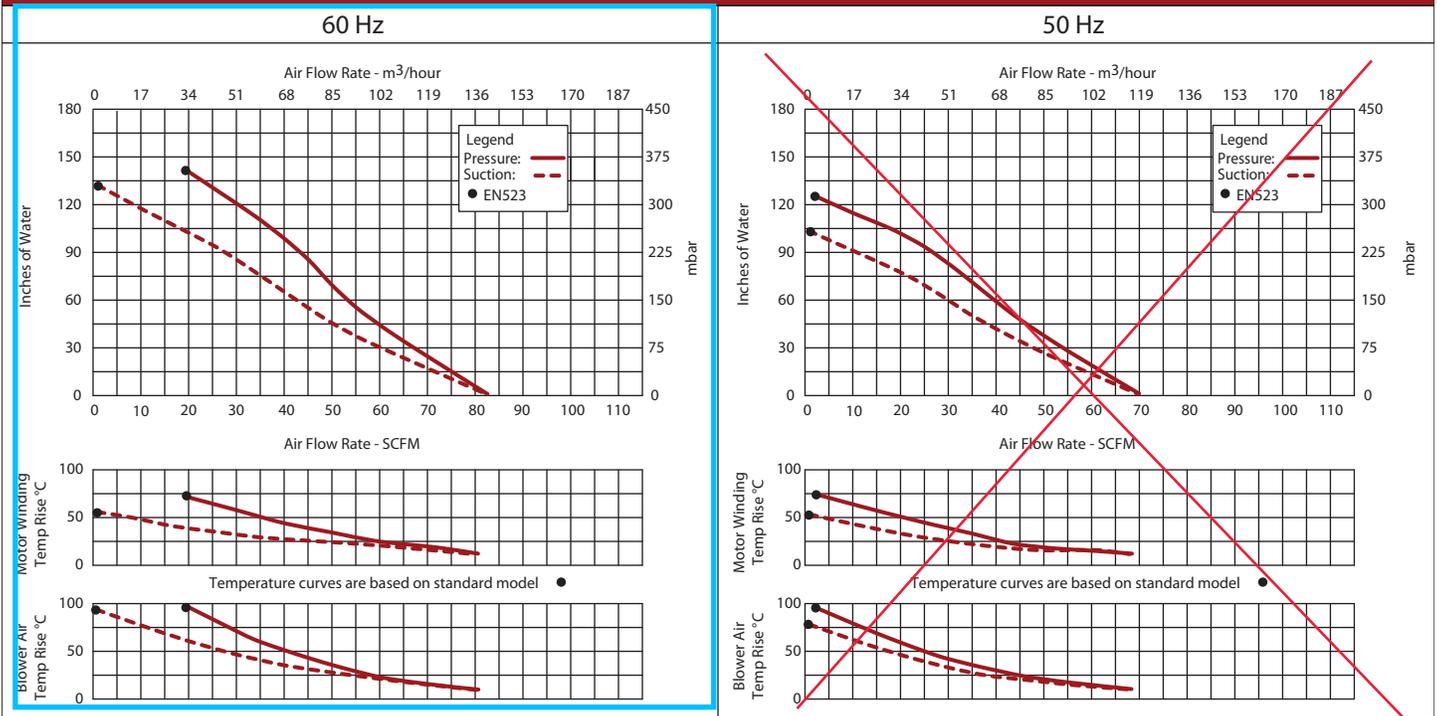
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES

- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges, & relief valves
- Switches - air flow, pressure, vacuum, or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package



Blower Performance at Standard Conditions



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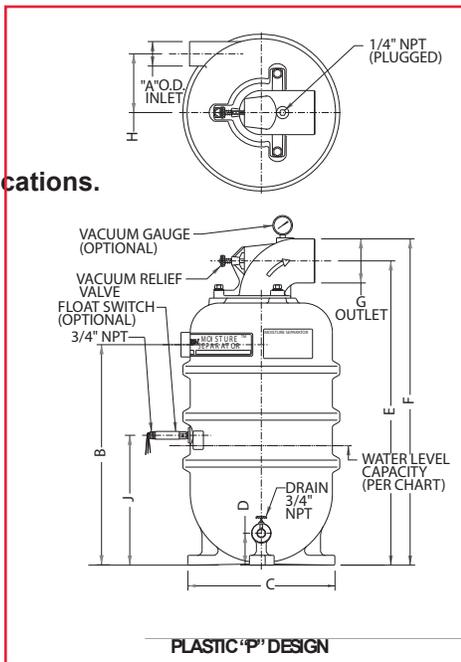
Filtration - Moisture Separator

ROTRON®

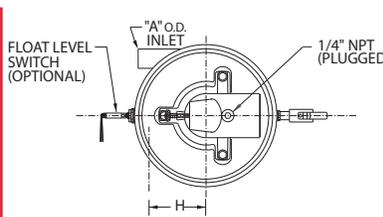
By separating and containing entrained liquids, ROTRON'S™ moisture separator helps protect our regenerative blowers and the end treatment system from corrosion and mineralization damage. Recommended for all soil vacuum extraction Applications.

SPECIFICATIONS:
SEPARATION METHOD – High Efficiency Cyclonic
RELIEF VALVE MATERIAL – Brass & Stainless Steel
FLOAT MATERIAL – Copper
FLOAT SWITCH – SPDT, Explosion-proof
NEMA 7&9, 5 Amp max.

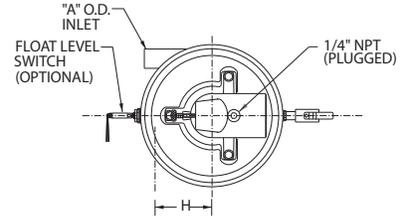
applications.



PLASTIC 'P' DESIGN



METAL 'D' DESIGN



METAL 'B' DESIGN

Specification	Units	Part/Model Number					
		MS200PS	MS300PS	MS350BS	MS500BS	MS600BS	MS1000BS
		038519	038520	038357	080660	080659	038914
Dimension A	Inches	2.38	2.88	3.25	3.25	4.00	6.00
	mm	60.5	73.2	82.6	82.6	101.6	152.4
CFM Max.	CFM	200	300	350	500	600	1000
	m3/hr	340	510	595	850	1020	1700
Dimension B	Inches	22.46	22.46	28.00	28.00	27.00	31.00
	mm	570.5	570.5	711.2	711.2	685.8	787.4
Dimension C	Inches	16.00	16.00	23.00	23.00	23.00	27.00
	mm	406.4	406.4	584.2	584.2	584.2	685.8
Dimension D	Inches	3.25	3.25	4.00	4.00	4.00	4.00
	mm	82.6	82.6	101.6	101.6	101.6	101.6
Dimension E	Inches	31.05	31.05	37.25	37.37	37.37	47.32
	mm	788.7	788.7	946.2	949.2	949.2	1201.9
Dimension F	Inches	33.30	33.30	39.50	54.50	54.50	51.70
	mm	845.8	845.8	1003.3	1384.3	1384.3	1313.2
Dimension H	Inches	6	6.00	9.75	9.75	9.25	10.00
	mm	152.4	152.4	247.7	247.7	235	254
Dimension G	Inches	4.50 OD	4.50 D	4.50 OD	6.63 ID	6.63 ID	8.62 OD
	mm	114.3	114.3	114.3	168.4	168.4	218.9
Dimension J	Inches	13.25	13.25	17.50	17.50	17.50	19.88
	mm	336.6	336.6	444.5	444.5	444.5	505
Drain Internal Thd	-	3/4	3/4	1	1	1	1
Shipping Weight	Lbs	42	42	82	95	96	150
	Kg	19.1	19.1	37.2	43.1	43.5	68

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AMETEK DYNAMIC FLUID SOLUTIONS
 75 North Street, Saugerties, NY 12477
 USA: +1 215-256-6601 - Europe: +49 7703 930909 - Asia: +86 21 5763 1258
 Customer Service Fax: +1 215.256.1338
 www.ametekdfs.com

2.0 Moisture Separator™ Specifications

2.1 Duty

The moisture separator shall be designed for use in a soil vapor extraction system capable of continuous operation with a pressure drop of less than six inches of water at the rated flow of 200 SCFM. The separator shall be capable of operation under various inlet conditions ranging from a fine mist to slugs of water with high efficiency.

2.2 Principle of Operation

The moisture separator shall incorporate cyclonic separation to remove entrained water. The separator must protect against an overflow by fail safe mechanical means. An electrical switch or contact(s) alone is not an acceptable means of protection against overflow, but is a good backup.

2.3 Construction

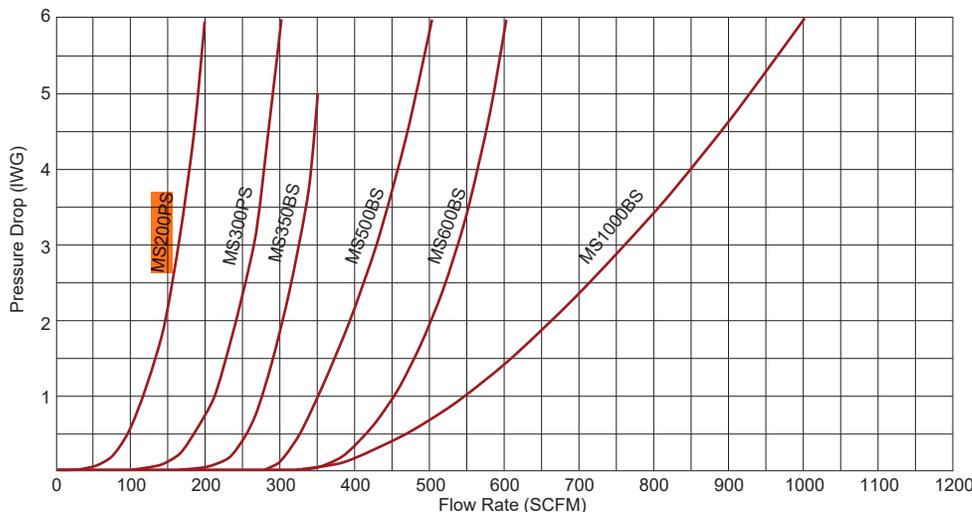
The body of the moisture separator shall be constructed of heavy wall plastic or heavy gauge cold rolled steel. The steel interior and exterior shall be epoxy (powder) coated to resist abrasion, corrosion, and chipping that might expose the surface. The inlet shall be tangentially located and welded to the body. The outlet port shall be constructed of PVC or cast aluminum alloy, flanged and sealed to the center of the top of the separator. The separator shall incorporate a non-sparking copper float ball and an adjustable relief valve to protect against overflow and overheating the blower.

For DR/EN/CP Blower Model	Selector Moisture Separator Model	Liquid-holding Capacity (gallons)	Inlet (OD)	Outlet	Max Vacuum Allow (IHG)
404 454 505 513 523 555 633 833	MS200PS	7	2.38	4.5 OD	12
656 6	MS300PS	7	2.88	6.63 ID	22
757 808	MS350BS	40	3.25		
858 1233	MS500BS		4.0	8.62 OD	
909	MS600BS	65			
979 14	MS1000BS		6.0		

2.4 Capacity and Dimension

The moisture separator must have a liquid capacity of 7 gallons. The inlet shall be 2.38 inch OD slip-on type. The outlet shall be 4.5 inch OD slip-on type.

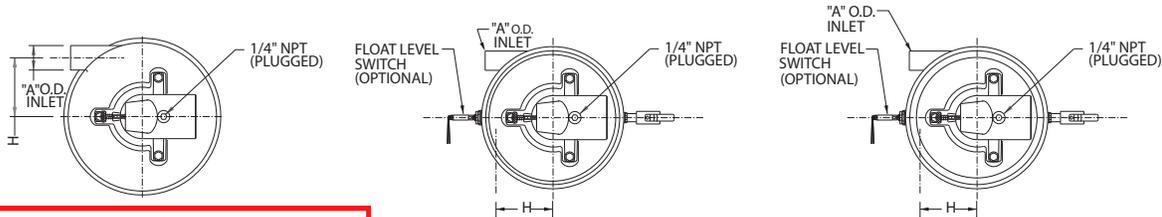
2.5 Pressure Drop



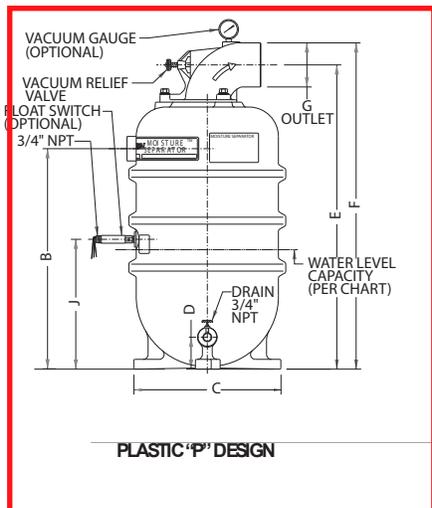
This document is for informational purposes only and should not be considered as a binding description of the products or their performance in all applications. The performance data on this page depicts typical performance under controlled laboratory conditions. AMETEK is not responsible for blowers driven beyond factory specified speed, temperature, pressure, flow or without proper alignment. Actual performance will vary depending on the operating environment and application. AMETEK products are not designed for and should not be used in medical life support applications. AMETEK reserves the right to revise its products without notification. The above characteristics represent standard products. For product designed to meet specific applications, contact AMETEK Technical & Industrial Products Sales department.

By separating and containing entrained liquids, ROTRON'S™ moisture separator helps protect our regenerative blowers and the end treatment system from corrosion and mineralization damage. Recommended for all soil vacuum extraction Applications.

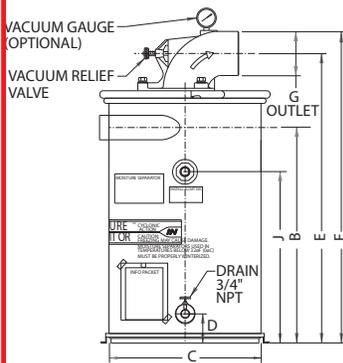
SPECIFICATIONS:
SEPARATION METHOD – High Efficiency Cyclonic
RELIEF VALVE MATERIAL – Brass & Stainless Steel
FLOAT MATERIAL – Copper
FLOAT SWITCH – SPDT, Explosion-proof NEMA 7&9, 5 Amp max.



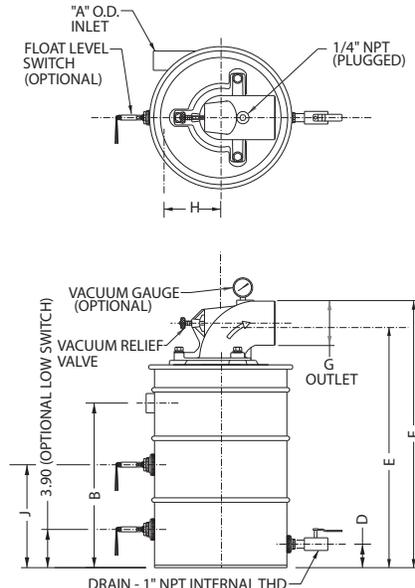
applications.



PLASTIC 'P' DESIGN



METAL 'D' DESIGN



METAL 'B' DESIGN

Specification	Units	Part/Model Number					
		MS200PS 038519	MS300PS 038520	MS350BS 038357	MS500BS 080660	MS600BS 080659	MS1000BS 038914
Dimension A	Inches mm	2.38 60.5	2.88 73.2	3.25 82.6	3.25 82.6	4.00 101.6	6.00 152.4
CFM Max.	CFM m3/hr	200 340	300 510	350 595	500 850	600 1020	1000 1700
Dimension B	Inches mm	22.46 570.5	22.46 570.5	28.00 711.2	28.00 711.2	27.00 685.8	31.00 787.4
Dimension C	Inches mm	16.00 406.4	16.00 406.4	23.00 584.2	23.00 584.2	23.00 584.2	27.00 685.8
Dimension D	Inches mm	3.25 82.6	3.25 82.6	4.00 101.6	4.00 101.6	4.00 101.6	4.00 101.6
Dimension E	Inches mm	31.05 788.7	31.05 788.7	37.25 946.2	37.37 949.2	37.37 949.2	47.32 1201.9
Dimension F	Inches mm	33.30 845.8	33.30 845.8	39.50 1003.3	54.50 1384.3	54.50 1384.3	51.70 1313.2
Dimension H	Inches mm	6 152.4	6.00 152.4	9.75 247.7	9.75 247.7	9.25 235	10.00 254
Dimension G	Inches mm	4.50 OD 114.3	4.50 D 114.3	4.50 OD 114.3	6.63 ID 168.4	6.63 ID 168.4	8.62 OD 218.9
Dimension J	Inches mm	13.25 336.6	13.25 336.6	17.50 444.5	17.50 444.5	17.50 444.5	19.88 505
Drain Internal Thd	-	3/4	3/4	1	1	1	1
Shipping Weight	Lbs Kg	42 19.1	42 19.1	82 37.2	95 43.1	96 43.5	150 68

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2.0 Moisture Separator™ Specifications

2.1 Duty

The moisture separator shall be designed for use in a soil vapor extraction system capable of continuous operation with a pressure drop of less than six inches of water at the rated flow of _____ SCFM. The separator shall be capable of operation under various inlet conditions ranging from a fine mist to slugs of water with high efficiency.

2.2 Principle of Operation

The moisture separator shall incorporate cyclonic separation to remove entrained water. The separator must protect against an overflow by fail safe mechanical means. An electrical switch or contact(s) alone is not an acceptable means of protection against overflow, but is a good backup.

2.3 Construction

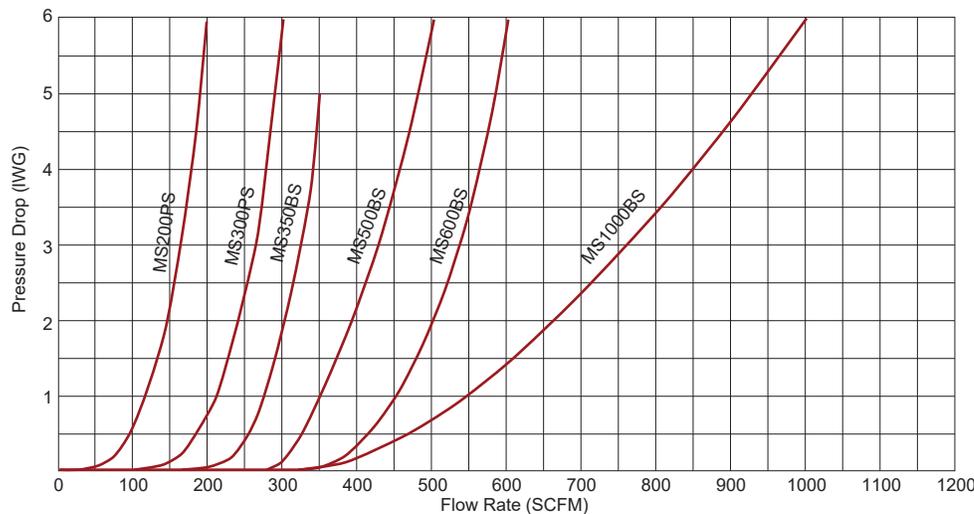
The body of the moisture separator shall be constructed of heavy wall plastic or heavy gauge cold rolled steel. The steel interior and exterior shall be epoxy (powder) coated to resist abrasion, corrosion, and chipping that might expose the surface. The inlet shall be tangentially located and welded to the body. The outlet port shall be constructed of PVC or cast aluminum alloy, flanged and sealed to the center of the top of the separator. The separator shall incorporate a non-sparking copper float ball and an adjustable relief valve to protect against overflow and overheating the blower.

For DR/EN/CP Blower Model	Selector Moisture Separator Model	Liquid-holding Capacity (gallons)	Inlet (OD)	Outlet	Max Vacuum Allow (IHG)
404 454 505 513 523 555 633 833	MS200PS	7	2.38	4.5 OD	12
656 6	MS300PS	7	2.88	6.63 ID	22
757 808	MS350BS	40	3.25		
858 1233	MS500BS		4.0	8.62 OD	
909	MS600BS	6.0			
979 14	MS1000BS	65	6.0	8.62 OD	

2.4 Capacity and Dimension

The moisture separator must have a liquid capacity of _____ gallons. The inlet shall be _____ inch OD slip-on type. The outlet shall be _____ inch OD slip-on type.

2.5 Pressure Drop



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Y-Pattern Valves



Features - PVC Gray, PVC Clear & CPVC

The Y-Pattern valve is a closing-down, globe type valve design that provides proportional opening to seating disc travel. As such, Y-Pattern valves are ideally suited for flow regulating applications. The Y-pattern configuration reduces pressure loss over that of standard globe valves. Available in IPS Sizes 1/2" - 4" with socket, SR threaded, flanged, socket union or SR threaded union end connectors.

Sample Engineering Specification

All thermoplastic valves shall be Y-Pattern configuration constructed from PVC, ASTM D 1784 Cell Classification 12454, or CPVC, ASTM D 1784 Cell Classification 23447. All valves shall have Buttress thread bonnet and standard O-ring type seating disc. All O-rings shall be EPDM or FKM. All valves shall have high impact polypropylene handles. All 1/2" - 2" valves shall be pressure rated at 150 psi and all 3" - 4" valves shall be pressure rated at 90 psi for water at 73°F, as manufactured by Spears® Manufacturing Company.

- Chemical & Corrosion Resistant PVC Gray, PVC Clear or CPVC Construction
- Buttress Thread Bonnet
- Fully Serviceable, Replaceable Components
- Standard O-ring Seal Seating Disc & Seals
- EPDM or FKM O-rings
- High Impact Polypropylene Handle
- Assembled with Silicone-Free, Water Soluble Lubricants
- Sizes 1/2" - 2" Pressure Rated to 150 psi @ 73°F, Sizes 3" - 4" Pressure Rated to 90 psi @ 73°F

Quick-View Valve Selection Chart

Valve Size	O-ring Material	PVC Material ^{1,2,3}					Pressure Rating	
		Socket	SR Threaded	Flanged	Socket Union	SR Threaded Union		
1/2	EPDM	1722-005	1721-005SR	1723-005	172A-005	172B-005SR	150 psi Non-Shock Water @73°F	
	FKM	1732-005	1731-005SR	1733-005	173A-005	173B-005SR		
3/4	EPDM	1722-007	1721-007SR	1723-007	172A-007	172B-007SR		
	FKM	1732-007	1731-007SR	1733-007	173A-007	173B-007SR		
1	EPDM	1722-010	1721-010SR	1723-010	172A-010	172B-010SR		
	FKM	1732-010	1731-010SR	1733-010	173A-010	173B-010SR		
1-1/4	EPDM	1722-012	1721-012SR	1723-012	172A-012	172B-012SR		
	FKM	1732-012	1731-012SR	1733-012	173A-012	173B-012SR		
1-1/2	EPDM	1722-015	1721-015SR	1723-015	172A-015	172B-015SR		
	FKM	1732-015	1731-015SR	1733-015	173A-015	173B-015SR		
2	EPDM	1722-020	1721-020SR	1723-020	172A-020	172B-020SR		
	FKM	1732-020	1731-020SR	1733-020	173A-020	173B-020SR		
3	EPDM	1722-030	1721-030SR	1723-030	172A-030	172B-030SR		90 psi Non-Shock Water @73°F
	FKM	1732-030	1731-030SR	1733-030	173A-030	173B-030SR		
4	EPDM	1722-040	1721-040SR	1723-040	172A-040	172B-040SR		
	FKM	1732-040	1731-040SR	1733-040	173A-040	173B-040SR		

- 1: For CPVC Y-Pattern, add the letter "C" to the part number (e.g. 1722-005C)
 2: For PVC Clear Y-Pattern, add the letters "CL" to the part number (e.g. 1722-005CL) or (e.g. 172A-005CL)
 3: For CPVC or Clear Special Reinforced Y-Pattern, (e.g. 1721-005CSR) or (e.g. 1721-005CLSR)

Replacement Parts

NO.	COMPONENT	QTY.	MATERIAL
1	Body ¹ (SOC/SR/FLG/UNION)	1	PVC/CLEAR/CPVC
2	Stem Assembly	1	PVC/CPVC;EPDM/FKM
3	Seal Carrier O-ring	1	EPDM/FKM
4	Bonnet Nut	1	PVC/CPVC
5	Bonnet	1	PVC/CPVC
6	Handwheel	1	PP
7	Stem Nut	1	PVC
8	Union O-ring	2	EPDM/FKM
9	Union Socket End	2	PVC/CPVC
10	Union SR Thread End	2	PVC/CPVC

- 1 - SR-Fipt Body Includes: Body (1), Spigot Adapters (2), SS Collars (2)
 - Flange Body Includes: Body (1), Spigot Hubs (2), Flange Rings (2)
 - Union Body Includes: Body (1), Spigot Ends (2), Nuts (2)
 2 - Stem Assembly Includes: Stem (1), Seat Retainer (1), Seat Plate (1), Seat (1), Seal Carrier (1), Retainer Plate (1) (Except 4"), Stem O-ring (1)

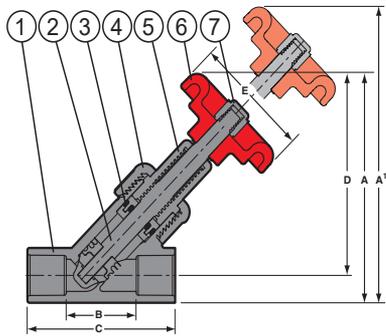
Temperature Pressure Rating

System Operating Temperature °F (°C)		100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)	200 (93)	210 (99)
Valve Pressure Rating psi (MPa)	1/2" - 2"	PVC	150 (1.03)	135 (.93)	110 (.76)	75 (.52)	50 (.34)	-0-	-0-	-0-	-0-	-0-	-0-
		CPVC	150 (1.03)	140 (.97)	130 (.90)	120 (.83)	110 (.76)	100 (.70)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)
	3" - 4"	PVC	90 (.70)	85 (.62)	75 (.52)	60 (.41)	40 (.30)	-0-	-0-	-0-	-0-	-0-	-0-
		CPVC	90 (.70)	85 (.62)	80 (.55)	75 (.52)	70 (.48)	60 (.41)	50 (.34)	45 (.31)	40 (.30)	35 (.24)	30 (.21)

C_v Values

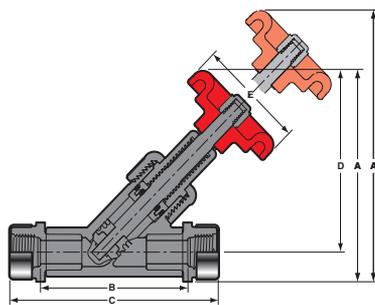
Size	Values
1/2	6.7
3/4	12.6
1	22.9
1-1/4	33.8
1-1/2	50.7
2	79.2
3	235
4	387

Y-Pattern Valves



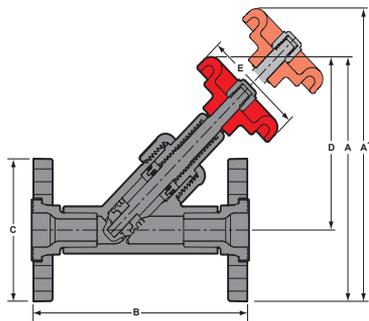
Socket Y-Pattern Dimensions & Weights

Nominal Size	Dimension Reference (inches, ± 1/16)						Approx. Wt. (Lbs.)	
	A ¹	A	B	C	D	E	Socket	
							PVC	CPVC
1/2	6-3/8	4-9/16	1-5/8	3-3/8	4	2-3/8	.31	.33
3/4	7-1/2	5-1/4	2	4	4-9/16	2-3/8	.50	.53
1	6-15/16	5-7/8	2-1/2	4-3/4	5-1/8	2-3/8	.78	.90
1-1/4	10-15/16	7-5/8	3-1/16	5-9/16	6-1/2	3-1/2	1.21	1.28
1-1/2	12	8-5/8	3-9/16	6-5/16	7-1/2	3-1/2	1.66	1.76
2	13-13/16	9-15/16	4-1/2	7-1/2	8-1/2	3-1/2	2.96	3.10
3	20	14-1/2	6-9/16	10-5/16	12-7/16	6-5/8	5.34	5.64
4	25-1/2	18-1/4	8-5/8	13-1/8	15-5/8	7-15/16	9.97	10.45



SR Threaded Y-Pattern Dimensions & Weights

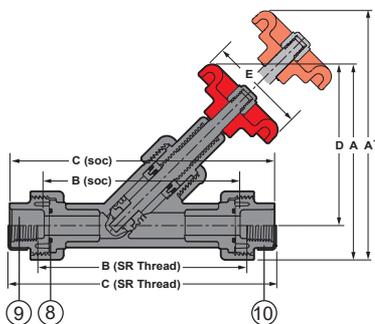
Nominal Size	Dimension Reference (inches, ± 1/16)						Approx. Wt. (Lbs.)	
	A ¹	A	B	C	D	E	SR Threaded	
							PVC	CPVC
1/2	6-1/2	4-11/16	3-5/8	5-1/16	4	2-3/8	.31	.33
3/4	7-5/8	5-7/16	4-3/8	5-13/16	4-9/16	2-3/8	.50	.53
1	8-5/8	6-1/8	5-3/16	7	5-1/8	2-3/8	.85	.90
1-1/4	11-1/8	7-3/4	6	7-15/16	6-1/2	3-1/2	1.21	1.28
1-1/2	12-1/4	8-7/8	6-15/16	8-13/16	7-1/2	3-1/2	1.66	1.76
2	14-1/16	10-3/16	8-1/8	10-1/8	8-1/2	3-1/2	2.96	3.10
3	20	14-13/16	11	14-1/4	12-7/16	6-5/8	5.34	5.64
4	25-13/16	18-1/2	14	14-3/4	15-5/8	7-15/16	9.97	10.45



Flanged Y-Pattern Dimensions & Weights

Nominal Size	Dimension Reference (inches, ± 1/16)						Approx. Wt. (Lbs.)	
	A ¹	A	B	C	D	E	Flanged	
							PVC	CPVC
1/2	7-9/16	5-3/4	5-11/16	3-1/2	4	2-3/8	.82	.85
3/4	8-3/4	6-1/2	6-7/16	3-7/8	4-9/16	2-3/8	1.23	1.28
1	9-3/4	7-1/4	7-1/4	4-1/4	5-1/8	2-3/8	1.70	1.81
1-1/4	12-1/4	8-7/8	8-1/8	4-5/8	6-1/2	3-1/2	2.40	2.52
1-1/2	13-3/8	10	9-3/16	5	7-1/2	3-1/2	3.07	3.25
2	15-3/8	11-1/2	10-3/8	6	8-1/2	3-1/2	5.20	5.42
3	21-11/16	16-3/16	12-1/16	7-1/2	12-7/16	6-5/8	9.44	10.07
4	27-7/16	20-3/16	14-9/16	9-1/16	15-5/8	7-15/16	14.87	16.15

Note: 4" flanged Y-Pattern use split flange ring



True Union Y-Pattern Dimensions & Weights

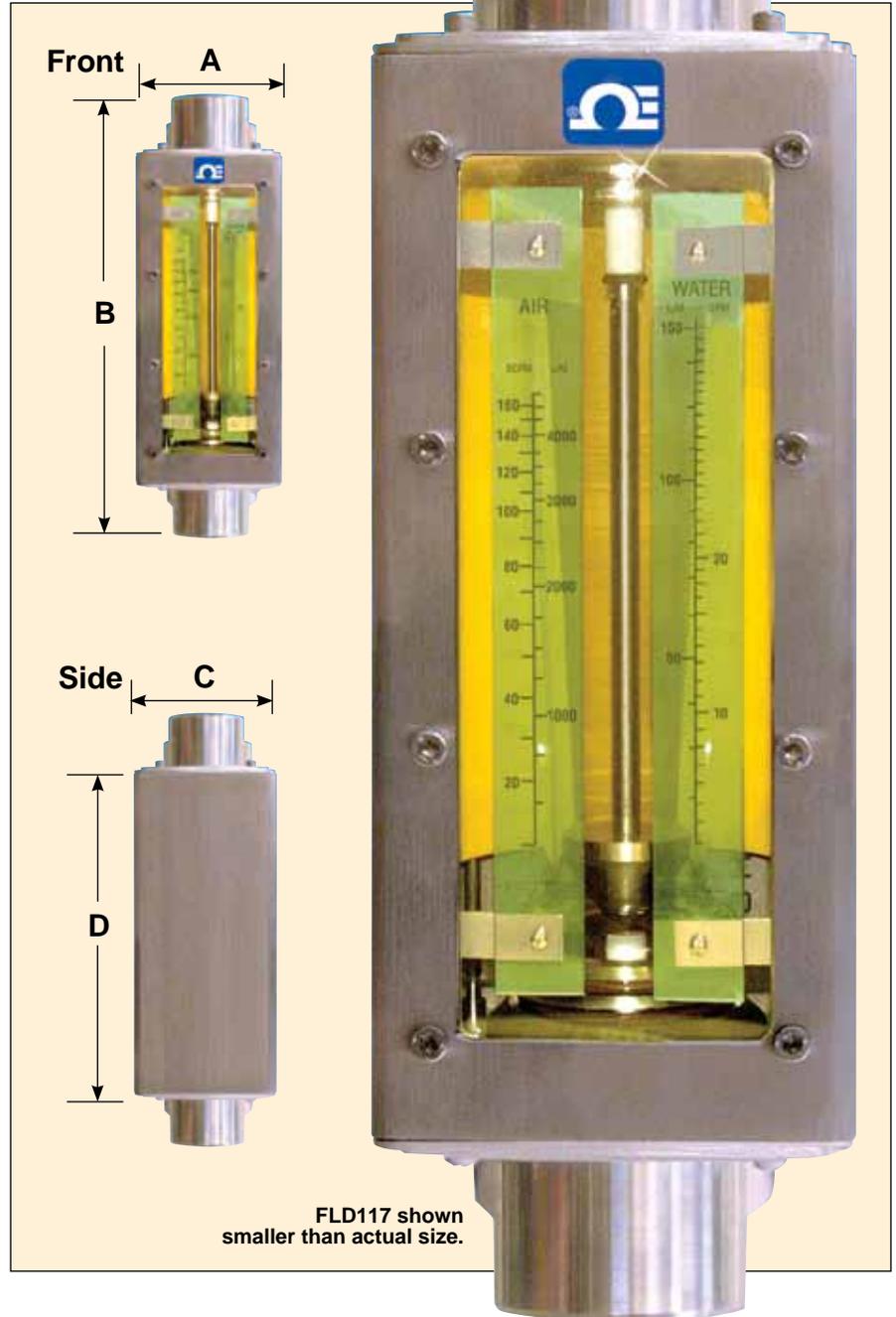
Nominal Size	Dimension Reference (inches, ± 1/16)						Approx. Wt. (Lbs.)			
	A ¹	A	B		C		D	E	Union	
			Socket	SR Thread	Socket	SR Thread			PVC	CPVC
1/2	7	5-3/16	5-1/8	5-1/2	6-7/8	7	4-1/4	2-5/8	.59	.62
3/4	8-3/16	6	5-7/8	6-7/16	7-7/8	7-7/8	4-7/8	2-5/8	.97	1.02
1	9-1/8	6-5/8	6-1/2	7-3/8	8-3/4	9	5-3/8	2-5/8	1.33	1.41
1-1/4	11-1/2	8-3/16	7-7/16	6-3/16	9-15/16	10-1/8	6-5/8	3-1/2	1.53	1.63
1-1/2	12-13/16	9-3/8	8-3/16	9	10-15/16	10-15/16	7-9/16	3-1/2	3.06	3.25
2	14-9/16	10-11/16	9-7/16	10-13/16	12-7/16	12-13/16	8-5/8	3-1/2	4.90	5.16
3	21-1/8	15-5/8	13-5/8	15-3/8	17-3/8	18-3/16	12-1/2	6-5/8	14.06	14.37
4	25	19-7/16	17-1/16	19-1/4	21-5/8	22-5/16	7-15/16	7-15/16	17.39	19.23

STAINLESS STEEL FRAME INDUSTRIAL FLOW METERS

FLD100 Series



- ✓ Heavy-Duty Stainless Steel
- ✓ Thick Polycarbonate Safety Shields
- ✓ Direct Reading Metric and English System Scales
- ✓ Unique Design Facilitates Ease of Maintenance Cleaning Processes
- ✓ Fluted Tubes on Tube Sizes 3 and 4 Tapered Tubes on Larger Sizes



The FLD100 Series heavy-duty flow meters are fully enclosed in a brushed stainless steel case. Ideal for industrial applications with flow rates up to 116 GPM and 250 SCFM. Used with industrial water and air service. Meters are graduated for direct reading of water and air. Flow meters come standard with FNPT end fittings for easy in-line installation or ANSI 150 flanges (-FL)

Tube Size	NPT (F)	Dimensions: mm (inch)			
		A	B*	C	D
3 and 4	1/2	51 (2)	242 (9.54)	57 (2.25)	204 (8.04)
5 and 6	1	89 (3.5)	348 (13.69)	95 (3.75)	267 (10.5)
8 and 9	2	127 (5)	396 (15.59)	133 (5.25)	293 (11.55)

* Without flange

SPECIFICATIONS

Accuracy: ±3% of full scale

Minimum Flow Rate: Approximately 10% of maximum flow rate

Repeatability: ±0.5% of full scale

Maximum Pressure: [at 93°C (200°F)] 200 psi (tube sizes 3, 4, 5 and 6); 125 psi (tube sizes 8 and 9)

Maximum Operating Temperature: 93°C (200°F)

Wetted Parts: Include borosilicate glass flow tubes, FKM O-rings, and 316 SS fittings, guide rods, floats and float stops.

Optional O-rings: Buna or EPR



Tube Size	Dimensions: mm (inch)				
	Flange Size	A	B Nominal	C	D
3 and 4	19.05 (¾)	50.8 (2)	243.3 (9.58)	57.15 (2.25)	204.2 (8.04)
5 and 6	38.1 (1½)	88.9 (3.5)	359.4 (14.15)	95.25 (3.75)	266.7 (10.50)
8 and 9	63.5 (2½)	127 (5)	456.7 (17.98)	133.4 (5.25)	293.4 (11.55)

To Order							
FPNT Mount Model No.	Flange Mount Model No.	Max Flow Rate					
		Water GPM	Air SCFM	Water L/min	Air L/min	Tube Size	Pressure Drop " H ₂ O
FLD101	FLD101-FL	0.25	1.2	0.95	35	3	< 2
FLD102	FLD102-FL	0.36	1.7	1.3	50	3	2
FLD103	FLD103-FL	0.76	3.3	3	90	3	5
FLD104	FLD104-FL	1.0	4.2	3.7	120	4	6
FLD105	FLD105-FL	1.5	6.5	5.6	180	4	8
FLD106	FLD106-FL	2.2	8.5	8.2	250	4	10
FLD107	FLD107-FL	3.8	16	14	475	5	10
FLD108	FLD108-FL	5.0	21.5	18	650	5	14
→ FLD109	FLD109-FL	6.0	25.5	20	725	6	5
FLD110	FLD110-FL	7.4	30	27.5	900	6	6
FLD111	FLD111-FL	9.6	40	35	1200	6	10
FLD112	FLD112-FL	11	47.5	40	1400	6	13
FLD113	FLD113-FL	14	62	50	1800	6	24
FLD114	FLD114-FL	20	90	75	2600	6	39
FLD115	FLD115-FL	22	90	83	2550	8	16
FLD116	FLD116-FL	26	—	98	—	6	70
FLD117	FLD117-FL	41	160	155	4531	9	5
FLD118	FLD118-FL	44	180	167	5098	8	30
FLD119	FLD119-FL	60	245	227	6938	9	16
FLD120	FLD120-FL	61	250	231	7080	8	40
FLD121	FLD121-FL	86	—	326	—	9	25
FLD122	FLD122-FL	116	—	439	—	9	45

Comes complete with operator's manual. NIST traceable calibration not available.

For oxygen cleaning add suffix "-02CLEAN" to model number, for additional cost.

Ordering Examples: FLD106, 2.2 GPM flow meter for water and air.

FLD120, 61 GPM flow meter for water and air.

FLD116-FL, 26 GPM flow meter for water with optional ANSI 150 flange.

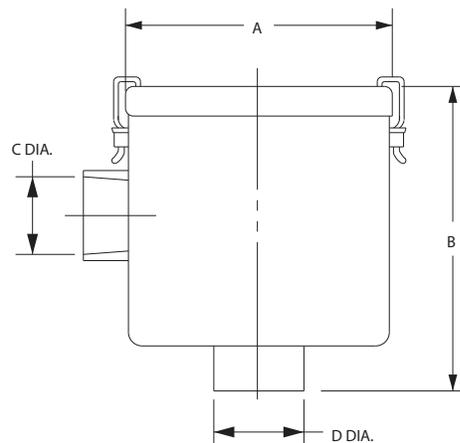
Filtration - Inline Filter (Dual Connection)

Inline Filters protect the blower from harmful dust and other particles that may be drawn into the blower through the air distribution system. Normally used in vacuum systems.

SPECIFICATIONS:

- HOUSING – Steel
- MEDIA – Polyester
- EFFICIENCY – 97-98% (8 to 10 micron particle size)
- FILTER ELEMENT – Replaceable (see filter elements) NOTE: “Z” MEDIA (1 to 3 micron particle size) available
- Feature 1/4" threaded tap for gauge connection on inlet and outlet

Inline filter PN 271200 is a straight through design
Inlet is directly opposite of outlet



Specification	Units	Part/Model Number							
		271200	516461	515254	515255	515256	516463*	516465*	517611*
Filter Element	-	271078	516434	516434	516435	516435	515135	515135	516515
Ref Blower Model	-	A	B	C, D	E	F	G	H	H
Inlet Connection	-	1.75 SO	1.00 NPSC-F	1.50 NPSC-F	2.00 NPSC-F	2.50 NPSC-F	3.00 NPT-M	4.00 NPT-M	6.00 NPT-M
Outlet Connection	-	2.00 SO	1.00 NPSC-F	1.50 NPSC-F	2.00 NPSC-F	2.50 NPSC-F	3.00 NPT-M	4.00 NPT-M	6.00 NPT-M
Dimension A	Inches	5.25	7.25	7.00	8.00	8.00	14.00	14.00	18.00
	mm	133.4	184.2	177.8	203.2	203.2	355.6	355.6	457.2
Dimension B	Inches	8.31	6.50	6.50	10.25	10.25	26.50	27.00	28.00
	mm	211.1	165.1	165.1	260.4	260.4	673.1	685.8	711.2
Dimension C	Inches	2.00	1.00	1.50	2.00	2.50	3.00	4.00	6.00
	mm	50.8	25.4	38.1	50.8	63.5	76.2	101.6	152.4
Dimension D	Inches	1.75	1.00	1.50	2.00	2.50	3.00	4.00	6.00
	mm	44.5	25.4	38.1	50.8	63.5	76.2	101.6	152.4
Z Media Filter PN	-		517886	517887	517888	517889	517890	517891	517892

A = SPIRAL	E = DR/EN/CP 656, 6, 633, S7
B = DR/EN/CP 068, 083, 101, 202	F = DR/EN/CP 757, 808, 858, S9, P9 (Inlet Only)
C = DR/EN/CP 303, 312, 313, 353	G = DR/EN/CP 833, S13, P13 (Inlet Only)
D = DR/EN/CP 404, 454, 513, 505, 555, 523	H = DR/EN/CP 909, 979, 1233, 14, S15, P15 (Inlet Only)

This document is for informational purposes only and should not be considered as a binding description of the products or their performance in all applications. The performance data on this page depicts typical performance under controlled laboratory conditions. AMETEK is not responsible for blowers driven beyond factory specified speed, temperature, pressure, flow or without proper alignment. Actual performance will vary depending on the operating environment and application. AMETEK products are not designed for and should not be used in medical life support applications. AMETEK reserves the right to revise its products without notification. The above characteristics represent standard products. For product designed to meet specific applications, contact AMETEK Technical & Industrial Products Sales department.



Kanaflex®

Suction &
Discharge
Cold Weather/
Flexible
Heavy-Duty
Abrasion
Resistance
Petroleum
Food Grade
Duct
Specialty
Accessories

General Catalog Industrial Hose



Kanaflex manufactures PVC, rubber, polyurethane and polypropylene hose and ducting of the highest quality utilizing advanced technology, equipment, and proprietary blends of raw materials. Each product series has been designed and tested to ensure outstanding service life and dependability in applications that conform to the required specifications.

Since 1952, Kanaflex's revolutionary production methods have taken the best properties of plastics and rubber, producing products capable of outperforming conventional plastic and rubber hose. Today, Kanaflex technology leads the industry and we continue to search for new raw materials and manufacturing processes to meet the most demanding current and future applications.

Kanaflex Corporation operates manufacturing facilities in Vernon Hills, Illinois, and Compton, California, and a distribution center in Houston, Texas. The company is a wholly owned subsidiary of Kanaflex Corporation Japan. Kanaflex hose is sold through a network of distributors throughout the United States and Canada.

Kanaflex hose is flexible, easy-to-handle, lightweight, and inherently durable. Our hoses continue to replace more expensive and harder-to-handle hoses for many of the industry's toughest jobs.



Flexible

Kanaflex hose lends itself to working in tight spaces.

Lightweight

Kanaflex is up to 50% lighter than conventional rubber hose, making it easier to handle and less expensive to transport.

Economical

Initial cost is low, and Kanaflex hoses are virtually maintenance-free which saves money in the long run.

Smooth bore

A smooth bore and flexible bending characteristics make for the fastest and most efficient transfer of fluids.

Premium rubber materials

Our hose properties are ideally suited for the following applications and conditions:

- Oil
- Chemicals
- Gasoline
- Abrasives
- Extreme temperature variations
- Extreme weather conditions

Because we continually improve our products, we reserve the right to alter specifications without notice.



SELECTION GUIDE

CATEGORY	PRODUCT	PAGE	GENERAL DESCRIPTION
Suction & Discharge 	Kanalite Flex CL (100CL)	8	General water suction and discharge hose
	Kanaflo U 113UVCLBK	9	All weather suction and discharge hose
	Kanaflo 110CL/110 (110CL/110GR)	10	Heavy-duty water suction and discharge hose
	Kanaflo 112CL/112AG (112CL/112AG)	11	Economical heavy-duty water suction and discharge hose
	Kanaflo 114CL/114GR	12	Light weight water suction and discharge hose
Cold Weather/Flexible 	Kanaline Blue	13	Heavy-duty water suction and discharge hose for applications requiring combined vacuum, higher working pressures, and increased flexibility
	Kanaflo Blue (116 Blue)	14	Heavy-duty water suction and discharge hose
	Kanalite Blue (100 Blue)	15	Low temp general water suction and discharge hose
	Kanalite CW (100CWFLX)	16	Low temp general water suction and discharge hose
	Kanaflo 116CL (116CL)	17	Heavy-duty water suction and discharge hose
	Kanaline CW	18	Heavy-duty water suction and discharge hose for applications requiring combined vacuum, higher working pressures, and increased flexibility
Heavy Duty 	Kanaline SR	19	Water suction and discharge hose for heavy-duty applications requiring combined vacuum and higher working pressures
	KanaChem RS (220RS)	20	All weather suction and discharge hose
	KanaChem 300 (300GR/EPDM)	21	All weather suction and discharge hose
	KanaChem 390 (390SD)	22	All weather suction and discharge hose
	KanaVac Max (Kanapower AT)	23	Heavy-duty abrasion resistant suction and discharge hose
Abrasion Resistance 	KanaVac AR (180AR)	24	Heavy-duty abrasion resistant suction and discharge hose
	KanaVac STAR (180STAR)	25	Heavy-duty abrasion resistant suction and discharge hose
	KanaVac MV (180MV)	26	Abrasion resistant medium-duty suction and discharge hose
	KanaVac Lite (180BL)	27	Lightweight abrasion resistant blower and suction hose
	KanaVac HR (180HR)	28	High temperature abrasion resistant suction hose
	KanaBoom Lite (KB-Lite)	29	Heavy-duty wet & dry material handling hose with static dissipative polyurethane liner
	KanaBoom (STKB)	30	Heavy-duty abrasion resistance hose with copper grounding wire for handling wet or dry materials
	Kanaline UFG (STKLUGF)	31	Heavy-duty food-grade static dissipative PVC and polyurethane construction with copper grounding wire for handling wet or dry materials
	Kanalite U (100UCLR)	32	Medium-duty polyurethane dry material handling hose

	CONSTRUCTION	TEMP RANGE (F°)	WORKING PRESSURE (72°F, P.S.I.)	SIZE
		-60 -40 -20 0 20 40 60 80 100 120 140		
	Flexible PVC, rigid PVC helix, smooth bore, corrugated O.D.	-13 140	30 to 50	1" to 10"
	Flexible PVC blended with polyurethane, rigid PVC helix, smooth bore, smooth O.D.	-13 140	55 to 86	1" to 3"
	Flexible PVC, rigid PVC helix, smooth bore, smooth O.D.	-13 140	28 to 86	3/4" to 8"
	Flexible PVC, rigid PVC helix, smooth bore, smooth O.D.	-13 140	50 to 80	1-1/4" to 4"
	Flexible PVC, rigid PVC helix, smooth bore, smooth O.D.	-13 140	45 to 65	1-1/4" to 4"
	Flexible cold weather PVC, rigid PVC helix, synthetic braiding, smooth bore, corrugated O.D.	-40 140	30 to 75	1-1/2" to 10"
	Flexible PVC, rigid PVC helix, smooth bore, smooth O.D.	-40 140	21 to 70	1" to 8"
	Cold weather PVC, rigid PVC helix, smooth bore, corrugated O.D.	-40 140	20 to 40	1" to 8"
	Cold weather PVC, rigid PVC helix, smooth bore, corrugated O.D.	-22 140	20 to 25	3" to 6"
	Flexible PVC, rigid PVC helix, smooth bore, smooth O.D.	-22 140	21 to 70	1" to 8"
	Flexible cold weather PVC, rigid PVC helix, synthetic braiding, smooth bore, corrugated O.D.	-22 140	50 to 70	2" to 6"
	Flexible PVC, rigid PVC helix, synthetic braiding, smooth bore, corrugated O.D.	-13 140	28 to 110	1-1/2" to 12"
	SBR rubber with carbon black, rigid PVC helix, smooth bore, smooth O.D.	-40 140	23 to 50	1-1/2" to 6"
	EPDM rubber, polyethylene helix, smooth bore, corrugated O.D.	-40 140	23 to 50	1" to 6"
	EPDM rubber, polyethylene helix, synthetic braiding, smooth bore, corrugated O.D.	-40 140	90 to 100	1-1/4" to 3"
	SBR rubber blended with static dissipating carbon black	-30 140	140	4" to 6"
	SBR rubber blended with static carbon black, rigid PVC helix, smooth bore, corrugated O.D.	-40 140	25 to 45	1-1/4" to 12"
	SBR rubber blended with static carbon black, rigid PVC helix, smooth bore, with copper wire, corrugated O.D.	-40 140	10 to 20	2" to 4"
	SBR rubber with carbon black, rigid PVC helix, smooth bore, corrugated O.D.	-40 140	8	5" to 6"
	SBR rubber blended with static carbon black, rigid PVC helix, smooth bore, corrugated O.D.	-40 140	8 to 18	2-1/2" to 8"
	EPDM rubber, polyethylene helix, metal helical wire, smooth bore, corrugated O.D.	-40 220	30	4" to 8"
	Flexible abrasion polyurethane liner, rigid PVC helix, smooth bore, PVC corrugated O.D. with static dissipating materials.	-40 140	20 to 35	1-1/2" to 8"
	Flexible high abrasion polyurethane liner, rigid PVC helix, synthetic braiding, no direction required, smooth bore, extra UV inhabitant PVC corrugated O.D. with static dissipating materials and copper grounding wire.	-33 140	60 to 75	4" to 8"
	Flexible static dissipative polyurethane liner and PVC, rigid PVC helix, synthetic braiding, no direction required, smooth bore, PVC corrugated O.D. with copper grounding wire.	-33 140	70 to 75	4" to 6"
	Flexible polyurethane lined PVC tube, rigid PVC helix, smooth bore, PVC corrugated O.D.	-13 140	30 to 40	2" to 6"

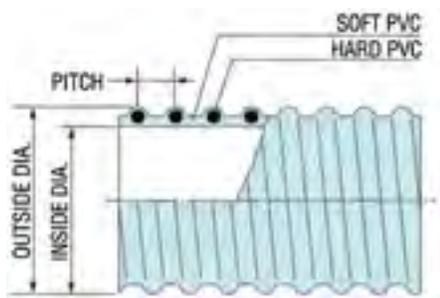
SELECTION GUIDE

CATEGORY	PRODUCT	PAGE	GENERAL DESCRIPTION
Petroleum 	KanaPower (ST120LT)	33	Tank truck drop hose with static grounding wire; 50% lighter than conventional rubber hose
	KanaVapor (ST120VP)	34	Gasoline vapor recovery hose
	KanaVapor Bio (ST120UACVR)	35	The ultimate all purpose tank truck and terminal vapor recovery hose with clear static dissipating tube and static grounding wire
	KanaPower Bio (ST120UAPDH)	36	The ultimate all purpose tank truck drop hose with clear static dissipating tube and static grounding wire
	KanaPower Max (ST120HP)	37	Tank truck drop hose with static grounding wire; 50% lighter than conventional rubber hose
	Kanaline OR	38	Oil resistant PVC heavy-duty suction and discharge hose *** Oil Use Only, NOT for use with gasoline or similar fuels ***
Food Grade 	Kanalite FG (200SFG)	39	Food grade suction and discharge hose
	Kanalite STFG (ST200SFG)	40	Medium-duty, lightweight, hose for pneumatic conveying
	Kanaflo FG (210HFG)	41	Heavy-duty food grade suction and discharge hose
	Kanaflo MK (212MK)	42	Heavy-duty food grade suction and discharge hose
	Kanaline FW	43	Heavy-duty food grade suction and discharge hose
Duct 	KanaDuct 150 (150CL)	44	Lightweight PVC blower and ducting hose
	KanaDuct 620 (620WD)	45	General ducting and blower hose with metal wire helix
	KanaDuct 625 (620WD WS)	46	General ducting and blower hose with metal wire helix and external wear strip
	KanaDuct 630 (630ED)	47	Medium-duty blower and ducting hose
	KanaDuct 660 (660YD)	48	Heavy-duty duct hose with "safety yellow" helix for high visibility
	KanaDuct 150U (150UDH)	49	Polyurethane medium-duty blower and ducting hose
	Kanalite 155 (155GY)	50	Heavy-duty PVC blower and ducting hose
Specialty 	Kanalite PS UVOR (101PSUVOR)	51	Methane gas recovery at landfills, water suction/discharge. Solid wall construction and extra UV inhibitors provide extended life.
	Kanalite PS (101PS)	52	Methane gas recovery at landfills, water suction/discharge
	Kanaflo Spa (Spa Cream)	53	Flexible PVC spa hose
	KanaDuct Poly (Kanaduct)	54	Duct hose, with interlock construction, allows the inside diameter to be changed by twisting the hose, while still holding its shape
Accessories	Banding Sleeve	55	Plastic banding sleeve for use with ST 120 LT hose
	Banding Coil (black or white)	55	Designed to fit and fill the area between the helix
	Duct Clamp	55	
	PowerLock Clamp	55	
	PowerLock Clamp PS	55	

	CONSTRUCTION	TEMP RANGE (F°)	WORKING PRESSURE (72°F, P.S.I.)	SIZE
		-60 -40 -20 0 20 40 60 80 100 120 140		
	Nitrile rubber static dissipating tube, rigid PVC helix, synthetic braiding, smooth bore, static grounding wire, corrugated O.D.	-30 140	65	2" to 4"
	Nitrile rubber, rigid PVC helix, smooth bore, corrugated O.D., static grounding wire	-40 140	10 to 20	2" to 4"
	Lightweight clear static dissipating non-permeable polyurethane with smooth bore, corrugated O.D., rigid PVC helix, static grounding wire	-52 140	7 to 9	2" to 4"
	Non-permeable polyurethane inner and outer tube with synthetic braiding, smooth bore, corrugated O.D., PVC helix for easy drag, clear static dissipating tube and multi-strand copper static wire	-52 140	65	2" to 4"
	Nitrile rubber static dissipating tube, rigid PVC helix, synthetic braiding, smooth bore, static grounding wire, corrugated O.D.	-30 140	150	3" to 4"
	Flexible oil-resistant PVC, rigid PVC helix, synthetic braiding, smooth bore, corrugated O.D.	-13 140	60 to 80	2" to 4"
	Produced entirely of compounds in compliance with FDA and 3-A non toxic specifications, flexible PVC, rigid PVC helix, smooth bore, corrugated O.D.	-13 140	30 to 50	1" to 4"
	Produced entirely of compounds in compliance with FDA and 3-A nontoxic specifications, flexible PVC, rigid PVC helix, multi-strand copper static grounding wire, smooth bore, corrugated O.D.	-13 140	30 to 45	1-1/2" to 4"
	Produced entirely of compounds in compliance with FDA and 3-A nontoxic specifications, flexible PVC, rigid PVC helix, smooth bore, corrugated O.D.	-13 140	55 to 86	3/4" to 4"
	Produced entirely of compounds in compliance with FDA and 3-A nontoxic specifications, flexible PVC, rigid PVC helix, smooth bore, corrugated O.D.	-13 140	62 to 66	1-1/2" to 3"
	Produced entirely of compounds in compliance with FDA and 3-A nontoxic specifications, flexible PVC, rigid PVC helix, synthetic braiding, smooth bore, corrugated O.D.	-13 140	70 to 110	1-1/2" to 6"
	Flexible PVC, rigid PVC helix, smooth bore, corrugated O.D.	-13 140	2 to 6	2-1/2" to 8"
	EPDM rubber, metal wire helix, smooth bore, slightly corrugated O.D.	-40 220	3 to 12	2" to 12"
	EPDM rubber, metal wire helix, wearstrip, smooth bore, corrugated O.D.	-40 220	3 to 12	2-1/2" to 12"
	EPDM rubber, polypropylene helix, smooth bore, corrugated O.D.	-40 158	—	2" to 8"
	EPDM rubber, polypropylene helix, smooth bore, corrugated O.D.	-40 158	3 to 9	4" to 12"
	Flexible clear polyurethane, rigid PVC helix, smooth bore, corrugated O.D.	-20 140	3 to 9	2-1/2" to 8"
	Flexible PVC, rigid PVC helix, smooth bore, corrugated O.D.	-13 140	10 to 20	1-1/2" to 8"
	Flexible PVC, rigid PVC helix, smooth bore, corrugated O.D.	-13 140	30 to 35	2-3/4" to 4-1/2"
	Rigid PVC and helix	-13 140	30 to 35	2-3/4" to 4-1/2"
	Flexible PVC, rigid PVC helix, smooth bore, smooth O.D.	-13 158	60 to 100	1/2" to 2"
	Interlocked polypropylene	-13 180	—	2-1/2" to 12"
	PVC construction, corrugated inside, smooth O.D.	-40 140	—	—
	PVC	—	—	—
	Steel	—	—	—
	Steel	—	—	—
	Steel	—	—	—

Kanalite PS UVOR (101 PS UVOR)

Methane gas recovery at landfills, water suction/discharge. Solid wall construction and extra UV inhibitors provide extended life.



SPECIFICATIONS

Temp. Range: -13°F to 140°F

Applications: Methane gas recovery at landfills; connection between rigid pipes of the same size; repair of broken rigid lines.

Construction: Flexible PVC, rigid PVC helix, smooth bore, corrugated O.D.

Note: Not a food-grade hose

AVAILABLE SIZES

Inside Dia. Inches	Outside Dia. Inches	Pitch Inches	Minimum Bend Radius 72°F, Inches	Working Pressure 72°F, P.S.I.	Vacuum Rating 72°F, In Hg	Weight Lbs/Ft	Standard Length Ft
2.375	2.76	0.41	3.5	35	29.8	0.64	100
3-1/2	4.02	0.63	7.0	30	29.8	1.10	100
4-1/2	5.08	0.67	9.0	30	28.0	1.70	100



* Over flexing or repeated flexing of hose within 18" of fitting is a common cause of hose failure. Installing a 12"-14" section of our Banding Coil at the end of the hose should be considered. **Kanaflex will not be responsible for damage to hose due to over flexing.**

Suction & Discharge
Cold Weather/Flexible
Heavy-Duty
Abrasion Resistance
Petroleum
Food Grade
Duct
Specialty
Accessories

Chemical Resistance

A — Satisfactory B — Suggest Testing C — Unsatisfactory

Chemical Name	Concentration	All PVC Hoses 150 UDH*, Kanaline UFG*	Kanaline OR	ST 120 HP ST 120 LT ST 120 VP	KP-AT, 180 STAR, 180 AR, 180 BL, 220 RS	180 HR, 390 SD, 620 WD, 630 ED, 660 YD	300 EPDM GR	ST120 UAPDH
Acetaldehyde		C	C	C	C	B	C	-
Acetamide		C	C	A	C	B	B	-
Acetic acid	10%	A	A	C	C	A	A	B
Acetic acid	50%	B	B	C	C	B	B	-
Acetic acid	100%	C	C	C	C	C	C	-
Acetic anhydride		C	C	C	C	C	C	-
Acetone		C	C	C	C	B	C	-
Alums ___ NH3, Cr, K		A	A	A	A	A	A	-
Ammonium hydroxide (ammonia water)		B	B	C	C	A	A	-
Animal oil (Lard oil)		C	A	A	C	C	C	-
ASTM reference fuel A		C	A	A	C	C	C	-
ASTM reference fuel B		C	B	A	C	C	C	-
ASTM reference fuel C		C	C	A	C	C	C	-
ASTM #1 oil		C	A	A	C	C	C	-
ASTM #2 oil		C	A	A	C	C	C	-
ASTM #3 oil		C	A	A	C	C	C	-
Beer		A	A	A	A	A	A	-
Benzene (Benzol)		C	C	C	C	C	C	-
Benzine		C	C	B	C	C	C	B
Benzyl alcohol		C	C	C	C	B	B	-
Biodiesel, B20		-	-	-	-	-	-	A
Biodiesel, B100		-	-	-	-	-	-	A
Brake Fuel (H.D.)		-	-	-	-	-	-	A
Bromine		C	C	C	C	C	C	-
Bunker oil		C	-	A	C	C	C	-
Butane		-	-	A	-	-	-	A
Calcium chloride		A	A	A	A	A	A	-
Calcium hydroxide		A	A	A	A	A	A	-
Carbon disulfide		C	C	C	C	C	C	-
Carbon tetrachloride		C	C	C	C	C	C	-
Carbonic acid		A	A	A	A	A	A	-
Chlorine gas (dry)		C	C	C	C	C	C	-
Chlorine gas (wet)		C	C	C	C	C	C	-
Chromic acid	2%	A	C	C	C	C	C	-
Chromic acid	5%	B	C	C	C	C	C	-
Chromic acid	10%	C	C	C	C	C	C	-
Chromic acid	25%	C	C	C	C	C	C	-
Creosote oil		C	C	B	C	C	C	-
Cresol		C	C	C	C	C	C	-
Cyclohexane		C	C	B	C	C	C	-
Cyclohexanone		C	C	C	C	C	C	C
Developing solutions (Hypos)		A	A	A	B	A	A	-
Diesel Fuel		-	-	A	-	-	-	A
Diethyl ether		C	C	C	C	B	C	-
Diethylene glycol		A	A	A	A	A	A	-
Dimethyl formamide		C	C	C	C	C	C	C
Diocetyl phthalate (DOP)		C	C	C	C	B	B	A
Ethanol E85		-	-	A	-	-	-	A
Ethanol E98		-	-	T	-	-	-	A
Ethanol E100		-	-	T	-	-	-	A
Ethyl acetate		C	C	C	C	B	C	-
Ethyl acetoacetate		C	C	C	C	B	C	-
Ethyl alcohol		B	A	A	A	A	B	-
Ethylene dichloride		C	C	C	C	C	C	C
Ethylene glycol		A	A	A	A	A	A	A
Ethylene glycol H2O	50%	-	-	A	-	-	-	A
Fluoroboric acid		-	-	A	B	A	A	-
Formaldehyde	40%	B	B	B	C	B	B	-
Formic Acid	50%	B	C	C	C	B	B	-
Freon 11		C	C	A	C	C	C	C
Freon 113		C	C	B	B	C	C	C
Freon 114		C	C	A	A	C	C	-
Freon 12		C	C	B	C	B	-	A
Freon 21		C	C	C	C	C	C	-
Freon 22		C	C	C	C	C	C	-

* Exceeds PVC ratings

The "Chemical Resistance classification" for each Kanaflex Hose is determined by the phenomenon (change of the quality of the material) which results when the material is exposed to the specified chemical. Testing is conducted on straight sections of hose which are set in a static position. Unless otherwise noted, the concentration of water solution is saturated and temperature is 72°F.

A — Satisfactory B — Suggest Testing C — Unsatisfactory

Chemical Name	Concentration	All PVC Hoses 150 UDH*, Kanaline UFG*	Kanaline OR	ST 120 HP ST 120 LT ST 120 VP	KP-AT, 180 STAR, 180 AR, 180 BL, 220 RS	180 HR, 390 SD, 620 WD, 630 ED, 660 YD	300 EPDM GR	ST120 UAPDH
Furan Furufuran		C	C	C	C	C	C	-
Gasoline (Aromatic content: less than 40%)		C	C	A	C	C	C	A
Glycerin		A	A	A	A	A	A	-
Hexane		C	A	A	C	C	C	-
Hydrobromic acid	20%	-	-	C	C	B	B	-
Hydrochloric acid	10%	A	A	C	B	A	A	-
Hydrochloric acid	38%	B	B	C	C	B	B	-
Hydrofluoric acid	10%	A	A	C	C	A	A	-
Hydrofluoric acid	20%	B	B	C	C	A	A	-
Hydrofluoric acid	40%	C	C	C	C	B	B	-
Hydrofluoric acid anhydrous		C	C	C	C	C	C	-
Hydrogen peroxide	5%	A	A	C	C	B	B	-
Hydrogen peroxide	30%	A	A	C	C	B	B	-
Hydrogen sulfide		-	-	C	C	A	A	-
Hypochlorous acid		-	-	C	C	C	C	-
Isooctane		C	A	A	C	C	C	-
Isopropyl alcohol		B	A	B	B	B	B	-
Jet Fuel, JP-8		-	-	A	-	-	-	A
Kerosene		C	A	A	C	C	C	A
Lacquer		C	C	C	C	C	C	-
Magnesium hydroxide		A	A	B	B	A	A	-
Mercury		A	A	A	A	A	A	-
Methyl alcohol		B	A	A	A	A	A	B
Methyl ethyl ketone (MEK)		C	C	C	C	B	B	-
Nitric acid	10%	A	A	C	C	B	B	-
Nitric acid	30%	B	B	C	C	B	B	-
Nitric acid	61.3%	C	C	C	C	C	C	-
Nitric acid	(fuming)	C	C	C	C	C	C	-
Nitrobenzene		C	C	C	C	C	C	-
Oil, Transmission Type A		-	-	A	-	-	-	A
Oleic acid		A	A	B	C	B	B	-
Oxalic acid		A	A	C	C	B	B	-
Oxygen		A	A	B	B	A	A	-
Ozone		B	B	C	C	A	A	-
Perchloric acid		A	B	B	B	B	B	-
Phosphoric acid	50%	A	A	B	C	A	A	-
Potassium dichromate	10%	A	A	A	B	A	A	-
Potassium hydroxide	30%	B	B	B	B	A	A	-
Potassium permanganate	5%	A	A	B	B	A	A	-
Potassium permanganate	30%	A	B	B	A	B	B	-
Propyl alcohol		A	A	A	A	A	A	-
Sea water		A	A	A	A	A	A	-
Silicone grease		A	A	A	A	A	A	-
Silicone oils		A	A	A	A	A	A	-
Soap solutions		B	A	A	B	A	A	-
Sodium hydroxide	10%	A	A	B	A	B	B	B
Sodium hypochlorite	5%	A	A	C	C	A	A	-
Sodium peroxide		C	C	B	B	A	A	-
Sodium phosphate		A	A	A	A	A	A	-
Soybean oil		C	A	A	B	C	C	-
Sulfur dioxide		A	A	C	C	A	A	-
Sulfuric acid	10%	A	A	B	A	B	B	A
Sulfuric acid	30%	B	B	C	B	C	C	B
Sulfuric acid	98%	C	C	C	C	C	C	-
Sulfuric acid	(fuming)	C	C	C	C	C	C	-
Sulfurous acid	10%	A	A	C	C	C	C	-
Tetrachloroethane		C	C	C	C	C	C	-
Tetrahydrofuran		C	C	C	C	B	C	-
Toluene		C	C	C	C	C	C	B
Trichloroethylene (Trichlene)		C	C	C	C	C	C	C
Turpentine		-	-	B	-	-	-	A
Vegetable oil		C	A	A	C	C	C	-
Vinegar		A	A	B	B	A	A	-
Whiskey		B	A	A	A	A	A	-
Xylene		C	C	C	C	C	C	-

* Exceeds PVC ratings

Note: Differing phenomena may result during hose use as a result of application variables such as hose bends, stress, vacuum, pressure, temperature, etc.

	100 CL/100 CWFLX/101 PS 101 ESI/QR, 100 Blue	100 UCL RD	110 CL/110 GR	112 AG/112 CL, 113UVCLBK, 114CL/GR	116 CL/116 Blue/Kanaflo Blue	150 CL	150 UDH	155 GY	180 AR/180 STAR STKB	180 BL	180 HR	180 MV	200 SFG	210 HFG/212 MK	220 RS	300 EPDM	390 SD BK	620 WD	620 WD WS	630 ED	660 YD	ST 120 LT/ST 120 UAPDH/ ST 120HR, ST 120 VP	ST 200 SFG	Banding Coil	Banding Sleeve	Duct Clamp	Kanaduct	Kanaline CW Kanaline Blue	Kanaline FW	Kanaline OR	Kanaline SR	Kanaline UFG (STKLUFUFG)	Kanapower AT	Powerlock Clamp/PS	Spa Cream			
Insulation																																						
Blower						•	•	•		•								•	•	•	•					•									•			
Lawn Mower, Gardening																																						
Grass Collection						•		•											•	•	•	•				•												
Mulch Blowing						•	•	•											•	•	•																	
Material Handling																																						
Bulk Unloading									•																			•					•					
Pneumatic Conveying	•	•											•	•									•												•			
Mining																																						
Cable Guard						•																																
Coal Rock Dust			•	•					•																											•		
Oil Drill Site Clean Up																•																				•		
Rock Drill Dust									•																											•		
General Use			•	•	•											•																•	•			•		
Petroleum																																						
General Tank Truck																						•																
Gasoline Terminal																						•																
Refinery, Catalyst Removal											•																									•		
Plant, Tank Scale										•																										•		
Rental																																						
Lawn & Garden						•		•											•		•	•				•												
Water Pumping			•	•	•											•																	•	•				
Roofing																																						
Gravel Removal									•		•	•																									•	
Spa																																						
Water Lines																																					•	
Transportation																																						
Aircraft, Avionics Cooling							•														•					•												
Airport, Lavatory Drop																					•	•				•												
RV, Ducting																																						
Railroad Lavatory Drop																																						
Waste Management																																						
Honey Truck																•	•																					
Landfill (methane gas)	•																																				•	
Sanitation Plant																																					•	
Street Sweeper											•															•											•	
Vacuum Truck									•		•				•																					•	•	
General Use	•		•	•				•		•						•	•																			•	•	

Minimum Bending Radius

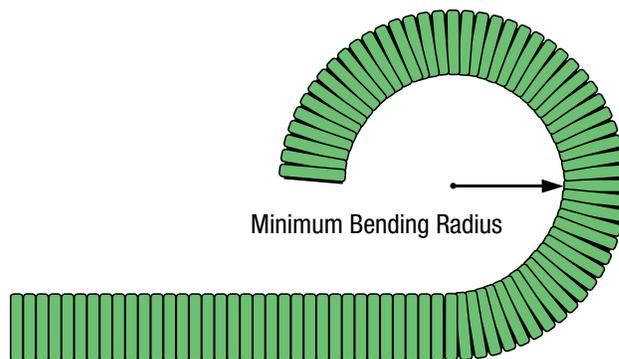
Minimum bending radius is the smallest diameter to which a hose can be bent without causing internal damage to the hose or flattening in the cross-section of the hose (kinking). Minimum bending radius is measured to the inside curvature of the hose as illustrated.

For Kanaflex hose, minimum bend radius is established at 72°F. Temperature changes, either lower or higher, will effect minimum bend radius. Caution should be taken to assure proper hose selection for the actual application temperature of both the material handled and the ambient temperature surrounding the application.

During storage of hose, ambient temperature should also be considered to prevent hose damage. When possible, minimum bending radius of the hose should be as large as possible to avoid damage to the hose and early hose failure.

Note: Over flexing or repeated flexing of hose within 18" of the fitting is a common cause of hose failure. To help support the hose, installing a 12" - 14" section of our Banding Coil at the end of the hose, just before the fitting, should be considered. And, to help prevent this common problem, Kanaflex recommends caution when using the hose.

Kanaflex will not be responsible for damage to the hose due to over flexing.



Temperature Effects

Kanaflex conducts tests at 72°F to determine the recommended minimum bending radius, working pressures, and vacuum ratings. Straight lengths of hose are used during testing. If the ambient temperatures, or application induced temperatures, vary from the 72°F baseline, stated specifications and ratings for the hose will change. If the hose application and placement includes bends, the stated specifications and ratings for the hose will also change.

Please take these variance guidelines into account when determining the suitability of a hose for a specific application.

Usage and Storage Suggestions

CARE AND MAINTENANCE

When Using Your Hose

The life of the hose is greatly influenced by the surrounding temperature, fluid temperature and time of exposure. Please select the proper hose according to the fluid used.

Especially in the case of a PVC hose, if the fluid temperature reaches or exceeds 120°F, do not exceed one half the rated working pressure of the hose.

In pressure applications, please open and close the valve slowly to avoid impact pressure. Suddenly closing the valve could cause the hose to burst.

Please do not use high-grade chemicals with high toxicity and hazardous materials such as high concentrations of Acidum or Alkalies and flammable or explosive gas.

Please set pump pressure below working pressure when you use it in the upright part of an underwater pump, otherwise there is a possibility of a failure caused by a water hammer when the pump is turned off.

Please do not use for compressed air; there is a possibility of a burst.

Please do not use for food grade unless indicated. Also, do not use for pharmaceutical products.

Exposure to the weather will increase the deterioration rate of the hose.

Remember hoses are replaceable items. The rate of their replacement will depend on the conditions under which they are used and deterioration.

Installation

Prior to the installation, please consider the impact on human health and surrounding facilities in case of a hose failure.

Since the hose will expand and contract because of internal pressure, please provide sufficient slack at the time of installation for expansion and contraction.

If twisted, the performance of a hose will fall. Please use a joint when a twist arises by rocking or rotation.

The hose could be damaged if there is a sharp bend at the fitting. Use appropriate elbows and fittings to support the hose so that when it is operational it will not bend sharply at the fitting. Please use an elbow or allow extra length to avoid this problem.

Please protect the hose against external impact (i.e. falling rock or running over the hose with a vehicle). If the installation of the hose requires 150 or more feet of continuous length, the resulting head or loss of pressure may disrupt the quantity of flow.

The hose will deteriorate with age. If you find any defects in your periodic inspections please replace the hose.

Storage — As Stock

Temperature, humidity, ozone, sunlight, oils, solvents, corrosive liquids, fumes, insects, rodents, and radioactive materials can adversely affect hose products in storage.

Exposure to direct or reflected sunlight should be avoided.

The hose needs to be stored under these conditions:

1. Out of direct sun, preferably a dark location
2. In a cool location
3. Low humidity
4. Free of dust and dirt
5. First-in, first-out basis
6. Ideal temperature range is 50 to 70 degrees F

The hose should not be piled or stacked to such an extent that the weight of the stack creates distortions on the lengths stored at the bottom.

Storage — After Use

Follow above recommendations.

After using, remove residual substance by washing the hose in cold water, etc.

Please store the hose with good ventilation so that air passes through the inside of a hose freely. In the case of rubber hose, please cap the ends.

Transport

When moving hose, please do not drag on the ground.

Handle carefully to protect the hose from impact during loading and unloading.

If you are lifting the hose by a crane, etc., do not lift it up by only one point but use several.

Exterior Inspection

If the following abnormalities are discovered, please stop use immediately and replace the hose.

- Hose shows any swelling or leakage near fittings
- Exterior cracking that allows any loss of fluid or creates a safety hazard
- Collapsing or kinking
- An inside swelling and exfoliation
- Others: hardening, swelling, cracking, etc.

Precautionary Statement

Kanaflex Corporation manufactures and distributes hose, ducting, and other products that conform to established specifications. These specifications are to be used as guidelines for the selection of hose to meet the specified criteria of each application. However, these established specifications are not intended to predict the performance of a Kanaflex product in any particular application.

Since application criteria vary, Kanaflex makes no recommendation of our products for use in a particular application. The distributor and final customer of the product should determine the acceptability of use of the product. Therefore, the distributor and customer will assume all responsibility regarding the proper selection and resultant success of Kanaflex products used for any application.

Claims

All claims on Kanaflex products must be reported to Kanaflex immediately. Kanaflex will forward a claim form and all information requested on the form is to be inserted and returned to Kanaflex. Kanaflex will request either the entire amount of product in question or sections of the product. The returned product must be labeled clearly and sent to the attention of the Kanaflex staff member responsible for receipt of the claim information. All additional product in question must be retained until a final determination is made regarding the claim.

Upon receipt of the requested material, Kanaflex will determine if the product meets all requirements as stated within our WARRANTY and then send notification as to the determination of the claim.

Often, the exact cause of failures cannot be determined. Kanaflex may suggest possible causes in an effort to prevent future failures.

Returned Goods Policy

The following guidelines must be met for acceptance of returned product:

1. Contact Kanaflex Customer Service department for return authorization.
2. Product must have been purchased within the last 90 days.
3. Only standard products, in standard lengths may be returned.
4. Merchandise must be sent back freight prepaid.
5. Merchandise must reach Kanaflex in good condition so that it may be resold. Damaged goods will be refused.
6. Restocking fee will apply.

Warranty

Every KANAFLEX hose is thoroughly inspected and tested before leaving the factory and is warranted to be free from defects in material and workmanship at the time of shipment by Kanaflex. Should any trouble develop within ninety (90) days of the date of shipment, please notify the manufacturer and obtain a written authorization for return. If an inspection by the manufacturer shows the trouble to be caused by defects in material or workmanship, Kanaflex will replace such merchandise at no charge, freight prepaid.

THIS WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OF KANAFLEX AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, STATUTORY OR OTHERWISE CREATED UNDER APPLICABLE LAW INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL KANAFLEX BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, OR FOR LOSS OF PROFITS.

This warranty shall not apply (1) in the event the hose has been abused or involved in an accident; (2) in the event of misuse (such as subjecting the hose to pressure beyond rated capacity, exceeding minimum bending radius specifications or transfer of materials not recommended by the manufacturer); (3) in the event of damage caused by insects and/or rodents.

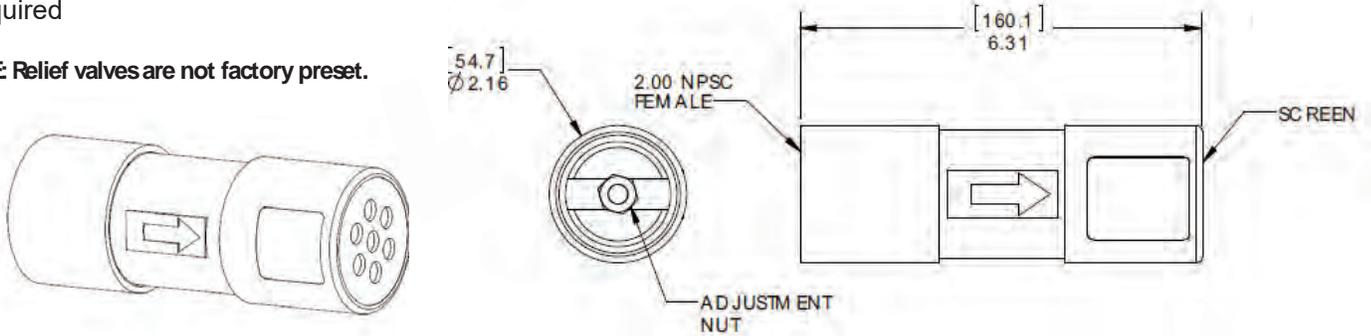
Notes:

These Relief Valves offer an alternative to our diaphragm regulated designs for applications where pressure/vacuum level control is less critical. Installed properly, they protect your system from excessive pressures/vacuums and keep your blower from overheating.

Mechanical

- Suitable for both pressure and vacuum systems
- Inlet screen can be installed on either end as required

NOTE: Relief valves are not factory preset.

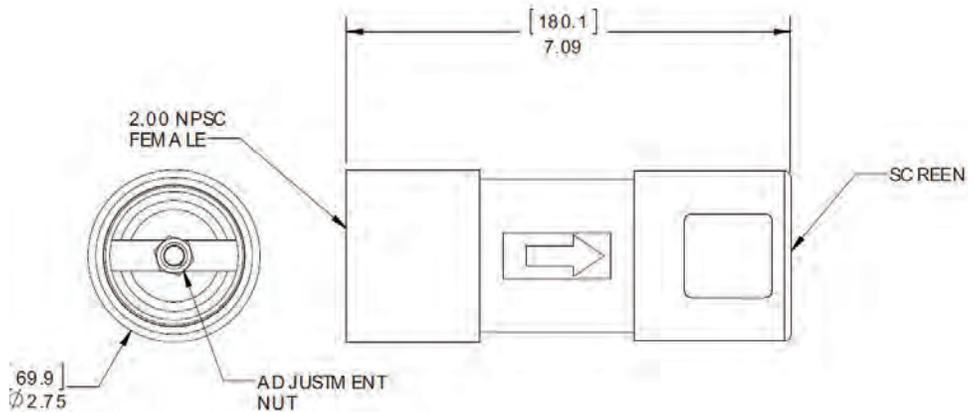


Note: Blower models DR858P9, and S9 require two 551027 relief valves.

Mechanical Vacuum Only

- Suitable for vacuum relief only
- Specifically designed for protecting system piping and vessels from damage caused by excessive vacuums

NOTE: Relief valves are not factory preset.



Specification	Units	Part/ Model Number		
		551026	551027	523230
Ref Blower Model	-	B, C, D	D, E, F	A, B, C, D, E, F
Range	in. H2O mbar	20-180 49.8-448.4	41.5-263 103.4-655.1	35-90 87.2-224.2
Connection	-	1 1/2	2	2
Description	-	Mechanical	Mechanical	Mechanical Vacuum Only

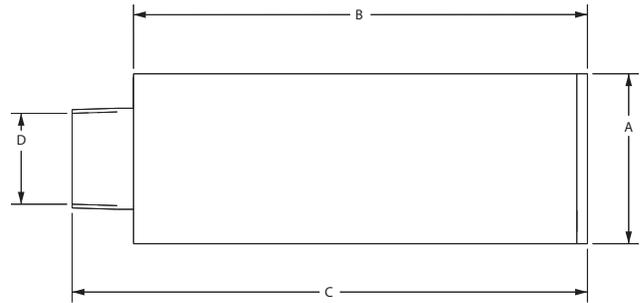
A = SPIRAL	E = DR/EN/CP 656, 6, 633, S7
B = DR/EN/CP 068, 083, 101, 202	F = DR/EN/CP 757, 808, 858, S9, P9 (Inlet Only)
C = DR/EN/CP 303, 312, 313, 353	G = DR/EN/CP 833, S13, P13 (Inlet Only)
D = DR/EN/CP 404, 454, 513, 505, 555, 523	H = DR/EN/CP 909, 979, 1233, 14, S15, P15 (Inlet Only)

This document is for informational purposes only and should not be considered as a binding description of the products or their performance in all applications. The performance data on this page depicts typical performance under controlled laboratory conditions. AMETEK is not responsible for blowers driven beyond factory specified speed, temperature, pressure, flow or without proper alignment. Actual performance will vary depending on the operating environment and application. AMETEK products are not designed for and should not be used in medical life support applications. AMETEK reserves the right to revise its products without notification. The above characteristics represent standard products. For product designed to meet specific applications, contact AMETEK Technical & Industrial Products Sales department.

Mufflers lower blower noise in areas where reduced sound levels are required.

SPECIFICATIONS:

HOUSING – Steel
 MEDIA – Acoustical Material



Specification	Units	Part/Model Number						
		523627	516838	523626	523625	523624	523623	523622
Ref Blower Model	-	B	B	C	D	E	E	E
Inlet Connection	-	1.0 NPT Male	1.0 SO Slip on	1.25 NPT Male	1.50 NPT Male	2.00 NPT Male	2.00 NPSC Female	2.00 NPT Male
Dimension A	Inches	4.00	1.90	4.00	4.00	4.00	4.00	4.00
	mm	101.6	48.3	101.6	101.6	101.6	101.6	101.6
Dimension B	Inches	10.93	5.16	10.93	10.93	10.93	10.93	15.75
	mm	277.6	131.1	277.6	277.6	277.6	277.6	400.1
Dimension C	Inches	13.98	6.23	14.07	14.57	12.16	12.43	16.95
	mm	355.1	158.2	357.4	370.1	308.9	315.7	430.5
Dimension D	Inches	1.00	1.00	1.25	1.50	2.00	2.00	2.00
	mm	25.4	25.4	31.8	38.1	50.8	50.8	50.8

A = SPIRAL	E = DR/EN/CP 656, 6, 633, S7
B = DR/EN/CP 068, 083, 101, 202	F = DR/EN/CP 757, 808, 858, S9, P9 (Inlet Only)
C = DR/EN/CP 303, 312, 313, 353	G = DR/EN/CP 833, S13, P13 (Inlet Only)
D = DR/EN/CP 404, 454, 513, 505, 555, 523	H = DR/EN/CP 909, 979, 1233, 14, S15, P15 (Inlet Only)

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ROTRON has a variety of gauges for pressure, vacuum and temperature measurements in various ranges. These gauges are reliable and rugged.

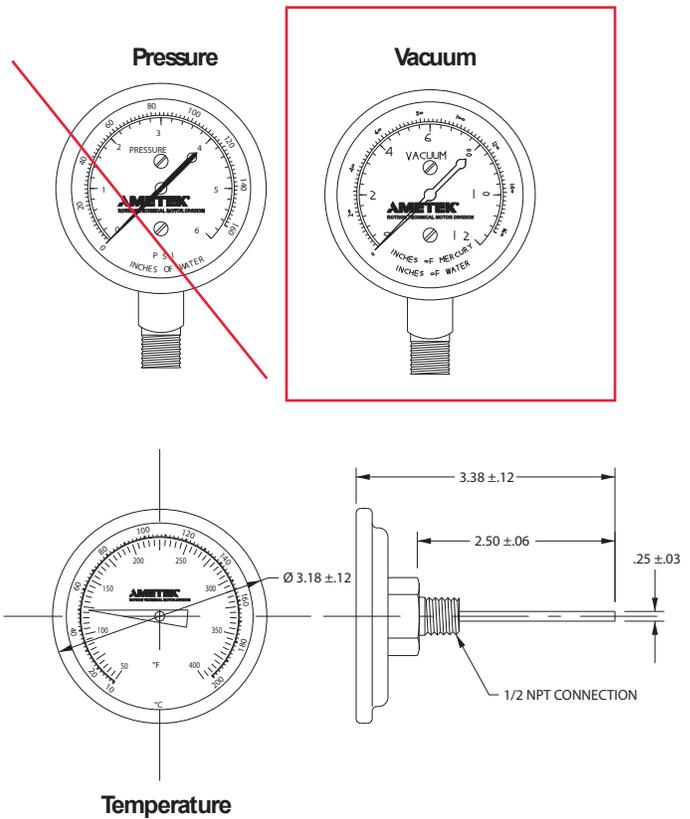
SPECIFICATIONS:

Pressure/ Vacuum

CASE— Drawn Steel Finished
in Black Enamel
DIAPHRAGM—
Bronze LENS— Clear
Plastic ACCURACY—
2% WEIGHT— 1/2 lb.
CONNECTION— 1/4"
NPT FACE— 2 1/2" dia.

Temperature

CASE— Steel
LENS— Glass
ACCURACY— 1%
WEIGHT— 1/4 lb.
CONNECTION— 1/2"
NPT FACE— 3" Dial



Specification	Units	Part/Model Number				
		551376	271949	529428	271950	551368
Range	-	Pressure	Pressure	Vacuum	Vacuum	Temperature
Description	-	0-60 IWG	0-160 IWG	0-60 IWG	0-160 IWG	0-200 Deg C

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Appendix E

Field Forms

SOIL-VAPOR EXTRACTION SYSTEM OPERATION AND MAINTENANCE FORM

SITE :	CLIFF PATROL YARD
DATE	
TIME ON SITE:	TIME OFF SITE:
PERSONNEL:	

Weather Information

Temp: _____ °F
 Wind Speed: _____ mph
 Wind Direction: _____
 Barometric Pressure: _____ in. Hg

Equipment Information

PID Calibration Yes/No
 CGI Calibration Yes/No
 Transducer Installed Yes/No
 Transducer Data Yes/No

System running upon arrival? Yes/No	If N, why?
System running upon departure? Yes/No	If N, why?
Ambient PID Readings:	
Decibal Reading (3 ft, 50 ft):	
Knockout Tank Level:	Volume drained (gallons):
Blower Amperage Draw:	Blower Meter Reading (hours):
Pre-Filter Pressure:	Post-Filter Pressure:

WELL DATA

WELL ID	Vacuum (in H2O)	Flow (scfm)	PID (ppm)	CH4 (% bv)	CO (% bv)	O2 (% bv)	Well Type	Water Level (ft btoc)	Notes
SVE-1									
MW-8									
MW-20									

FILTER CLEANED?

FILTER CHANGE?

Observations/Note:

SAMPLE DATA

SAMPLE CONTAINER TYPE

Tedlar Bag

SAMPLES

Sample/Location ID	Date	Time	Analysis	Container	Volume	Comments

FIELD PERSONNEL SIGNATURE: _____

Appendix F

Permit Documents

June 30, 2020

Ms. Rhonda V. Romero
Minor Source Section Manager
New Mexico Environment Department
Air Quality Bureau
525 Camino de los Marquez, Suite 1
Santa Fe, New Mexico 87505

RE: No Permit Required Determination, NMDOT Cliff Patrol Yard, Cliff, Grant County, New Mexico;

Ms. Romero,

On behalf of the New Mexico Department of Transportation (NMDOT), INTERA is submitting this No Permit Required (NPR) determination to the New Mexico Environment Department (NMED) Air Quality Bureau (aqb) for a courtesy review. INTERA Incorporated (INTERA), under contract with NMDOT and with technical approval from the NMED Petroleum Storage Tank Bureau (PSTB) has developed a Final Remediation Plan (FRP) to address petroleum contamination in the subsurface at the NMDOT Cliff Patrol Yard (facility). The FRP includes the installation of a mobile soil vapor extraction (SVE) remediation system to remediate petroleum hydrocarbons in the subsurface. The SVE system will extract contaminated vapors from the subsurface and will direct discharge these extracted vapors into the atmosphere. The extracted vapors will not be treated prior to discharging to the atmosphere because the facility's potential emission rate (PER) is less than the applicable thresholds of 10 pounds per hour and 10 tons per year of any regulated air contaminant. INTERA appreciates NMED aqb curtesy review of this NPR determination permit application.

Please contact me at (603) 969-4070 / emarcillo@intera.com if you have any questions or require additional information.

Sincerely

INTERA Incorporated



Eileen Marcillo
Project Hydrologist



Ashley Arrossa
Project Engineer

cc: Mr. Larry Kemp, NMDOT

<p>Mail Application To:</p> <p>New Mexico Environment Department Air Quality Bureau Permits Section 525 Camino de los Marquez, Suite 1 Santa Fe, New Mexico, 87505</p> <p>Phone: (505) 476-4300 Fax: (505) 476-4375 www.env.nm.gov/aqb</p>		<p>For Department use only:</p> <p>AIRS No.:</p>
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Universal Air Quality Permit Application

Use this application for NOI, NSR, or Title V sources.

Use this application for: the initial application, modifications, technical revisions, and renewals. For technical revisions, complete Sections, 1-A, 1-B, 2-E, 3, 9 and any other sections that are relevant to the requested action; coordination with the Air Quality Bureau permit staff prior to submittal is encouraged to clarify submittal requirements and to determine if more or less than these sections of the application are needed. Use this application for streamline permits as well. [See Section 1-I for submittal instructions for other permits.](#)

This application is submitted as (check all that apply): Request for a No Permit Required Determination (no fee)
 Updating an application currently under NMED review. Include this page and all pages that are being updated (no fee required).
 Construction Status: Not Constructed Existing Permitted (or NOI) Facility Existing Non-permitted (or NOI) Facility
 Minor Source: a NOI 20.2.73 NMAC 20.2.72 NMAC application or revision 20.2.72.300 NMAC Streamline application
 Title V Source: Title V (new) Title V renewal TV minor mod. TV significant mod. TV Acid Rain: New Renewal
 PSD Major Source: PSD major source (new) minor modification to a PSD source a PSD major modification

Acknowledgements:
 I acknowledge that a pre-application meeting is available to me upon request. Title V Operating, Title IV Acid Rain, and NPR applications have no fees.
 \$500 NSR application Filing Fee enclosed **OR** The full permit fee associated with 10 fee points (required w/ streamline applications).
 Check No.: in the amount of
 I acknowledge the required submittal format for the hard copy application is printed double sided 'head-to-toe', 2-hole punched (except the Sect. 2 landscape tables is printed 'head-to-head'), numbered tab separators. Incl. a copy of the check on a separate page.
 This facility qualifies to receive assistance from the Small Business Environmental Assistance program (SBEAP) and qualifies for 50% of the normal application and permit fees. Enclosed is a check for 50% of the normal application fee which will be verified with the Small Business Certification Form for your company.
 This facility qualifies to receive assistance from the Small Business Environmental Assistance Program (SBEAP) but does not qualify for 50% of the normal application and permit fees. To see if you qualify for SBEAP assistance and for the small business certification form go to https://www.env.nm.gov/aqb/sbap/small_business_criteria.html).

Citation: Please provide the **low level citation** under which this application is being submitted: **20.2.72.200.A.1 NMAC**

Section 1 – Facility Information

Section 1-A: Company Information

		AI # if known (see 1 st 3 to 5 #s of permit IDEA ID No.):	Updating Permit/NOI #:
1	Facility Name: NMDOT Cliff Patrol Yard	Plant primary SIC Code (4 digits):	
		Plant NAIC code (6 digits):	
a	Facility Street Address (If no facility street address, provide directions from a prominent landmark): 8157 HWY 180, Cliff, Grant County, New Mexico		
2	Plant Operator Company Name: INTERA, Incorporated	Phone/Fax: 505.246.1600	
a	Plant Operator Address: 6000 Uptown Blvd NE, Suite 220, Albuquerque, New Mexico 87110		
b	Plant Operator's New Mexico Corporate ID or Tax ID: 74-3010638		
3	Plant Owner(s) name(s): New Mexico Department of Transportation	Phone/Fax: (505) 670-4644	

a	Plant Owner(s) Mailing Address(s): PO Box 1149, Room 201 1120 Cerrillos Road, Santa Fe, New Mexico 87504		
4	Bill To (Company): INTERA Incorporated	Phone/Fax: 505-246-1600	
a	Mailing Address: 6000 Uptown Blvd. NE Suite 220, Albuquerque, NM 87110	E-mail: emarcillo@intera.com	
5	<input type="checkbox"/> Preparer: <input checked="" type="checkbox"/> Consultant: INTERA Incorporated	Phone/Fax: 603.969.4070 or 505.246.1600	
a	Mailing Address: 6000 Uptown Blvd. NE Suite 220, Albuquerque, NM 87110	E-mail: emarcillo@intera.com	
6	Plant Operator Contact: Eileen Marcillo	Phone/Fax: 603.969.4070 or 505.246.1600	
a	Address: 6000 Uptown Blvd. NE Suite 220, Albuquerque, NM 87110	E-mail: emarcillo@intera.com	
7	Air Permit Contact: Eileen Marcillo	Title: Senior Scientist	
a	E-mail: emarcillo@intera.com	Phone/Fax: 603.969.4070 or 505.246.1600	
b	Mailing Address: 6000 Uptown Blvd. NE Suite 220, Albuquerque, NM 87110		
c	The designated Air permit Contact will receive all official correspondence (i.e. letters, permits) from the Air Quality Bureau.		

Section 1-B: Current Facility Status

1.a	Has this facility already been constructed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1.b If yes to question 1.a, is it currently operating in New Mexico? <input type="checkbox"/> Yes <input type="checkbox"/> No
2	If yes to question 1.a, was the existing facility subject to a Notice of Intent (NOI) (20.2.73 NMAC) before submittal of this application? <input type="checkbox"/> Yes <input type="checkbox"/> No	If yes to question 1.a, was the existing facility subject to a construction permit (20.2.72 NMAC) before submittal of this application? <input type="checkbox"/> Yes <input type="checkbox"/> No
3	Is the facility currently shut down? <input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, give month and year of shut down (MM/YY):
4	Was this facility constructed before 8/31/1972 and continuously operated since 1972? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
5	If Yes to question 3, has this facility been modified (see 20.2.72.7.P NMAC) or the capacity increased since 8/31/1972? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
6	Does this facility have a Title V operating permit (20.2.70 NMAC)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes, the permit No. is: P-
7	Has this facility been issued a No Permit Required (NPR)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes, the NPR No. is:
8	Has this facility been issued a Notice of Intent (NOI)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes, the NOI No. is:
9	Does this facility have a construction permit (20.2.72/20.2.74 NMAC)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes, the permit No. is:
10	Is this facility registered under a General permit (GCP-1, GCP-2, etc.)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If yes, the register No. is:

Section 1-C: Facility Input Capacity & Production Rate

1	What is the facility's maximum input capacity, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: N/A	Daily: N/A	Annually: N/A
b	Proposed	Hourly: N/A	Daily: N/A	Annually: N/A
2	What is the facility's maximum production rate, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: N/A	Daily: N/A	Annually: N/A
b	Proposed	Hourly: N/A	Daily: N/A	Annually: N/A

Section 1-D: Facility Location Information

1	Section: 19	Range: 17W	Township: 15S	County: Grant	Elevation (ft): 4600
2	UTM Zone: <input type="checkbox"/> 12 or <input checked="" type="checkbox"/> 13			Datum: <input type="checkbox"/> NAD 27 <input checked="" type="checkbox"/> NAD 83 <input type="checkbox"/> WGS 84	
a	UTM E (in meters, to nearest 10 meters): 159,289			UTM N (in meters, to nearest 10 meters): 3,655,328	
b	AND Latitude (deg., min., sec.): 32° 58' 59.63"			Longitude (deg., min., sec.): 108° 38' 45.27"	
3	Name and zip code of nearest New Mexico town: Cliff 88028				
4	Detailed Driving Instructions from nearest NM town (attach a road map if necessary): Along US Highway 180, MP 81				
5	The facility is 2.4 miles west of Cliff, NM center.				
6	Status of land at facility (check one): <input checked="" type="checkbox"/> Private <input type="checkbox"/> Indian/Pueblo <input type="checkbox"/> Federal BLM <input type="checkbox"/> Federal Forest Service <input type="checkbox"/> Other (specify)				
7	List all municipalities, Indian tribes, and counties within a ten (10) mile radius (20.2.72.203.B.2 NMAC) of the property on which the facility is proposed to be constructed or operated: Census Designated Place-Cliff, Grant County. Census Designated Place-Buckhorn, Grant County				
8	20.2.72 NMAC applications only : Will the property on which the facility is proposed to be constructed or operated be closer than 50 km (31 miles) to other states, Bernalillo County, or a Class I area (see www.env.nm.gov/aqb/modeling/class1areas.html)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (20.2.72.206.A.7 NMAC) If yes, list all with corresponding distances in kilometers: Gila Wilderness, 11.50 km				
9	Name nearest Class I area: Gila Wilderness				
10	Shortest distance (in km) from facility boundary to the boundary of the nearest Class I area (to the nearest 10 meters): 11.50 km				
11	Distance (meters) from the perimeter of the Area of Operations (AO is defined as the plant site inclusive of all disturbed lands, including mining overburden removal areas) to nearest residence, school or occupied structure: 200 m				
12	Method(s) used to delineate the Restricted Area: Locked gate and continuous chain link fence "Restricted Area" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area within the property may be identified with signage only. Public roads cannot be part of a Restricted Area.				
13	Does the owner/operator intend to operate this source as a portable stationary source as defined in 20.2.72.7.X NMAC? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No A portable stationary source is not a mobile source, such as an automobile, but a source that can be installed permanently at one location or that can be re-installed at various locations, such as a hot mix asphalt plant that is moved to different job sites.				
14	Will this facility operate in conjunction with other air regulated parties on the same property? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If yes, what is the name and permit number (if known) of the other facility?				

Section 1-E: Proposed Operating Schedule (The 1-E.1 & 1-E.2 operating schedules may become conditions in the permit.)

1	Facility maximum operating ($\frac{\text{hours}}{\text{day}}$): 24	($\frac{\text{days}}{\text{week}}$): 7	($\frac{\text{weeks}}{\text{year}}$): 52	($\frac{\text{hours}}{\text{year}}$): 8760
2	Facility's maximum daily operating schedule (if less than 24 $\frac{\text{hours}}{\text{day}}$)? Start:		<input type="checkbox"/> AM <input type="checkbox"/> PM	End: <input type="checkbox"/> AM <input type="checkbox"/> PM
3	Month and year of anticipated start of construction: August 2020			
4	Month and year of anticipated construction completion: August 2020			
5	Month and year of anticipated startup of new or modified facility: August 2020			
6	Will this facility operate at this site for more than one year? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			

Section 1-F: Other Facility Information

1	Are there any current Notice of Violations (NOV), compliance orders, or any other compliance or enforcement issues related to this facility? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If yes, specify:
---	---

a	If yes, NOV date or description of issue:	NOV Tracking No:
b	Is this application in response to any issue listed in 1-F, 1 or 1a above? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, provide the 1c & 1d info below:	
c	Document Title:	Date: Requirement # (or page # and paragraph #):
d	Provide the required text to be inserted in this permit:	
2	Is air quality dispersion modeling or modeling waiver being submitted with this application? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
3	Does this facility require an "Air Toxics" permit under 20.2.72.400 NMAC & 20.2.72.502, Tables A and/or B? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
4	Will this facility be a source of federal Hazardous Air Pollutants (HAP)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
a	If Yes, what type of source? <input type="checkbox"/> Major (<input type="checkbox"/> ≥10 tpy of any single HAP OR <input type="checkbox"/> ≥25 tpy of any combination of HAPS) OR <input checked="" type="checkbox"/> Minor (<input type="checkbox"/> <10 tpy of any single HAP AND <input type="checkbox"/> <25 tpy of any combination of HAPS)	
5	Is any unit exempt under 20.2.72.202.B.3 NMAC? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
a	If yes, include the name of company providing commercial electric power to the facility: _____ Commercial power is purchased from a commercial utility company, which specifically does not include power generated on site for the sole purpose of the user.	

Section 1-G: Streamline Application (This section applies to 20.2.72.300 NMAC Streamline applications only)

1	<input type="checkbox"/> I have filled out Section 18, "Addendum for Streamline Applications." <input checked="" type="checkbox"/> N/A (This is not a Streamline application.)
---	--

Section 1-H: Current Title V Information - Required for all applications from TV Sources

(Title V-source required information for all applications submitted pursuant to 20.2.72 NMAC (Minor Construction Permits), or 20.2.74/20.2.79 NMAC (Major PSD/NNSR applications), and/or 20.2.70 NMAC (Title V))

1	Responsible Official (R.O.) (20.2.70.300.D.2 NMAC):	Phone:
a	R.O. Title:	R.O. e-mail:
b	R. O. Address:	
2	Alternate Responsible Official (20.2.70.300.D.2 NMAC):	Phone:
a	A. R.O. Title:	A. R.O. e-mail:
b	A. R. O. Address:	
3	Company's Corporate or Partnership Relationship to any other Air Quality Permittee (List the names of any companies that have operating (20.2.70 NMAC) permits and with whom the applicant for this permit has a corporate or partnership relationship):	
4	Name of Parent Company ("Parent Company" means the primary name of the organization that owns the company to be permitted wholly or in part.):	
a	Address of Parent Company:	
5	Names of Subsidiary Companies ("Subsidiary Companies" means organizations, branches, divisions or subsidiaries, which are owned, wholly or in part, by the company to be permitted.):	
6	Telephone numbers & names of the owners' agents and site contacts familiar with plant operations:	
7	Affected Programs to include Other States, local air pollution control programs (i.e. Bernalillo) and Indian tribes: Will the property on which the facility is proposed to be constructed or operated be closer than 80 km (50 miles) from other states, local pollution control programs, and Indian tribes and pueblos (20.2.70.402.A.2 and 20.2.70.7.B)? If yes, state which ones and provide the distances in kilometers:	

Section 1-I – Submittal Requirements

Each 20.2.73 NMAC (NOI), a 20.2.70 NMAC (Title V), a 20.2.72 NMAC (NSR minor source), or 20.2.74 NMAC (PSD) application package shall consist of the following:

Hard Copy Submittal Requirements:

- 1) One hard copy **original signed and notarized application package printed double sided ‘head-to-toe’ 2-hole punched** as we bind the document on top, not on the side; except Section 2 (landscape tables), which should be **head-to-head**. Please use **numbered tab separators** in the hard copy submittal(s) as this facilitates the review process. For NOI submittals only, hard copies of UA1, Tables 2A, 2D & 2F, Section 3 and the signed Certification Page are required. **Please include a copy of the check on a separate page.**
- 2) If the application is for a minor NSR, PSD, NNSR, or Title V application, include one working hard **copy** for Department use. This **copy** should be printed in book form, 3-hole punched, and **must be double sided**. Note that this is in addition to the head-to-toe 2-hole punched copy required in 1) above. Minor NSR Technical Permit revisions (20.2.72.219.B NMAC) only need to fill out Sections 1-A, 1-B, 3, and should fill out those portions of other Section(s) relevant to the technical permit revision. TV Minor Modifications need only fill out Sections 1-A, 1-B, 1-H, 3, and those portions of other Section(s) relevant to the minor modification. NMED may require additional portions of the application to be submitted, as needed.
- 3) The entire NOI or Permit application package, including the full modeling study, should be submitted electronically. Electronic files for applications for NOIs, any type of General Construction Permit (GCP), or technical revisions to NSRs must be submitted with compact disk (CD) or digital versatile disc (DVD). For these permit application submittals, **two CD** copies are required (in sleeves, not crystal cases, please), with additional CD copies as specified below. NOI applications require only a **single CD** submittal. Electronic files for other New Source Review (construction) permits/permit modifications or Title V permits/permit modifications can be submitted on CD/DVD or sent through AQB’s secure file transfer service.

Electronic files sent by (check one):

- CD/DVD attached to paper application
- secure electronic transfer. Air Permit Contact Name _____
 Email _____
 Phone number _____

a. If the file transfer service is chosen by the applicant, after receipt of the application, the Bureau will email the applicant with instructions for submitting the electronic files through a secure file transfer service. Submission of the electronic files through the file transfer service needs to be completed within 3 business days after the invitation is received, so the applicant should ensure that the files are ready when sending the hard copy of the application. The applicant will not need a password to complete the transfer. **Do not use the file transfer service for NOIs, any type of GCP, or technical revisions to NSR permits.**

- 4) Optionally, the applicant may submit the files with the application on compact disk (CD) or digital versatile disc (DVD) following the instructions above and the instructions in 5 for applications subject to PSD review.
- 5) If **air dispersion modeling** is required by the application type, include the **NMED Modeling Waiver** and/or electronic air dispersion modeling report, input, and output files. The dispersion modeling **summary report only** should be submitted as hard copy(ies) unless otherwise indicated by the Bureau.
- 6) If the applicant submits the electronic files on CD and the application is subject to PSD review under 20.2.74 NMAC (PSD) or NNSR under 20.2.79 NMC include,
 - a. one additional CD copy for US EPA,
 - b. one additional CD copy for each federal land manager affected (NPS, USFS, FWS, USDI) and,
 - c. one additional CD copy for each affected regulatory agency other than the Air Quality Bureau.

If the application is submitted electronically through the secure file transfer service, these extra CDs do not need to be submitted.

Electronic Submittal Requirements [in addition to the required hard copy(ies)]:

- 1) All required electronic documents shall be submitted as 2 separate CDs or submitted through the AQB secure file transfer service. Submit a single PDF document of the entire application as submitted and the individual documents comprising the application.
- 2) The documents should also be submitted in Microsoft Office compatible file format (Word, Excel, etc.) allowing us to access the text and formulas in the documents (copy & paste). Any documents that cannot be submitted in a Microsoft Office compatible

format shall be saved as a PDF file from within the electronic document that created the file. If you are unable to provide Microsoft office compatible electronic files or internally generated PDF files of files (items that were not created electronically: i.e. brochures, maps, graphics, etc.), submit these items in hard copy format. We must be able to review the formulas and inputs that calculated the emissions.

- 3) It is preferred that this application form be submitted as 4 electronic files (**3 MSWord docs**: Universal Application section 1 [UA1], Universal Application section 3-19 [UA3], and Universal Application 4, the modeling report [UA4]) and **1 Excel file** of the tables (Universal Application section 2 [UA2]). Please include as many of the 3-19 Sections as practical in a single MS Word electronic document. Create separate electronic file(s) if a single file becomes too large or if portions must be saved in a file format other than MS Word.
- 4) The **electronic file names** shall be a maximum of 25 characters long (including spaces, if any). The format of the electronic Universal Application shall be in the format: "A-3423-FacilityName". The "A" distinguishes the file as an application submittal, as opposed to other documents the Department itself puts into the database. Thus, all electronic application submittals should begin with "A-". Modifications to existing facilities should use the **core permit number** (i.e. '3423') the Department assigned to the facility as the next 4 digits. Use 'XXXX' for new facility applications. The format of any separate electronic submittals (additional submittals such as non-Word attachments, re-submittals, application updates) and Section document shall be in the format: "A-3423-9-description", where "9" stands for the **section #** (in this case Section 9-Public Notice). Please refrain, as much as possible, from submitting any scanned documents as this file format is extremely large, which uses up too much storage capacity in our database. Please take the time to fill out the **header information** throughout all submittals as this will identify any loose pages, including the Application Date (date submitted) & Revision number (0 for original, 1, 2, etc.; which will help keep track of subsequent partial update(s) to the original submittal. Do not use special symbols (#, @, etc.) in file names. The footer information should not be modified by the applicant.

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Table 2-A: Regulated Emission Sources

Unit and stack numbering must correspond throughout the application package. If applying for a NOI under 20.2.73 NMAC, equipment exemptions under 2.72.202 NMAC do not apply.

Unit Number ¹	Source Description	Make	Model #	Serial #	Manufacturer's Rated Capacity ³ (Specify Units)	Requested Permitted Capacity ³ (Specify Units)	Date of Manufacture ²	Controlled by Unit #	Source Classification Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB) ⁴	Replacing Unit No.
							Date of Construction/Reconstruction ²	Emissions vented to Stack #				
1	SVE Blower	ROTRON	EN 523	NA	84 CFM	84 CFM	NA			<input type="checkbox"/> Existing (unchanged) <input checked="" type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
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										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	
										<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> New/Additional <input type="checkbox"/> To Be Modified	<input type="checkbox"/> To be Removed <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To be Replaced	

¹ Unit numbers must correspond to unit numbers in the previous permit unless a complete cross reference table of all units in both permits is provided.

² Specify dates required to determine regulatory applicability.

³ To properly account for power conversion efficiencies, generator set rated capacity shall be reported as the rated capacity of the engine in horsepower, not the kilowatt capacity of the generator set.

⁴ "4SLB" means four stroke lean burn engine, "4SRB" means four stroke rich burn engine, "2SLB" means two stroke lean burn engine, "CI" means compression ignition, and "SI" means spark ignition

Table 2-B: Insignificant Activities¹ (20.2.70 NMAC) OR Exempted Equipment (20.2.72 NMAC)

All 20.2.70 NMAC (Title V) applications must list all Insignificant Activities in this table. All 20.2.72 NMAC applications must list Exempted Equipment in this table. If equipment listed on this table is exempt under 20.2.72.202.B.5, include emissions calculations and emissions totals for 202.B.5 "similar functions" units, operations, and activities in Section 6, Calculations. Equipment and activities exempted under 20.2.72.202 NMAC may not necessarily be Insignificant under 20.2.70 NMAC (and vice versa). Unit & stack numbering must be consistent throughout the application package. Per Exemptions Policy 02-012.00 (see http://www.env.nm.gov/aqb/permit/aqb_pol.html), 20.2.72.202.B NMAC Exemptions do not apply, but 20.2.72.202.A NMAC exemptions do apply to NOI facilities under 20.2.73 NMAC. List 20.2.72.301.D.4 NMAC Auxiliary Equipment for Streamline applications in Table 2-A. The List of Insignificant Activities (for TV) can be found online at <https://www.env.nm.gov/air-quality/air-quality-title-v-operating-permits-guidance-page/>. TV sources may elect to enter both TV Insignificant Activities and Part 72 Exemptions on this form.

Unit Number	Source Description	Manufacturer	Model No.	Max Capacity	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5)	Date of Manufacture /Reconstruction ²	For Each Piece of Equipment, Check One
			Serial No.	Capacity Units	Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Installation /Construction ²	
1	SVE Blower	ROTRON	EN 523	84 CFM	20.2.72.202.B.5		<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input checked="" type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced
							<input type="checkbox"/> Existing (unchanged) <input type="checkbox"/> To be Removed <input type="checkbox"/> New/Additional <input type="checkbox"/> Replacement Unit <input type="checkbox"/> To Be Modified <input type="checkbox"/> To be Replaced

¹ Insignificant activities exempted due to size or production rate are defined in 20.2.70.300.D.6, 20.2.70.7.Q NMAC, and the NMED/AQB List of Insignificant Activities, dated September 15, 2008. Emissions from these insignificant activities do not need to be reported, unless specifically requested.

² Specify date(s) required to determine regulatory applicability.

Section 3

Application Summary

The **Application Summary** shall include a brief description of the facility and its process, the type of permit application, the applicable regulation (i.e. 20.2.72.200.A.X, or 20.2.73 NMAC) under which the application is being submitted, and any air quality permit numbers associated with this site. If this facility is to be collocated with another facility, provide details of the other facility including permit number(s). In case of a revision or modification to a facility, provide the lowest level regulatory citation (i.e. 20.2.72.219.B.1.d NMAC) under which the revision or modification is being requested. Also describe the proposed changes from the original permit, how the proposed modification will affect the facility's operations and emissions, de-bottlenecking impacts, and changes to the facility's major/minor status (both PSD & Title V).

The **Process Summary** shall include a brief description of the facility and its processes.

Startup, Shutdown, and Maintenance (SSM) routine or predictable emissions: Provide an overview of how SSM emissions are accounted for in this application. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on SSM emissions.

This is an application for a No Permit Required (NPR) determination. The application is for a new, minor source (NMAC 20.2.72.200.A), which will discharge a maximum of 0.273 tons per year of volatile organic compounds (VOCs).

This facility is a soil vapor extraction remediation system used to reduce and remove subsurface VOCs in dissolved and vapor phases at an operating New Mexico Department of Transportation Patrol Yard. An extraction blower will apply a vacuum to the subsurface through an extraction well(s) to remove VOC impacted soil vapor and to volatilize VOCs from the groundwater surface. The extracted vapor will be directly discharged to the atmosphere at a height of 10 ft or greater.

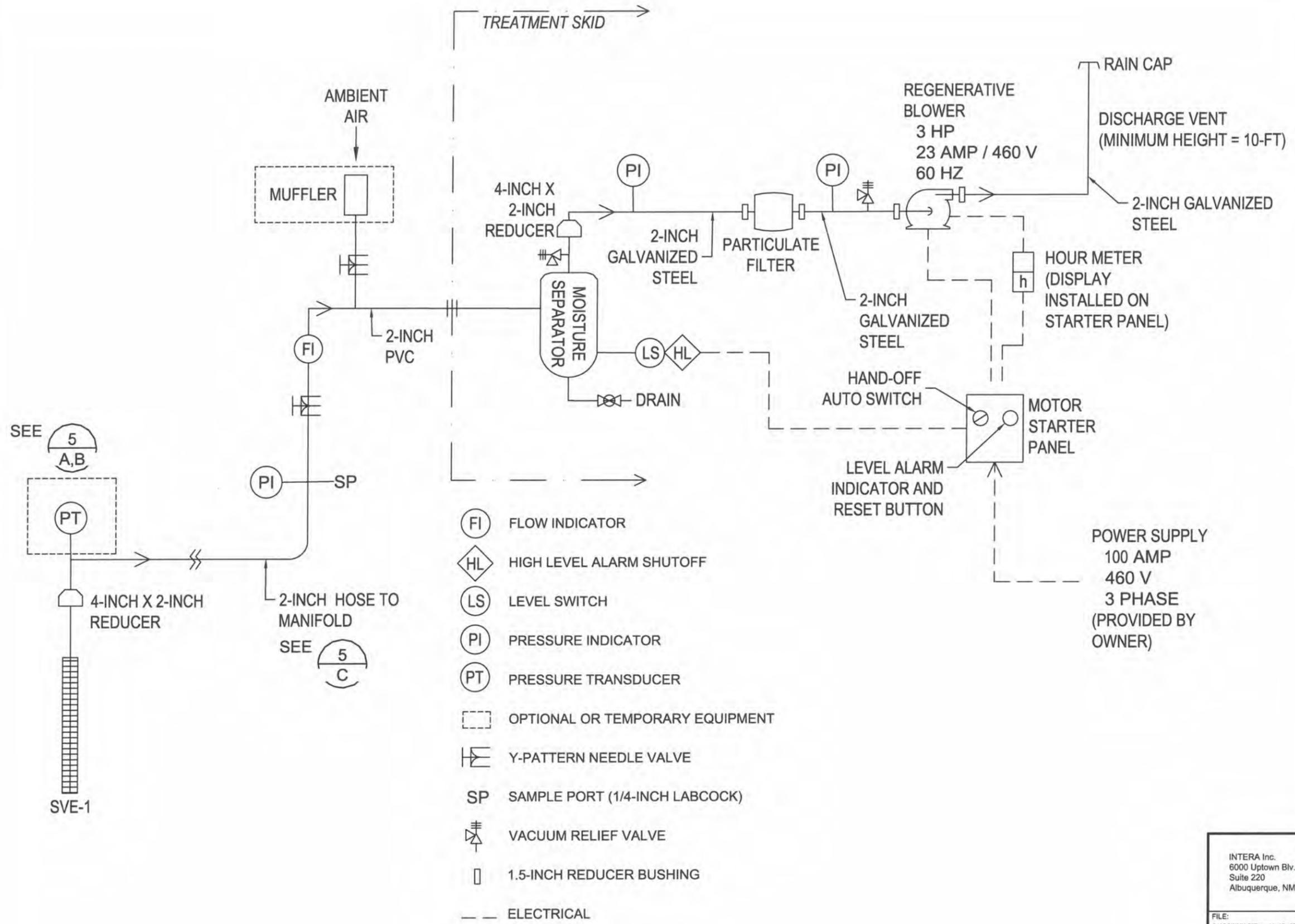
SSM emissions are not accounted for in this application. As designed, the blower is required for the removal of VOCs. If the blower stops functioning, this shuts the system down and no further emissions are discharged to the atmosphere.

Section 4

Process Flow Sheet

A **process flow sheet** and/or block diagram indicating the individual equipment, all emission points and types of control applied to those points. The unit numbering system should be consistent throughout this application.

Please see the attached INTERA Engineering Drawings, Sheet 4, "Process and Instrumentation Diagram" for the general system arrangement and flow.



ENGINEER SEAL			
BY			
REVISIONS		DESIGNED BY:	
NO.	DATE	DRAWN BY:	
		CHECKED BY:	DATE:
			DESIGN

Final Remediation Plan

PIPING AND INSTRUMENTATION DIAGRAM

Section 5

Plot Plan Drawn To Scale

A **plot plan drawn to scale** showing emissions points, roads, structures, tanks, and fences of property owned, leased, or under direct control of the applicant. This plot plan must clearly designate the restricted area as defined in UA1, Section 1-D.12. The unit numbering system should be consistent throughout this application.

Please see the attached INTERA Engineering Drawings, Sheet 2, "Site Plan."

Section 6

All Calculations

Show all calculations used to determine both the hourly and annual controlled and uncontrolled emission rates. All calculations shall be performed keeping a minimum of three significant figures. Document the source of each emission factor used (if an emission rate is carried forward and not revised, then a statement to that effect is required). If identical units are being permitted and will be subject to the same operating conditions, submit calculations for only one unit and a note specifying what other units to which the calculations apply. All formulas and calculations used to calculate emissions must be submitted. The "Calculations" tab in the UA2 has been provided to allow calculations to be linked to the emissions tables. Add additional "Calc" tabs as needed. If the UA2 or other spread sheets are used, all calculation spread sheet(s) shall be submitted electronically in Microsoft Excel compatible format so that formulas and input values can be checked. Format all spread sheets and calculations such that the reviewer can follow the logic and verify the input values. Define all variables. If calculation spread sheets are not used, provide the original formulas with defined variables. Additionally, provide subsequent formulas showing the input values for each variable in the formula. All calculations, including those calculations are imbedded in the Calc tab of the UA2 portion of the application, the printed Calc tab(s), should be submitted under this section.

Tank Flashing Calculations: The information provided to the AQB shall include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., NOI, permit, or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis. If Hysis is used, all relevant input parameters shall be reported, including separator pressure, gas throughput, and all other relevant parameters necessary for flashing calculation.

SSM Calculations: It is the applicant's responsibility to provide an estimate of SSM emissions or to provide justification for not doing so. In this Section, provide emissions calculations for Startup, Shutdown, and Routine Maintenance (SSM) emissions listed in the Section 2 SSM and/or Section 22 GHG Tables and the rationale for why the others are reported as zero (or left blank in the SSM/GHG Tables). Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on calculating SSM emissions. If SSM emissions are greater than those reported in the Section 2, Requested Allowables Table, modeling may be required to ensure compliance with the standards whether the application is NSR or Title V. Refer to the Modeling Section of this application for more guidance on modeling requirements.

Glycol Dehydrator Calculations: The information provided to the AQB shall include the manufacturer's maximum design recirculation rate for the glycol pump. If GRI-Glycalc is used, the full input summary report shall be included as well as a copy of the gas analysis that was used.

Road Calculations: Calculate fugitive particulate emissions and enter haul road fugitives in Tables 2-A, 2-D and 2-E for:

1. If you transport raw material, process material and/or product into or out of or within the facility and have PER emissions greater than 0.5 tpy.
2. If you transport raw material, process material and/or product into or out of the facility more frequently than one round trip per day.

Significant Figures:

A. All emissions standards are deemed to have at least two significant figures, but not more than three significant figures.

B. At least 5 significant figures shall be retained in all intermediate calculations.

C. In calculating emissions to determine compliance with an emission standard, the following rounding off procedures shall be used:

- (1) If the first digit to be discarded is less than the number 5, the last digit retained shall not be changed;
- (2) If the first digit discarded is greater than the number 5, or if it is the number 5 followed by at least one digit other than the number zero, the last figure retained shall be increased by one unit; **and**
- (3) If the first digit discarded is exactly the number 5, followed only by zeros, the last digit retained shall be rounded upward if it is an odd number, but no adjustment shall be made if it is an even number.
- (4) The final result of the calculation shall be expressed in the units of the standard.

Control Devices: In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device

regardless if the applicant takes credit for the reduction in emissions. The applicant can indicate in this section of the application if they chose to not take credit for the reduction in emission rates. For notices of intent submitted under 20.2.73 NMAC, only uncontrolled emission rates can be considered to determine applicability unless the state or federal Acts require the control. This information is necessary to determine if federally enforceable conditions are necessary for the control device, and/or if the control device produces its own regulated pollutants or increases emission rates of other pollutants.

Please see attached calculations beginning on the next page. All VOC emissions are less than 10 ton/yr and 10 lb/hr.

Tank flashing and SSM calculations are not required for this project.

1. Purpose

The purpose of this calculation is to calculate the hourly and annual uncontrolled emission rates for the Proposed Soil Vapor Extraction (SVE) remediation system at NMDOT Cliff Patrol Yard.

2. Background

A No Permit Required “NPR” is being requested from the New Mexico Environment Department (NMED) Air Quality Bureau (AQB) for the SVE system’s emissions. An NPR is applicable when a facility’s potential emission rate (PER) is less than the applicability thresholds of 20.2.72.200 and 20.2.73.200 NMAC. That is, a facility’s PER must be less than 10 pounds per hour (pph) and 10 tons per year (tpy) of any regulated air contaminant and less than 1 ton per year (tpy) of lead. The PER is referred to as the “uncontrolled emission rate” and is based on continuous operation (8760 hours per year) at maximum capacity without any controls.

3. Method

The analytical laboratory effluent concentration (C_{lab}) is converted to a volume of air under standard conditions (C_{std}) using Equation 1:

Eq. 1:

$$C_{std} = C_{lab} \cdot \left(\frac{P_{std}}{P_{lab}} \cdot \frac{T_{lab}}{T_{std}} \right)$$

For this calculation,

P_{std} = 0 ft amsl or 14.7 psi

P_{lab} = 5,000 ft above mean sea level (amsl) or 12.23 pounds per square inch (psi)

T_{lab} = 70 degrees (°F) or 529.7 Rankine (R)

T_{std} = 68 °F or 527.7 R

The PER is then calculated in pounds per hour (lb/hr) and tons per year (ton/yr) using Equation 2:

Eq. 2:

$$PER = Q_{out} * C_{std}$$

Where,

Q_{out} = maximum anticipated discharge flow rate.

Rev.	Orig.	Date	Chkd.	Date	Client/Project:
0	AKA	6/9/2020			NMDOT.C008.CAF-CPY
			ETM	6/16/2020	Subject: Estimated Potential Emission Rates for No Permit Required Documentation
					Calc. No. NMDOT.C008.CAF-CPY-2
					Sheet 1 of 3

4. Solution

A sample calculation for estimating the PER of total xylenes is provided below. The maximum total xylenes concentration measured during the SVE Pilot Test was 890 micrograms per liter ($\mu\text{g/L}$).

Calculate the total xylenes concentrations under standard conditions, C_{std} , using Eq. 1.

$$C_{std} = C_{lab} \cdot \left(\frac{P_{std}}{P_{lab}} \cdot \frac{T_{lab}}{T_{std}} \right) = 890 \frac{\mu\text{g}}{\text{L}} \times \left(\frac{14.7 \text{ psi}}{12.23 \text{ psi}} \cdot \frac{529.7 \text{ R}}{527.7 \text{ R}} \right) = 1073.8 \frac{\mu\text{g}}{\text{L}}$$

Calculate PER in pounds per hour (lb/hr) and tons per year (ton/yr) assuming a discharge air flow rate, 11 SCFM, using Eq. 2:

$$\begin{aligned} PER &= 11 \text{ SCFM} * 1073.8 \mu\text{g/L} * (28.317 \text{ L/ft}^3) \\ &* (60 \text{ min/hr}) * (\text{pound} / 453.59 \text{ grams}) * (\text{gram} / 10^6 \mu\text{g}) = \mathbf{0.044 \text{ lb/hr}} \end{aligned}$$

$$\text{Total Xylenes PER} = 0.044 \text{ lb/hr} * 8760 \text{ hr/yr} * \text{ton}/2000 \text{ lb} = \mathbf{0.194 \text{ ton/yr}}$$

Summary

The maximum hazardous air pollutants (HAPs) detected in the soil vapor samples collected during the 2019 SVE Pilot Test and their corresponding PER are summarized in the table below:

HAP	Maximum Effluent Concentration ($\mu\text{g/L}$)	Concentration at Standard Conditions C_{std} (mg/L)	Emissions Rate (lb/hr)	Emissions Rate (Tons/yr)
Benzene	32	38.6	0.002	0.007
Ethylbenzene	230	277.5	0.011	0.050
Toluene	90	108.6	0.004	0.020
Xylenes, Total	890	1073.8	0.044	0.194
Cumene (Isopropylbenzene)	11	13.3	0.001	0.002
Total VOC HAPs			0.062	0.273

The total calculated annual PER of 0.273 tons/yr is well below the No Permit Required threshold of 10 tons/yr, set by the NMED Air Quality Bureau.

Rev.	Orig.	Date	Chkd.	Date	Client/Project:
0	AKA	6/9/2020			NMDOT.C008.CAF-CPY
			ETM	6/16/2020	Subject: Estimated Potential Emission Rates for No Permit Required Documentation
					Calc. No. NMDOT.C008.CAF-CPY-2
					Sheet 2 of 3

Conversions:

453.59 grams/pound

1000000 µg/gram

60 minutes/hour

28.317 liter/cubic foot

8760 hour/year

2000 lb/ton

7. References

U.S. Environmental Protection Agency. Administrative and Technical Aspects for Source Sampling for Particulates. August 2012.

SVE Pilot Test Sampling Lab Results, Hall Environmental Analytical Laboratory, dated September 20, 2019.

Rev.	Orig.	Date	Chkd.	Date	Client/Project:
0	AKA	6/9/2020			NMDOT.C008.CAF-CPY
			ETM	6/16/2020	Subject: Estimated Potential Emission Rates for No Permit Required Documentation
					Calc. No. NMDOT.C008.CAF-CPY-2
					Sheet 3 of 3

Section 6.a

Green House Gas Emissions

(Submitting under 20.2.70, 20.2.72 20.2.74 NMAC)

Title V (20.2.70 NMAC), Minor NSR (20.2.72 NMAC), and PSD (20.2.74 NMAC) applicants must estimate and report greenhouse gas (GHG) emissions to verify the emission rates reported in the public notice, determine applicability to 40 CFR 60 Subparts, and to evaluate Prevention of Significant Deterioration (PSD) applicability. GHG emissions that are subject to air permit regulations consist of the sum of an aggregate group of these six greenhouse gases: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

Calculating GHG Emissions:

1. Calculate the ton per year (tpy) GHG mass emissions and GHG CO₂e emissions from your facility.
2. GHG mass emissions are the sum of the total annual tons of greenhouse gases without adjusting with the global warming potentials (GWPs). GHG CO₂e emissions are the sum of the mass emissions of each individual GHG multiplied by its GWP found in Table A-1 in 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Emissions from routine or predictable start up, shut down, and maintenance must be included.
4. Report GHG mass and GHG CO₂e emissions in Table 2-P of this application. Emissions are reported in **short** tons per year and represent each emission unit's Potential to Emit (PTE).
5. All Title V major sources, PSD major sources, and all power plants, whether major or not, must calculate and report GHG mass and CO₂e emissions for each unit in Table 2-P.
6. For minor source facilities that are not power plants, are not Title V, and are not PSD there are three options for reporting GHGs in Table 2-P: 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHGs as a second separate unit; 3) or check the following **X** By checking this box, the applicant acknowledges the total CO₂e emissions are less than 75,000 tons per year. **No GHG are generated from operation of the remediation system.**

Sources for Calculating GHG Emissions:

- Manufacturer's Data
- AP-42 Compilation of Air Pollutant Emission Factors at <http://www.epa.gov/ttn/chief/ap42/index.html>
- EPA's Internet emission factor database WebFIRE at <http://cfpub.epa.gov/webfire/>
- 40 CFR 98 Mandatory Green House Gas Reporting except that tons should be reported in short tons rather than in metric tons for the purpose of PSD applicability.
- API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry. August 2009 or most recent version.
- Sources listed on EPA's NSR Resources for Estimating GHG Emissions at <http://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases>:

Global Warming Potentials (GWP):

Applicants must use the Global Warming Potentials codified in Table A-1 of the most recent version of 40 CFR 98 Mandatory Greenhouse Gas Reporting. The GWP for a particular GHG is the ratio of heat trapped by one unit mass of the GHG to that of one unit mass of CO₂ over a specified time period.

"Greenhouse gas" for the purpose of air permit regulations is defined as the aggregate group of the following six gases: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. **(20.2.70.7 NMAC, 20.2.74.7 NMAC)**. You may also find GHGs defined in 40 CFR 86.1818-12(a).

Metric to Short Ton Conversion:

Short tons for GHGs and other regulated pollutants are the standard unit of measure for PSD and title V permitting programs. 40 CFR 98 Mandatory Greenhouse Reporting requires metric tons.

1 metric ton = 1.10231 short tons (per Table A-2 to Subpart A of Part 98 – Units of Measure Conversions)

Section 7

Information Used To Determine Emissions

Information Used to Determine Emissions shall include the following:

- If manufacturer data are used, include specifications for emissions units and control equipment, including control efficiencies specifications and sufficient engineering data for verification of control equipment operation, including design drawings, test reports, and design parameters that affect normal operation.
 - If test data are used, include a copy of the complete test report. If the test data are for an emissions unit other than the one being permitted, the emission units must be identical. Test data may not be used if any difference in operating conditions of the unit being permitted and the unit represented in the test report significantly effect emission rates.
 - If the most current copy of AP-42 is used, reference the section and date located at the bottom of the page. Include a copy of the page containing the emissions factors, and clearly mark the factors used in the calculations.
 - If an older version of AP-42 is used, include a complete copy of the section.
 - If an EPA document or other material is referenced, include a complete copy.
 - Fuel specifications sheet.
 - If computer models are used to estimate emissions, include an input summary (if available) and a detailed report, and a disk containing the input file(s) used to run the model. For tank-flashing emissions, include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., permit or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis.
-

1. SVE Pilot Test Analytical Results, Hall Environmental Laboratory. September 2019.



Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

September 20, 2019

Eileen Marcillo

Intera, Inc.

6000 Uptown Boulevard, NE Suite 220

Albuquerque, NM 87110

TEL: (603) 969-4070

FAX:

RE: Cliff Patrol Yard

OrderNo.: 1909754

Dear Eileen Marcillo:

Hall Environmental Analysis Laboratory received 5 sample(s) on 9/13/2019 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results, it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifiers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0901

Sincerely,

A handwritten signature in black ink, appearing to read 'Andy Freeman', is written over a white background.

Andy Freeman

Laboratory Manager

4901 Hawkins NE

Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1909754

Date Reported: 9/20/2019

CLIENT: Intera, Inc.

Client Sample ID: SVE-101

Project: Cliff Patrol Yard

Collection Date: 9/11/2019 7:30:00 AM

Lab ID: 1909754-001

Matrix: AIR

Received Date: 9/13/2019 8:51:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8015D: GASOLINE RANGE							Analyst: NSB
Gasoline Range Organics (GRO)	36000	500		µg/L	100	9/17/2019 9:41:30 AM	G62992
Surr: BFB	96.9	53-256		%Rec	100	9/17/2019 9:41:30 AM	G62992
EPA METHOD 8260B: VOLATILES							Analyst: DJF
Benzene	5.4	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Toluene	14	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Ethylbenzene	43	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Methyl tert-butyl ether (MTBE)	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,2,4-Trimethylbenzene	9.5	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,3,5-Trimethylbenzene	6.1	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,2-Dichloroethane (EDC)	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,2-Dibromoethane (EDB)	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Naphthalene	ND	10		µg/L	50	9/19/2019 1:19:20 PM	A63060
1-Methylnaphthalene	ND	20		µg/L	50	9/19/2019 1:19:20 PM	A63060
2-Methylnaphthalene	ND	20		µg/L	50	9/19/2019 1:19:20 PM	A63060
Acetone	ND	50		µg/L	50	9/19/2019 1:19:20 PM	A63060
Bromobenzene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Bromodichloromethane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Bromoform	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Bromomethane	ND	10		µg/L	50	9/19/2019 1:19:20 PM	A63060
2-Butanone	ND	50		µg/L	50	9/19/2019 1:19:20 PM	A63060
Carbon disulfide	ND	50		µg/L	50	9/19/2019 1:19:20 PM	A63060
Carbon tetrachloride	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Chlorobenzene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Chloroethane	ND	10		µg/L	50	9/19/2019 1:19:20 PM	A63060
Chloroform	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Chloromethane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
2-Chlorotoluene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
4-Chlorotoluene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
cis-1,2-DCE	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
cis-1,3-Dichloropropene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,2-Dibromo-3-chloropropane	ND	10		µg/L	50	9/19/2019 1:19:20 PM	A63060
Dibromochloromethane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Dibromomethane	ND	10		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,2-Dichlorobenzene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,3-Dichlorobenzene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,4-Dichlorobenzene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Dichlorodifluoromethane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,1-Dichloroethane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,1-Dichloroethene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1909754

Date Reported: 9/20/2019

CLIENT: Intera, Inc.

Client Sample ID: SVE-101

Project: Cliff Patrol Yard

Collection Date: 9/11/2019 7:30:00 AM

Lab ID: 1909754-001

Matrix: AIR

Received Date: 9/13/2019 8:51:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES							Analyst: DJF
1,2-Dichloropropane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,3-Dichloropropane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
2,2-Dichloropropane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,1-Dichloropropene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Hexachlorobutadiene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
2-Hexanone	ND	50		µg/L	50	9/19/2019 1:19:20 PM	A63060
Isopropylbenzene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
4-Isopropyltoluene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
4-Methyl-2-pentanone	ND	50		µg/L	50	9/19/2019 1:19:20 PM	A63060
Methylene chloride	ND	15		µg/L	50	9/19/2019 1:19:20 PM	A63060
n-Butylbenzene	ND	15		µg/L	50	9/19/2019 1:19:20 PM	A63060
n-Propylbenzene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
sec-Butylbenzene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Styrene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
tert-Butylbenzene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,1,1,2-Tetrachloroethane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,1,2,2-Tetrachloroethane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Tetrachloroethene (PCE)	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
trans-1,2-DCE	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
trans-1,3-Dichloropropene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,2,3-Trichlorobenzene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,2,4-Trichlorobenzene	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,1,1-Trichloroethane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,1,2-Trichloroethane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Trichloroethene (TCE)	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Trichlorofluoromethane	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
1,2,3-Trichloropropane	ND	10		µg/L	50	9/19/2019 1:19:20 PM	A63060
Vinyl chloride	ND	5.0		µg/L	50	9/19/2019 1:19:20 PM	A63060
Xylenes, Total	160	7.5		µg/L	50	9/19/2019 1:19:20 PM	A63060
Surr: Dibromofluoromethane	86.1	53.9-127		%Rec	50	9/19/2019 1:19:20 PM	A63060
Surr: 1,2-Dichloroethane-d4	76.5	70-130		%Rec	50	9/19/2019 1:19:20 PM	A63060
Surr: Toluene-d8	105	70-130		%Rec	50	9/19/2019 1:19:20 PM	A63060
Surr: 4-Bromofluorobenzene	84.8	70-130		%Rec	50	9/19/2019 1:19:20 PM	A63060

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1909754

Date Reported: 9/20/2019

CLIENT: Intera, Inc.

Client Sample ID: SVE-102

Project: Cliff Patrol Yard

Collection Date: 9/11/2019 11:00:00 AM

Lab ID: 1909754-002

Matrix: AIR

Received Date: 9/13/2019 8:51:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8015D: GASOLINE RANGE							Analyst: NSB
Gasoline Range Organics (GRO)	99000	500	E	µg/L	100	9/17/2019 10:04:59 AM	G62992
Surr: BFB	134	53-256		%Rec	100	9/17/2019 10:04:59 AM	G62992
EPA METHOD 8260B: VOLATILES							Analyst: DJF
Benzene	30	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Toluene	62	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Ethylbenzene	180	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Methyl tert-butyl ether (MTBE)	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,2,4-Trimethylbenzene	56	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,3,5-Trimethylbenzene	28	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,2-Dichloroethane (EDC)	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,2-Dibromoethane (EDB)	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Naphthalene	ND	20		µg/L	100	9/19/2019 1:48:46 PM	A63060
1-Methylnaphthalene	ND	40		µg/L	100	9/19/2019 1:48:46 PM	A63060
2-Methylnaphthalene	ND	40		µg/L	100	9/19/2019 1:48:46 PM	A63060
Acetone	ND	100		µg/L	100	9/19/2019 1:48:46 PM	A63060
Bromobenzene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Bromodichloromethane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Bromoform	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Bromomethane	ND	20		µg/L	100	9/19/2019 1:48:46 PM	A63060
2-Butanone	ND	100		µg/L	100	9/19/2019 1:48:46 PM	A63060
Carbon disulfide	ND	100		µg/L	100	9/19/2019 1:48:46 PM	A63060
Carbon tetrachloride	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Chlorobenzene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Chloroethane	ND	20		µg/L	100	9/19/2019 1:48:46 PM	A63060
Chloroform	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Chloromethane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
2-Chlorotoluene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
4-Chlorotoluene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
cis-1,2-DCE	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
cis-1,3-Dichloropropene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,2-Dibromo-3-chloropropane	ND	20		µg/L	100	9/19/2019 1:48:46 PM	A63060
Dibromochloromethane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Dibromomethane	ND	20		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,2-Dichlorobenzene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,3-Dichlorobenzene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,4-Dichlorobenzene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Dichlorodifluoromethane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,1-Dichloroethane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,1-Dichloroethene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1909754

Date Reported: 9/20/2019

CLIENT: Intera, Inc.

Client Sample ID: SVE-102

Project: Cliff Patrol Yard

Collection Date: 9/11/2019 11:00:00 AM

Lab ID: 1909754-002

Matrix: AIR

Received Date: 9/13/2019 8:51:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES							Analyst: DJF
1,2-Dichloropropane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,3-Dichloropropane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
2,2-Dichloropropane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,1-Dichloropropene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Hexachlorobutadiene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
2-Hexanone	ND	100		µg/L	100	9/19/2019 1:48:46 PM	A63060
Isopropylbenzene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
4-Isopropyltoluene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
4-Methyl-2-pentanone	ND	100		µg/L	100	9/19/2019 1:48:46 PM	A63060
Methylene chloride	ND	30		µg/L	100	9/19/2019 1:48:46 PM	A63060
n-Butylbenzene	ND	30		µg/L	100	9/19/2019 1:48:46 PM	A63060
n-Propylbenzene	21	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
sec-Butylbenzene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Styrene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
tert-Butylbenzene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,1,1,2-Tetrachloroethane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,1,2,2-Tetrachloroethane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Tetrachloroethene (PCE)	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
trans-1,2-DCE	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
trans-1,3-Dichloropropene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,2,3-Trichlorobenzene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,2,4-Trichlorobenzene	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,1,1-Trichloroethane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,1,2-Trichloroethane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Trichloroethene (TCE)	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Trichlorofluoromethane	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
1,2,3-Trichloropropane	ND	20		µg/L	100	9/19/2019 1:48:46 PM	A63060
Vinyl chloride	ND	10		µg/L	100	9/19/2019 1:48:46 PM	A63060
Xylenes, Total	710	15		µg/L	100	9/19/2019 1:48:46 PM	A63060
Surr: Dibromofluoromethane	83.8	53.9-127		%Rec	100	9/19/2019 1:48:46 PM	A63060
Surr: 1,2-Dichloroethane-d4	74.8	70-130		%Rec	100	9/19/2019 1:48:46 PM	A63060
Surr: Toluene-d8	106	70-130		%Rec	100	9/19/2019 1:48:46 PM	A63060
Surr: 4-Bromofluorobenzene	80.8	70-130		%Rec	100	9/19/2019 1:48:46 PM	A63060

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1909754

Date Reported: 9/20/2019

CLIENT: Intera, Inc.

Client Sample ID: SVE-103

Project: Cliff Patrol Yard

Collection Date: 9/11/2019 2:00:00 PM

Lab ID: 1909754-003

Matrix: AIR

Received Date: 9/13/2019 8:51:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8015D: GASOLINE RANGE							Analyst: NSB
Gasoline Range Organics (GRO)	76000	500		µg/L	100	9/17/2019 10:28:30 AM	G62992
Surr: BFB	141	53-256		%Rec	100	9/17/2019 10:28:30 AM	G62992
EPA METHOD 8260B: VOLATILES							Analyst: DJF
Benzene	32	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Toluene	90	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Ethylbenzene	230	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Methyl tert-butyl ether (MTBE)	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,2,4-Trimethylbenzene	67	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,3,5-Trimethylbenzene	34	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,2-Dichloroethane (EDC)	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,2-Dibromoethane (EDB)	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Naphthalene	ND	20		µg/L	100	9/19/2019 2:18:13 PM	A63060
1-Methylnaphthalene	ND	40		µg/L	100	9/19/2019 2:18:13 PM	A63060
2-Methylnaphthalene	ND	40		µg/L	100	9/19/2019 2:18:13 PM	A63060
Acetone	ND	100		µg/L	100	9/19/2019 2:18:13 PM	A63060
Bromobenzene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Bromodichloromethane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Bromoform	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Bromomethane	ND	20		µg/L	100	9/19/2019 2:18:13 PM	A63060
2-Butanone	ND	100		µg/L	100	9/19/2019 2:18:13 PM	A63060
Carbon disulfide	ND	100		µg/L	100	9/19/2019 2:18:13 PM	A63060
Carbon tetrachloride	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Chlorobenzene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Chloroethane	ND	20		µg/L	100	9/19/2019 2:18:13 PM	A63060
Chloroform	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Chloromethane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
2-Chlorotoluene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
4-Chlorotoluene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
cis-1,2-DCE	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
cis-1,3-Dichloropropene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,2-Dibromo-3-chloropropane	ND	20		µg/L	100	9/19/2019 2:18:13 PM	A63060
Dibromochloromethane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Dibromomethane	ND	20		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,2-Dichlorobenzene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,3-Dichlorobenzene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,4-Dichlorobenzene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Dichlorodifluoromethane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,1-Dichloroethane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,1-Dichloroethene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1909754

Date Reported: 9/20/2019

CLIENT: Intera, Inc.

Client Sample ID: SVE-103

Project: Cliff Patrol Yard

Collection Date: 9/11/2019 2:00:00 PM

Lab ID: 1909754-003

Matrix: AIR

Received Date: 9/13/2019 8:51:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES							Analyst: DJF
1,2-Dichloropropane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,3-Dichloropropane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
2,2-Dichloropropane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,1-Dichloropropene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Hexachlorobutadiene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
2-Hexanone	ND	100		µg/L	100	9/19/2019 2:18:13 PM	A63060
Isopropylbenzene	11	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
4-Isopropyltoluene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
4-Methyl-2-pentanone	ND	100		µg/L	100	9/19/2019 2:18:13 PM	A63060
Methylene chloride	ND	30		µg/L	100	9/19/2019 2:18:13 PM	A63060
n-Butylbenzene	ND	30		µg/L	100	9/19/2019 2:18:13 PM	A63060
n-Propylbenzene	27	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
sec-Butylbenzene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Styrene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
tert-Butylbenzene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,1,1,2-Tetrachloroethane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,1,2,2-Tetrachloroethane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Tetrachloroethene (PCE)	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
trans-1,2-DCE	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
trans-1,3-Dichloropropene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,2,3-Trichlorobenzene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,2,4-Trichlorobenzene	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,1,1-Trichloroethane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,1,2-Trichloroethane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Trichloroethene (TCE)	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Trichlorofluoromethane	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
1,2,3-Trichloropropane	ND	20		µg/L	100	9/19/2019 2:18:13 PM	A63060
Vinyl chloride	ND	10		µg/L	100	9/19/2019 2:18:13 PM	A63060
Xylenes, Total	890	15		µg/L	100	9/19/2019 2:18:13 PM	A63060
Surr: Dibromofluoromethane	89.7	53.9-127		%Rec	100	9/19/2019 2:18:13 PM	A63060
Surr: 1,2-Dichloroethane-d4	83.8	70-130		%Rec	100	9/19/2019 2:18:13 PM	A63060
Surr: Toluene-d8	109	70-130		%Rec	100	9/19/2019 2:18:13 PM	A63060
Surr: 4-Bromofluorobenzene	82.8	70-130		%Rec	100	9/19/2019 2:18:13 PM	A63060

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.
	D	Sample Diluted Due to Matrix
	H	Holding times for preparation or analysis exceeded
	ND	Not Detected at the Reporting Limit
	PQL	Practical Quantitative Limit
	S	% Recovery outside of range due to dilution or matrix

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1909754

Date Reported: 9/20/2019

CLIENT: Intera, Inc.

Client Sample ID: MW-20

Project: Cliff Patrol Yard

Collection Date: 9/12/2019 3:35:00 PM

Lab ID: 1909754-004

Matrix: AIR

Received Date: 9/13/2019 8:51:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8015D: GASOLINE RANGE							Analyst: NSB
Gasoline Range Organics (GRO)	43000	500		µg/L	100	9/17/2019 10:51:58 AM	G62992
Surr: BFB	138	53-256		%Rec	100	9/17/2019 10:51:58 AM	G62992
EPA METHOD 8260B: VOLATILES							Analyst: DJF
Benzene	30	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Toluene	37	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Ethylbenzene	91	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Methyl tert-butyl ether (MTBE)	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,2,4-Trimethylbenzene	38	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,3,5-Trimethylbenzene	24	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,2-Dichloroethane (EDC)	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,2-Dibromoethane (EDB)	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Naphthalene	ND	10		µg/L	50	9/19/2019 2:47:38 PM	A63060
1-Methylnaphthalene	ND	20		µg/L	50	9/19/2019 2:47:38 PM	A63060
2-Methylnaphthalene	ND	20		µg/L	50	9/19/2019 2:47:38 PM	A63060
Acetone	ND	50		µg/L	50	9/19/2019 2:47:38 PM	A63060
Bromobenzene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Bromodichloromethane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Bromoform	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Bromomethane	ND	10		µg/L	50	9/19/2019 2:47:38 PM	A63060
2-Butanone	ND	50		µg/L	50	9/19/2019 2:47:38 PM	A63060
Carbon disulfide	ND	50		µg/L	50	9/19/2019 2:47:38 PM	A63060
Carbon tetrachloride	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Chlorobenzene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Chloroethane	ND	10		µg/L	50	9/19/2019 2:47:38 PM	A63060
Chloroform	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Chloromethane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
2-Chlorotoluene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
4-Chlorotoluene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
cis-1,2-DCE	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
cis-1,3-Dichloropropene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,2-Dibromo-3-chloropropane	ND	10		µg/L	50	9/19/2019 2:47:38 PM	A63060
Dibromochloromethane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Dibromomethane	ND	10		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,2-Dichlorobenzene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,3-Dichlorobenzene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,4-Dichlorobenzene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Dichlorodifluoromethane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,1-Dichloroethane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,1-Dichloroethene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1909754

Date Reported: 9/20/2019

CLIENT: Intera, Inc.

Client Sample ID: MW-20

Project: Cliff Patrol Yard

Collection Date: 9/12/2019 3:35:00 PM

Lab ID: 1909754-004

Matrix: AIR

Received Date: 9/13/2019 8:51:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES							Analyst: DJF
1,2-Dichloropropane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,3-Dichloropropane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
2,2-Dichloropropane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,1-Dichloropropene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Hexachlorobutadiene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
2-Hexanone	ND	50		µg/L	50	9/19/2019 2:47:38 PM	A63060
Isopropylbenzene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
4-Isopropyltoluene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
4-Methyl-2-pentanone	ND	50		µg/L	50	9/19/2019 2:47:38 PM	A63060
Methylene chloride	ND	15		µg/L	50	9/19/2019 2:47:38 PM	A63060
n-Butylbenzene	ND	15		µg/L	50	9/19/2019 2:47:38 PM	A63060
n-Propylbenzene	11	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
sec-Butylbenzene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Styrene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
tert-Butylbenzene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,1,1,2-Tetrachloroethane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,1,2,2-Tetrachloroethane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Tetrachloroethene (PCE)	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
trans-1,2-DCE	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
trans-1,3-Dichloropropene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,2,3-Trichlorobenzene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,2,4-Trichlorobenzene	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,1,1-Trichloroethane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,1,2-Trichloroethane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Trichloroethene (TCE)	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Trichlorofluoromethane	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
1,2,3-Trichloropropane	ND	10		µg/L	50	9/19/2019 2:47:38 PM	A63060
Vinyl chloride	ND	5.0		µg/L	50	9/19/2019 2:47:38 PM	A63060
Xylenes, Total	420	7.5		µg/L	50	9/19/2019 2:47:38 PM	A63060
Surr: Dibromofluoromethane	93.7	53.9-127		%Rec	50	9/19/2019 2:47:38 PM	A63060
Surr: 1,2-Dichloroethane-d4	86.3	70-130		%Rec	50	9/19/2019 2:47:38 PM	A63060
Surr: Toluene-d8	108	70-130		%Rec	50	9/19/2019 2:47:38 PM	A63060
Surr: 4-Bromofluorobenzene	85.6	70-130		%Rec	50	9/19/2019 2:47:38 PM	A63060

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1909754

Date Reported: 9/20/2019

CLIENT: Intera, Inc.

Client Sample ID: MW-8

Project: Cliff Patrol Yard

Collection Date: 9/12/2019 5:00:00 PM

Lab ID: 1909754-005

Matrix: AIR

Received Date: 9/13/2019 8:51:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8015D: GASOLINE RANGE							Analyst: NSB
Gasoline Range Organics (GRO)	910	25		µg/L	5	9/17/2019 12:49:16 PM	G62992
Surr: BFB	145	53-256		%Rec	5	9/17/2019 12:49:16 PM	G62992
EPA METHOD 8260B: VOLATILES							Analyst: DJF
Benzene	0.44	0.25		µg/L	5	9/19/2019 3:17:05 PM	A63060
Toluene	0.95	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Ethylbenzene	6.1	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Methyl tert-butyl ether (MTBE)	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,2,4-Trimethylbenzene	4.3	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,3,5-Trimethylbenzene	2.3	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,2-Dichloroethane (EDC)	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,2-Dibromoethane (EDB)	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Naphthalene	ND	1.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
1-Methylnaphthalene	ND	2.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
2-Methylnaphthalene	ND	2.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
Acetone	ND	5.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
Bromobenzene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Bromodichloromethane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Bromoform	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Bromomethane	ND	1.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
2-Butanone	ND	5.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
Carbon disulfide	ND	5.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
Carbon tetrachloride	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Chlorobenzene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Chloroethane	ND	1.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
Chloroform	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Chloromethane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
2-Chlorotoluene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
4-Chlorotoluene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
cis-1,2-DCE	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
cis-1,3-Dichloropropene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,2-Dibromo-3-chloropropane	ND	1.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
Dibromochloromethane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Dibromomethane	ND	1.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,2-Dichlorobenzene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,3-Dichlorobenzene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,4-Dichlorobenzene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Dichlorodifluoromethane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,1-Dichloroethane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,1-Dichloroethene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

Analytical Report

Lab Order 1909754

Date Reported: 9/20/2019

CLIENT: Intera, Inc.

Client Sample ID: MW-8

Project: Cliff Patrol Yard

Collection Date: 9/12/2019 5:00:00 PM

Lab ID: 1909754-005

Matrix: AIR

Received Date: 9/13/2019 8:51:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES							Analyst: DJF
1,2-Dichloropropane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,3-Dichloropropane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
2,2-Dichloropropane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,1-Dichloropropene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Hexachlorobutadiene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
2-Hexanone	ND	5.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
Isopropylbenzene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
4-Isopropyltoluene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
4-Methyl-2-pentanone	ND	5.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
Methylene chloride	ND	1.5		µg/L	5	9/19/2019 3:17:05 PM	A63060
n-Butylbenzene	ND	1.5		µg/L	5	9/19/2019 3:17:05 PM	A63060
n-Propylbenzene	1.1	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
sec-Butylbenzene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Styrene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
tert-Butylbenzene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,1,1,2-Tetrachloroethane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,1,2,2-Tetrachloroethane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Tetrachloroethene (PCE)	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
trans-1,2-DCE	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
trans-1,3-Dichloropropene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,2,3-Trichlorobenzene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,2,4-Trichlorobenzene	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,1,1-Trichloroethane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,1,2-Trichloroethane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Trichloroethene (TCE)	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Trichlorofluoromethane	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
1,2,3-Trichloropropane	ND	1.0		µg/L	5	9/19/2019 3:17:05 PM	A63060
Vinyl chloride	ND	0.50		µg/L	5	9/19/2019 3:17:05 PM	A63060
Xylenes, Total	33	0.75		µg/L	5	9/19/2019 3:17:05 PM	A63060
Surr: Dibromofluoromethane	98.2	53.9-127		%Rec	5	9/19/2019 3:17:05 PM	A63060
Surr: 1,2-Dichloroethane-d4	104	70-130		%Rec	5	9/19/2019 3:17:05 PM	A63060
Surr: Toluene-d8	106	70-130		%Rec	5	9/19/2019 3:17:05 PM	A63060
Surr: 4-Bromofluorobenzene	88.5	70-130		%Rec	5	9/19/2019 3:17:05 PM	A63060

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	PQL	Practical Quantitative Limit	RL	Reporting Limit
	S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: 1909754

20-Sep-19

Client: Intera, Inc.
Project: Cliff Patrol Yard

Sample ID: 1909754-001ADUP	SampType: DUP	TestCode: EPA Method 8015D: Gasoline Range								
Client ID: SVE-101	Batch ID: G62992	RunNo: 62992								
Prep Date:	Analysis Date: 9/17/2019	SeqNo: 2147503			Units: µg/L					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	37000	500						3.17	20	
Surr: BFB	190000		200000		94.6	53	256	0	0	

Qualifiers:

- | | |
|---|---|
| * Value exceeds Maximum Contaminant Level. | B Analyte detected in the associated Method Blank |
| D Sample Diluted Due to Matrix | E Value above quantitation range |
| H Holding times for preparation or analysis exceeded | J Analyte detected below quantitation limits |
| ND Not Detected at the Reporting Limit | P Sample pH Not In Range |
| PQL Practical Quantitative Limit | RL Reporting Limit |
| S % Recovery outside of range due to dilution or matrix | |



Hall Environmental Analysis Laboratory
 4901 Hawkins NE
 Albuquerque, NM 87109
 TEL: 505-345-3975 FAX: 505-345-4107
 Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: INT

Work Order Number: 1909754

RcptNo: 1

Received By: Daniel Marquez 9/13/2019 8:51:00 AM

Completed By: Michelle Garcia 9/13/2019 5:09:02 PM

Reviewed By: *MB* *alida*

DM
Michelle Garcia

Chain of Custody

1. Is Chain of Custody complete? Yes No Not Present
2. How was the sample delivered? Client

Log In

3. Was an attempt made to cool the samples? Yes No NA
4. Were all samples received at a temperature of >0° C to 6.0°C Yes No NA
5. Sample(s) in proper container(s)? Yes No
6. Sufficient sample volume for indicated test(s)? Yes No
7. Are samples (except VOA and ONG) properly preserved? Yes No
8. Was preservative added to bottles? Yes No NA
9. VOA vials have zero headspace? Yes No No VOA Vials
10. Were any sample containers received broken? Yes No
11. Does paperwork match bottle labels? Yes No
 (Note discrepancies on chain of custody)
12. Are matrices correctly identified on Chain of Custody? Yes No
13. Is it clear what analyses were requested? Yes No
14. Were all holding times able to be met? Yes No
 (If no, notify customer for authorization.)

of preserved bottles checked for pH: _____
 (<2 or >12 unless noted)
 Adjusted? _____
 Checked by: *ENM 9/16/19*

Special Handling (if applicable)

15. Was client notified of all discrepancies with this order? Yes No NA

Person Notified:	_____	Date:	_____
By Whom:	_____	Via:	<input type="checkbox"/> eMail <input type="checkbox"/> Phone <input type="checkbox"/> Fax <input type="checkbox"/> In Person
Regarding:	_____		
Client Instructions:	_____		

16. Additional remarks:

17. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	NA	Good	Not Present			

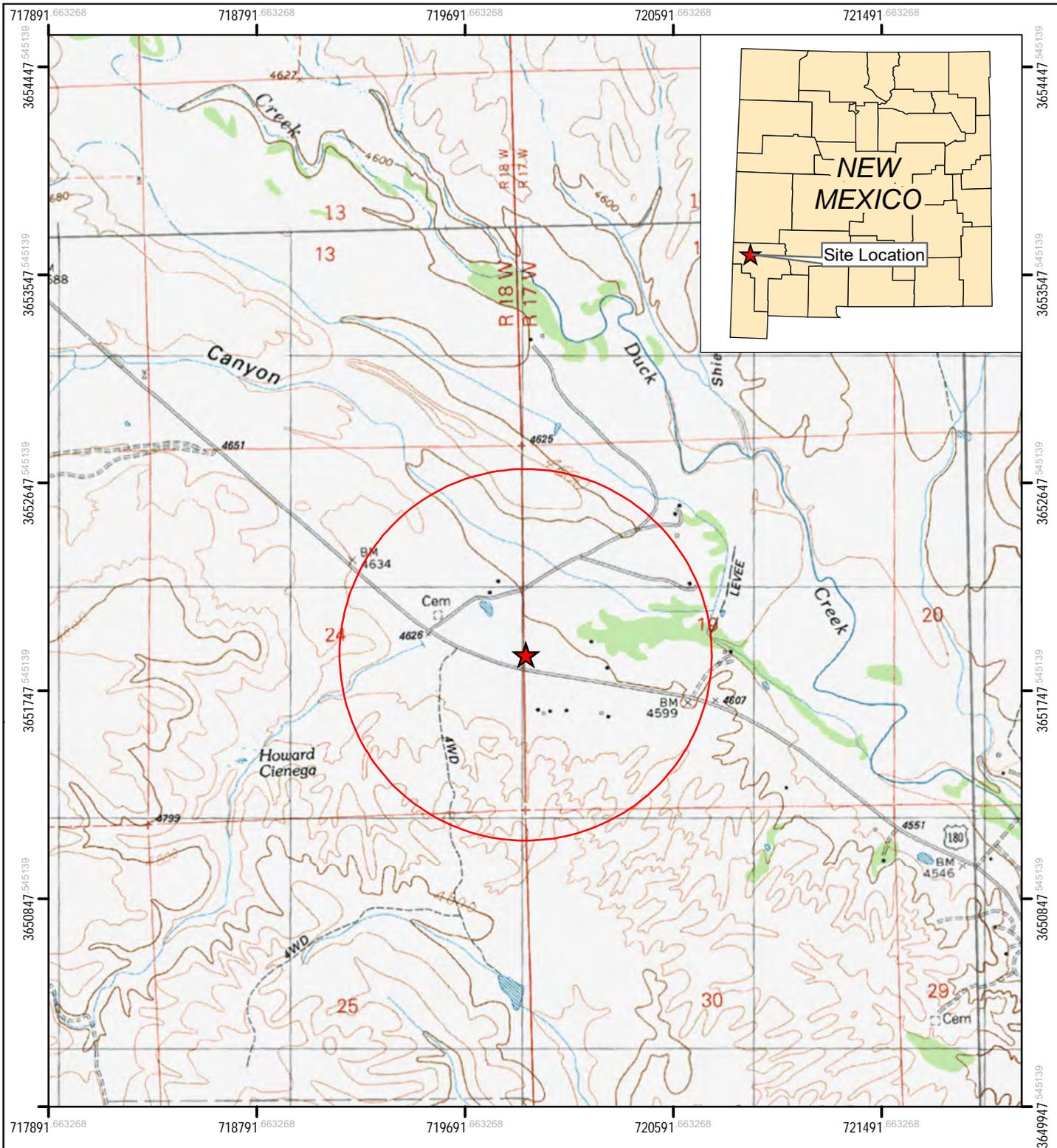
Section 8

Map(s)

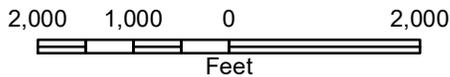
A map such as a 7.5 minute topographic quadrangle showing the exact location of the source. The map shall also include the following:

The UTM or Longitudinal coordinate system on both axes	An indicator showing which direction is north
A minimum radius around the plant of 0.8km (0.5 miles)	Access and haul roads
Topographic features of the area	Facility property boundaries
The name of the map	The area which will be restricted to public access
A graphical scale	

To save paper and to standardize the application format, delete this sentence, and begin your submittal for this attachment on this page.



USGS 7.5 Minute Topographic Map: Cliff Quadrangle & Antelope Ridge Quadrangle 1990, Canteen Canyon Quadrangle & Buckhorn Quadrangle 1965; Contour Interval 40 Feet



Sources:
Topo – USGS topo maps

Topographic Map
NMDOT Cliff Patrol Yard

Section 10

Written Description of the Routine Operations of the Facility

A written description of the routine operations of the facility. Include a description of how each piece of equipment will be operated, how controls will be used, and the fate of both the products and waste generated. For modifications and/or revisions, explain how the changes will affect the existing process. In a separate paragraph describe the major process bottlenecks that limit production. The purpose of this description is to provide sufficient information about plant operations for the permit writer to determine appropriate emission sources.

The SVE system will be operated for at least 12 months. The system startup will require daily site visits for the first two to three days of operation. Following the first week of operation, visits will be conducted weekly until the end of the first month of operation. Monthly visits will be conducted after the first month of operation.

The following O&M activities will be performed during vapor monitoring events:

- Vapor extraction flow rate.
- Valve positions.
- Well head vacuum at extraction and observation wells
- VOCs (PID) concentrations in extracted vapor.
- Fluid levels at adjacent monitoring wells.
- Fluid volume removed from the moisture separator.
- Barometric pressure (obtained from the closest weather station).
- Noise levels (phone application, or equivalent)
- Blower motor amperages
- Duration of equipment operation (motor run time)
- Hydrocarbon levels in ambient air downwind of the system
- Pressure difference prior to and after the particulate filter
- Condition of wells and equipment and changes to site traffic patterns and use
- Housekeeping requirements.

If needed, this facility will remain in operation longer than twelve months. O&M activities will continue as described for any operational time past twelve months.

Section 13

Determination of State & Federal Air Quality Regulations

This section lists each state and federal air quality regulation that may apply to your facility and/or equipment that are stationary sources of regulated air pollutants.

Not all state and federal air quality regulations are included in this list. Go to the Code of Federal Regulations (CFR) or to the Air Quality Bureau's regulation page to see the full set of air quality regulations.

Required Information for Specific Equipment:

For regulations that apply to specific source types, in the 'Justification' column **provide any information needed to determine if the regulation does or does not apply. For example**, to determine if emissions standards at 40 CFR 60, Subpart IIII apply to your three identical stationary engines, we need to know the construction date as defined in that regulation; the manufacturer date; the date of reconstruction or modification, if any; if they are or are not fire pump engines; if they are or are not emergency engines as defined in that regulation; their site ratings; and the cylinder displacement.

Required Information for Regulations that Apply to the Entire Facility:

See instructions in the 'Justification' column for the information that is needed to determine if an 'Entire Facility' type of regulation applies (e.g. 20.2.70 or 20.2.73 NMAC).

Regulatory Citations for Regulations That Do Not, but Could Apply:

If there is a state or federal air quality regulation that does not apply, but you have a piece of equipment in a source category for which a regulation has been promulgated, you must **provide the low level regulatory citation showing why your piece of equipment is not subject to or exempt from the regulation. For example** if you have a stationary internal combustion engine that is not subject to 40 CFR 63, Subpart ZZZZ because it is an existing 2 stroke lean burn stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions, your citation would be 40 CFR 63.6590(b)(3)(i). **We don't want a discussion of every non-applicable regulation, but if it is possible a regulation could apply, explain why it does not. For example**, if your facility is a power plant, you do not need to include a citation to show that 40 CFR 60, Subpart OOO does not apply to your non-existent rock crusher.

Regulatory Citations for Emission Standards:

For each unit that is subject to an emission standard in a source specific regulation, such as 40 CFR 60, Subpart OOO or 40 CFR 63, Subpart HH, include the low level regulatory citation of that emission standard. Emission standards can be numerical emission limits, work practice standards, or other requirements such as maintenance. **Here are examples:** a glycol dehydrator is subject to the general standards at 63.764C(1)(i) through (iii); an engine is subject to 63.6601, Tables 2a and 2b; a crusher is subject to 60.672(b), Table 3 and all transfer points are subject to 60.672(e)(1)

Federally Enforceable Conditions:

All federal regulations are federally enforceable. All Air Quality Bureau State regulations are federally enforceable except for the following: affirmative defense portions at 20.2.7.6.B, 20.2.7.110(B)(15), 20.2.7.11 through 20.2.7.113, 20.2.7.115, and 20.2.7.116; 20.2.37; 20.2.42; 20.2.43; 20.2.62; 20.2.63; 20.2.86; 20.2.89; and 20.2.90 NMAC. Federally enforceable means that EPA can enforce the regulation as well as the Air Quality Bureau and federally enforceable regulations can count toward determining a facility's potential to emit (PTE) for the Title V, PSD, and nonattainment permit regulations.

INCLUDE ANY OTHER INFORMATION NEEDED TO COMPLETE AN APPLICABILITY DETERMINATION OR THAT IS RELEVANT TO YOUR FACILITY'S NOTICE OF INTENT OR PERMIT.

EPA Applicability Determination Index for 40 CFR 60, 61, 63, etc: <http://cfpub.epa.gov/adi/>

To save paper and to standardize the application format, delete this sentence, and begin your submittal for this attachment on this page.

Example of a Table for STATE REGULATIONS:

STATE REGULATIONS CITATION	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION: (You may delete instructions or statements that do not apply in the justification column to shorten the document.)
20.2.1 NMAC	General Provisions	Yes	Facility	General Provisions apply to Notice of Intent, Construction, and Title V permit applications.
20.2.3 NMAC	Ambient Air Quality Standards NMAAQS	Yes	Facility	The facility will emit low concentrations of VOCs.
20.2.7 NMAC	Excess Emissions	No	Facility	NPR determination not a permit
20.2.23 NMAC	Fugitive Dust Control	No	Facility	The facility will not generate fugitive dust.
20.2.33 NMAC	Gas Burning Equipment - Nitrogen Dioxide	No	Facility	The facility does not have gas burning equipment.
20.2.34 NMAC	Oil Burning Equipment: NO ₂	No	Facility	The facility does not burn oil.
20.2.35 NMAC	Natural Gas Processing Plant – Sulfur	No	Facility	The facility does not process natural gas.
20.2.37 and 20.2.36 NMAC	Petroleum Processing Facilities and Petroleum Refineries	N/A	N/A	The facility does not process petroleum.
20.2.38 NMAC	Hydrocarbon Storage Facility	No	Facility	The facility does not store hydrocarbons.
20.2.39 NMAC	Sulfur Recovery Plant - Sulfur	No	Facility	The facility does not recover sulfur.
20.2.61.109 NMAC	Smoke & Visible Emissions	No	Facility	This facility will not have visible emissions.
20.2.70 NMAC	Operating Permits	No	Facility	Exempt under 20.2.70.202.B NMAC
20.2.71 NMAC	Operating Permit Fees	No	Facility	Exempt under 20.2.70.202.B NMAC
20.2.72 NMAC	Construction Permits	No	Facility	No permits necessary.
20.2.73 NMAC	NOI & Emissions Inventory Requirements	No	Facility	Emission rates are low enough that an NOI is not required.
20.2.74 NMAC	Permits – Prevention of Significant Deterioration (PSD)	No	Facility	<p>This facility is not a major PSD source as defined below.</p> <p>20.2.74.7.AG(1) A stationary source listed in Table 1 of this Part (20.2.74.501 NMAC) which emits, or has the potential to emit, emissions equal to or greater than one hundred (100) tons per year of any stack and fugitive emissions (as defined) of any regulated air pollutant; or</p> <p>20.2.74.7.AG(2) A stationary source not listed in Table 1 of this Part (20.2.74.501 NMAC) and which emits or has the potential to emit stack emissions of two hundred fifty (250) tons per year or more of any regulated pollutant; or</p> <p>20.2.74.7.AG(3) A physical change that would occur at a stationary source not otherwise qualifying under paragraphs (1) or (2) of subsection if the change would constitute a major stationary source by itself (e.g. an increase of 250 tpy or more); or</p> <p>20.2.74.300.D a source or modification that becomes a major stationary source or major modification solely due to a relaxation in any enforceable limitation established after August 7, 1980, on the capacity of the source or modification</p>

<u>STATE REGULATIONS CITATION</u>	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION: (You may delete instructions or statements that do not apply in the justification column to shorten the document.)
				otherwise to emit a pollutant, such as a restriction on hours of operation, then this part shall apply to the source or modification as through construction had not yet commenced. 20.2.74.200.7.AG(5) The fugitive emissions of a stationary source shall not be included in determining for any of the purposes of this section whether it is a major stationary source, unless the source belongs to one of the stationary source categories found in Table 1 of this Part (20.2.74.501 NMAC) or any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.
20.2.75 NMAC	Construction Permit Fees	No	Facility	No permits necessary.
20.2.77 NMAC	New Source Performance	No	Facility	Under the Clean Air Act, this facility is classified as an area source which is not regulated by EPA under 40 CFR Part 60.
20.2.78 NMAC	Emission Standards for HAPS	No	Facility	Under the Clean Air Act, this facility is classified as an area source which is not regulated by EPA under 40 CFR Part 61.
20.2.79 NMAC	Permits – Nonattainment Areas	No	Facility	This facility is a minor source and nonattainment area requirements do not apply.
20.2.80 NMAC	Stack Heights	No	Facility	This facility has one stack which will be at a height greater than 10 feet.
20.2.82 NMAC	MACT Standards for source categories of HAPS	No	Facility	Under the Clean Air Act, this facility is classified as an area source which is not regulated by EPA under 40 CFR Part 63.

Example of a Table for Applicable FEDERAL REGULATIONS (Note: This is not an exhaustive list):

<u>FEDERAL REGULATIONS CITATION</u>	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
40 CFR 50	NAAQS	No	Facility	This facility emits a small volume of low concentration VOCs and is not anticipated to impact ambient air.
NSPS 40 CFR 60, Subpart A	General Provisions	No	Facility	Under the Clean Air Act, this facility is classified as an area source which is not regulated by EPA under 40 CFR Part 60.
NSPS 40 CFR60.40a, Subpart Da	Subpart Da, Performance Standards for Electric Utility Steam Generating Units	No	Facility	This facility does not operate steam generating units.
NSPS 40 CFR60.40b Subpart Db	Electric Utility Steam Generating Units	No	Facility	This facility does not operate steam generating units.

<u>FEDERAL REGU- LATIONS CITATION</u>	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
40 CFR 60.40c, Subpart Dc	Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units	No	Facility	This facility does not operate steam generating units.
NSPS 40 CFR 60, Subpart Ka	Standards of Performance for Storage Vessels for Petroleum Liquids for which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and Prior to July 23, 1984	No	Facility	This facility does not have any storage vessels for petroleum liquids constructed, modified, or commenced between these dates.
NSPS 40 CFR 60, Subpart Kb	Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984	No	Facility	This facility does not have any storage vessels for volatile organic liquids.
NSPS 40 CFR 60.330 Subpart GG	Stationary Gas Turbines	No	Facility	This facility does not have any stationary gas turbines.
NSPS 40 CFR 60, Subpart KKK	Leaks of VOC from Onshore Gas Plants	No	Facility	This facility does not have any leaks of VOC from onshore gas plants.
NSPS 40 CFR Part 60 Subpart LLL	Standards of Performance for Onshore Natural Gas Processing: SO₂ Emissions	No	Facility	This facility is not an onshore natural gas processing plant.
NSPS 40 CFR Part 60 Subpart OOOO	Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution for which construction, modification or reconstruction commenced after August 23, 2011 and before	No	Facility	This facility is not involved in the production, transmission, and distribution of crude oil or natural gas.

<u>FEDERAL REGU- LATIONS CITATION</u>	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
	September 18, 2015			
NSPS 40 CFR Part 60 Subpart OOOa	Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After September 18, 2015	No	Facility	This facility is not involved in the production, transmission, and distribution of crude oil or natural gas.
NSPS 40 CFR 60 Subpart IIII	Standards of performance for Stationary Compression Ignition Internal Combustion Engines	No	Facility	This facility does operate an internal combustion engine.
NSPS 40 CFR Part 60 Subpart JJJJ	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines	No	Facility	This facility does operate an internal combustion engine.
NSPS 40 CFR 60 Subpart TTTT	Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units	No	Facility	This facility does operate electric generating units.
NSPS 40 CFR 60 Subpart UUUU	Emissions Guidelines for Greenhouse Gas Emissions and Compliance Times for Electric Utility Generating Units	No	Facility	This facility does operate electric generating units.
NSPS 40 CFR 60, Subparts WWW, XXX, Cc, and Cf	Standards of performance for Municipal Solid Waste (MSW) Landfills	No	Facility	This facility is not a landfill.
NESHAP 40 CFR 61 Subpart A	General Provisions		Units Subject to 40 CFR 61	Under the Clean Air Act, this facility is classified as an area source which is not regulated by EPA under 40 CFR Part 61.
NESHAP 40 CFR 61 Subpart E	National Emission Standards for Mercury	No	Facility	This facility does not emit mercury.
NESHAP 40 CFR 61 Subpart V	National Emission Standards for Equipment Leaks (Fugitive Emission Sources)	No	Facility	This facility does not have sources that are intended to operate in volatile hazardous air pollutant (VHAP) service: pumps, compressors, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, connectors, surge control vessels, bottoms receivers, and control devices or systems required by this subpart.

<u>FEDERAL REGU- LATIONS CITATION</u>	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
MACT 40 CFR 63, Subpart A	General Provisions	No	Facility	Under the Clean Air Act, this facility is classified as an area source which is not regulated by EPA under 40 CFR Part 63.
MACT 40 CFR 63.760 Subpart HH	Oil and Natural Gas Production Facilities	No	Facility	This facility is not an oil and natural gas production facility.
MACT 40 CFR 63 Subpart HHH		No	Facility	This facility is not a natural gas transmission or storage facility.
MACT 40 CFR 63 Subpart DDDDD	National Emission Standards for Hazardous Air Pollutants for Major Industrial, Commercial, and Institutional Boilers & Process Heaters	No	Facility	Under the Clean Air Act, this facility is classified as an area source which is not regulated by EPA under 40 CFR Part 63.
MACT 40 CFR 63 Subpart UUUUU	National Emission Standards for Hazardous Air Pollutants Coal & Oil Fire Electric Utility Steam Generating Unit	No	Facility	Under the Clean Air Act, this facility is classified as an area source which is not regulated by EPA under 40 CFR Part 63.
MACT 40 CFR 63 Subpart ZZZZ	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE MACT)	No	Facility	Under the Clean Air Act, this facility is classified as an area source which is not regulated by EPA under 40 CFR Part 63.
40 CFR 64	Compliance Assurance Monitoring	No	Facility	This facility is not a Title V major source.
40 CFR 68	Chemical Accident Prevention	No	Facility	This facility does not have more than a threshold quantity of a regulated substance in a process, as determined under §68.115,
Title IV – Acid Rain 40 CFR 72	Acid Rain	No	Facility	This facility does not generate commercial electric power or electric power for sale.
Title IV – Acid Rain 40 CFR 73	Sulfur Dioxide Allowance Emissions	No	Facility	This facility does not generate commercial electric power or electric power for sale.

<u>FEDERAL REGULATIONS CITATION</u>	Title	Applies? Enter Yes or No	Unit(s) or Facility	JUSTIFICATION:
Title IV-Acid Rain 40 CFR 75	Continuous Emissions Monitoring	No	Facility	This facility does not generate commercial electric power or electric power for sale.
Title IV – Acid Rain 40 CFR 76	Acid Rain Nitrogen Oxides Emission Reduction Program	No	Facility	This facility does not generate commercial electric power or electric power for sale.
Title VI – 40 CFR 82	Protection of Stratospheric Ozone	No	Facility	This facility does not produce, transform, destroy, service/maintain or dispose of any products or appliances as specified in 40 CFR 82..

Appendix G

Public Notice

July 21, 2020

Mr. Tim Noger
NMED Petroleum Storage Tank Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505

RE: Public Notice Affidavits, Final Remediation Plan, NMDOT Cliff Patrol Yard, Cliff, Grant County, New Mexico; Deliverable ID# 18786-1

Dear Mr. Noger,

On behalf of the New Mexico Department of Transportation (NMDOT), INTERA Incorporated (INTERA) is submitting the certified affidavits from the Silver City Daily Press public notices as part of the Final Remediation Plan for the NMDOT Cliff Patrol Yard. Please contact me at (603) 969-4070 / emarcillo@intera.com if you have any questions or require additional information.

Sincerely

INTERA Incorporated



Eileen Marcillo
Project Manager/Hydrologist

Enclosure

cc: Mr. Larry Kemp, NMDOT
Ms. Katherine MacNeil, NMED PSTB

Affidavit of Publication

STATE OF NEW MEXICO S S
COUNTY OF GRANT

Nickolas C. Seibel, being first duly sworn, on his oath says: That he is the publisher of the Silver City Daily Press and Independent, a newspaper published in the Town of Silver City, in the County of Grant and the State of New Mexico, and that said newspaper is now, and was at all times herein mentioned, a newspaper of general circulation.

That the advertisement, copy of which is hereto attached, was published in said hereinbefore mentioned newspaper once each and every week for 2 consecutive week(s), the first publication thereof having been made on 7/1/2020 and the last publication thereof having been made on 7/7/2020. That said newspaper was regularly printed, published and issued with said notice herein upon the following dates, to wit:

7/1/20	7/7/20
--------	--------

Nickolas C. Seibel
Nickolas C. Seibel
Subscribed and sworn to before me on this 10th day of July, 2020
Melanie K. Rogers
Notary



Affidavit of Publication

STATE OF NEW MEXICO S S
COUNTY OF GRANT

Nickolas C. Seibel, being first duly sworn, on his oath says: That he is the publisher of the Silver City Daily Press and Independent, a newspaper published in the Town of Silver City, in the County of Grant and the State of New Mexico, and that said newspaper is now, and was at all times herein mentioned, a newspaper of general circulation.

That the advertisement, copy of which is hereto attached, was published in said hereinbefore mentioned newspaper once each and every week for 2 consecutive week(s), the first publication thereof having been made on 7/1/2020 and the last publication thereof having been made on 7/7/2020. That said newspaper was regularly printed, published and issued with said notice herein upon the following dates, to wit:

7/1/20 7/7/20

Nickolas C. Seibel
Nickolas C. Seibel

Subscribed and sworn to before me on this 10th day of July, 2020.

Melanie K Rogers
Notary



AND INDEPENDENT

CLASSIFIED AD RATES:

Up to 25 words - \$3.85 per day or \$19.25 per week, plus 8 percent tax. 10c per word per day for each additional word over 25. Payment must be made before ad is published.

CLASSIFIED AD DEADLINE:

Noon the day before publication on Monday through Friday. The deadline for Monday is noon Friday. PLEASE CHECK YOUR CLASSIFIED AD THE FIRST DAY!

The Silver City Daily Press is not responsible for more than ONE INCORRECT DAY, OR OMISSION OF COPY FOR MORE THAN ONE DAY. Request for corrections must be made within 24 hours of the first publication day by calling 388-1576.

DISPLAY AD RATES & DEADLINES:

Display open rate is \$8.40 per column inch per day, plus tax. Payment must be made before ad is published. Display deadline is 2 p.m. the day before publication.

NO REFUNDS ON CLASSIFIED OR DISPLAY ADS OR SUBSCRIPTIONS.

PUBLISHER'S NOTICE:

All real estate advertised in this newspaper is subject to the Federal Fair Housing Act of 1968 which makes it illegal to advertise any preference, limitation, or discrimination based on race, color, religion, sex or national origin or intention to make any such preference, limitation or discrimination. This newspaper will not knowingly accept any advertising for real estate which is in violation of the law. Our readers are informed that all dwellings advertised in this newspaper are available on an equal opportunity basis.

AUTOS

BRYAN TRUCK & AUTO
Where **TOP \$\$\$ollar\$\$** is ALWAYS Paid For Your Used Vehicles and RV's
1405 N. Hudson St.
(575) 388-0280

COMMERCIAL FOR RENT

BAYARD SELF STORAGE
Winifred Street
Bayard, NM
CONTAINERS FOR RENT
Sizes: 8'x10' 8'x15' 8'x20'
Call (575) 313-0714.
J19(W,F)-9tp

RETAIL SPACE:
• Office Space for Rent, 900 square feet - \$450.00 per month. **First Month Rent Free.**
• Work Shop for Rent, 1,000 square feet - \$475 per month. With office and restroom.
Call 575-313-4703.
F21-tfnc

COMMERCIAL FOR SALE

EZY PAWN
Is For Sale.
Call for more information
575-534-7888.
J10-tfnc

FOR RENT

1 bedroom apartment downtown. Water paid - \$500.00 per month, \$500.00 deposit.
Call 575-590-0750.
Jy3-4tp

Two bedroom, 2 bath home in Santa Clara. Living room, dining room and kitchen. Large fenced yard - \$750.00 per month plus deposit.
Call 575-590-2607.
Jy3-5tp

HELP WANTED

FIRST DAY AD
~><~ Part-Time ~><~
MENTOR/COMPANION
To keep 23-year-old autistic young man active and engaged.
• 12 to 24 hours per week.
• Must be energetic,
• Kind,
• Available on some Saturdays,
• Have own transportation --
\$10.00 to \$17.00 per hour.
Call Charlotte 590-0946.
Jy7-5tp

~><~ NOW ~><~
Accepting Applications for:
SERVER
Please Apply in Person
~><~ NO Phone Calls ~><~
2340 Bosworth Drive
Jy3-17tc

HELP WANTED

Needed:
LINE COOKS
~><~ & ~><~
WAITRESSES
• Apply in Person •
At The
~><~PATIO RESTAURANT~><~
Downtown Hurley
••~><~•••••~><~•••••
Enjoy Our Newly Re-Opened Dining Room
Jy1-5tc

SERVICES

Evaporative/ Swamp Cooler SERVICE
~><~ Call James 519-2090 ~><~
J30(T,W,F)-6tp

No Dental Insurance?
Check Out The Membership Plans at:

ARTISTIC SMILES
Starting at \$400 a Year:
• Adults Save Over \$500.00,
• Children Under 13 Save Over \$750.00.
You Will Receive:
√ 2 Exams (x-ray Included),
√ 2 Emergency Visits (x-rays included), and
√ 2 Cleanings Per Year.
You'll Also Receive:
• 10% Off Basic and
• 15% Off Major Procedures.
~><~•••••~><~

Call Us at 575-597-3801
Come By Our Office at:
3801 N. Pinos Altos Road
Or Visit Us On-line at:
artistsmilesnm.com
To Schedule Your Appointment Today!
J29-24tp

JACK OF ALL TRADES
"No Job Too Big Or Too Small"
NEED AC SERVICE?
FREE ESTIMATE
Licensed Business
~><~•••••~><~
We Offer Senior Citizen & Military Discounts
575-590-8075
madride1214@gmail.com
J26-21tp

WESTERN MECHANICAL
Appliance Repairs by Western Mechanical
Call Jesus Polanco
575-388-3830
Mr27-tfnc

WANTED

~><~ **WANTED TO RENT** ~><~
One car garage space in downtown Silver City for car storage.
Call 313-9831.
J26-5tdh

ROOFING/ CONSTRUCTION

RIO BEND CONSTRUCTION
~><~ **GRANITE INSTALLED** ~><~
CALL US FOR ALL YOUR BUILDING NEEDS
575-534-7888.
F19-tfnc

ROOFING/ CONSTRUCTION

DJ'S Dumptruck & Backhoe, LLC
Concrete and Rock Breaking, Post Holes Punched, lot clearing, landscape setup, trenching, tree trimming, tree removal, wood chipper service, gravel and river rock, hauling, etc. FREE estimates.
~><~ Please call David ~><~
at 575-313-7504 or email davidjaquez3@gmail.com.
Jy19(T,F)Jy19,2020p

ROMO CONSTRUCTION
New construction, remodeling, concrete, masonry, plaster and stucco, roofing, manufactured home site prep and repairs. Call
575-519-9326 or 575-537-6307
ALONSO ROMO
Jy8-Jy10,2020

MASTERCRAFT METALS
Standing Seam Roofing.
Protect your largest investment with a lifetime roof guaranteed not to leak and a company that stands behind its work. Materials only or with installation. The Only Metal Roof Approved For Low Slope Applications.
Free Estimates - 575-388-8800.
www.mastercraftmetals.com
Ap23-tfnc

YARD SERVICES

ONE MAN & A TRUCK
Tree Trimming & Removal
Xeriscaping,
Hauling etc.
Major cleanup
"We do it...when we say We'll do it"
Silver City 590-3127

~><~ **Douglas Yard Service** ~><~
Remove or plant trees.
Plant flowers,
Weed eating,
Haul trash,
Trim hedges.
~><~•••••~><~
Call Mike at 575-654-5364.
J30-5tp

~><~ General ~><~
Yard Maintenance
Weed Eating,
Brush, Cactus, & Tree Removal
~><~ Property Cleanup. ~><~
Call James 519-2090
J30(T,W,F)-6tp

REMEMBER WHEN? If you can't, we can help.
Ask us how when you visit us on-line at:
airwayinstitutenm.com or
Call 575-597-3801
Jy6-4tp

Obituaries



CARREON: On June 29, 2020, God received his beloved daughter, Susana, into his arms and welcomed her into eternal life. "We are saddened by our loss but can rejoice in the promises of the Resurrection, and because she lived and was such an intimate and amazing part of our lives, her love, her kindness and her caring manner will be treasured forever." Susie was a true Christian and a servant of God, showing love to her family and to people from all walks of life. She graciously and generously shared her time, her talent, and her treasure. She was the silent strength, the prayerful warrior, and the soft light in the distance and up close that brought many to the Lord and blessed their achievements. Susie was born May 24, 1925, in Hanover, N.M., to Felipe and Pomposa Esparza. She was the youngest of eight children. Susie married Erasmio Carreon in 1948. Together,

OBITUARIES Page 10

Legal

NOTICE OF SUBMISSION OF FINAL REMEDIATION PLAN
Date of Notice:
July 1, 2020 and July 7, 2020

Notice is hereby given by INTERA Incorporated (INTERA) of the planned submission of a Final Remediation Plan (FRP) on July 2, 2020, as follows:
1. The FRP proposes remediation of petroleum in the subsurface (soil and groundwater) caused by a release of petroleum products.
2. The petroleum release occurred at the New Mexico Department of Transportation (NMDOT) Cliff Patrol Yard located at 8157 Hwy 180, Cliff, Grant County, New Mexico. The remediation equipment will be located at this property.
3. The FRP proposes installing a small-scale soil vapor extraction (SVE) system to remove petroleum contamination. The soil vapor extracted by the SVE system will be discharged to the atmosphere.
4. A copy of the FRP can be viewed by interested parties at the following website: <https://tinyurl.com/y9bhbnpw>
5. Public comments on the plan must be delivered by mail or e-mail no later than July 28, 2020 (21 days from the second notice date) to the PSTB Project Manager, Mr. Tim Noger (contact information listed below). Comments may also be submitted to the Secretary of the Environment Department. Please include the name of the site "NMDOT Cliff Patrol Yard, Cliff, New Mexico" with comments.
Tim Noger
Project Manager
NMED/Petroleum Storage Tank Bureau
Remedial Action Program
2905 Rodeo Park Drive East, Bldg. 1
Santa Fe, NM 87505
Email: tim.noger@state.nm.us
Jy1,7

Legal

AVISO DE PRESENTACIÓN DEL PLAN FINAL DE REMEDIACIÓN
Fecha de aviso:
Julio 1, 2020 and Julio 7, 2020 (segunda fecha de aviso)

Por este medio, INTERA INCORPORATED (INTERA) notifica la presentación previa de un Plan de Remediación Final (FRP) para el próximo 2 de julio de 2020, de la siguiente manera:
1. El FRP propone la remediación del petróleo encontrado en el subsuelo (suelo y agua subterránea) causado por la liberación de productos derivados del petróleo.
2. La liberación de petróleo ocurrió en el Cliff Patrol Yard del Departamento de Transporte de Nuevo México (NMDOT) ubicado en 8157 Hwy 180, Cliff, Condado de Grant, Nuevo México. El equipo de remediación estará ubicado dentro de esta propiedad.
3. El FRP propone instalar un sistema de extracción de vapor de suelo (SVE) a pequeña escala para eliminar la contaminación por petróleo. El vapor del suelo extraído por el sistema SVE se descargará a la atmósfera.
4. Las partes interesadas pueden ver una copia del FRP en el siguiente sitio web: <https://tinyurl.com/y9bhbnpw>
5. Los comentarios públicos sobre el plan deben enviarse por correo o correo electrónico a más tardar el julio 28, 2020 (21 días a partir de la segunda fecha de notificación) al Gerente de Proyecto PSTB, Sr. Tim Noger (la información de contacto se detalla a continuación). También se pueden enviar comentarios al Secretario del Departamento de Medio Ambiente. Incluya el nombre del sitio "NMDOT Cliff Patrol Yard, Cliff, New Mexico" con comentarios.
Tim Noger
Project Manager
NMED/Petroleum Storage Tank Bureau
Remedial Action Program
2905 Rodeo Park Drive East, Bldg. 1
Santa Fe, NM 87505
Email: tim.noger@state.nm.us
Jy1,7

Legal

STATE ENGINEER OFFICE NOTICE is hereby given that on June 09, 2020, Stephen J. and Sherea D. Richins, PO Box 437 Cliff, NM 88028, and Miguel A. and Teresa Apodaca, PO Box 374 Gila, NM 88038 filed with the **STATE ENGINEER** Application No. SD-00247-57 for Permit to Change Point of Diversion and Place of Use within the Gila-San Francisco Underground Water Basin of the State of New Mexico.

Grant is the County affected by the diversion and in which the water has been or will be put to beneficial use. This notice is ordered to be published in the Silver City Daily Press. The applicants are requesting to change point of diversion and place of use previously permitted under SD-00247-57 approved January 13, 2016 by discontinuing the irrigation of 2.0 acres of land located in Pt. NE 1/4 and Pt. SE 1/4 of Section 27, Township 15 South, Range 17 West, N.M.P.M., diverted from Fort West Ditch point of diversion SD-00247 located in SW 1/4 SW 1/4 SW 1/4 of Section 6, Township 15 South, Range

16 West, N.M.P.M., and commence the use of Fort West Ditch SD-00247 located as described above and existing wells GSF-00916, drilled to a depth of 120 feet located in the SW 1/4 SW 1/4 NW 1/4 of Section 26, Township 15 South, Range 17 West, N.M.P.M., at latitude 32°58'14.43"N, longitude 108°34'31.082"W, and GSF-00916-POD2, drilled to a depth of 60 feet and constructed with 6 inch casing, located in the SW 1/4 SW 1/4 NW 1/4 of Section 26, Township 15 South, Range 17 West, N.M.P.M., at latitude 32°58'11.8"N, longitude 108°34'33.2"W for an amount of water not to exceed twenty-nine (29.0) acre-feet per acre delivered at the farm headgate or at the well as the case may be in any period of ten (10) consecutive years and not to exceed three and four-tenths (3.4) acre-feet per acre delivered at the farm headgate or at the well as the case may be in any one (1) year for irrigation purposes on 2.0 acres of land with an average yearly diversion of 5.80 acre-feet located in Pt. SW 1/4 NW 1/4 of Section 26, Town-

ship 15 South, Range 17 West, N.M.P.M.

The property described in this application is located south of the intersection of Turkey Creek Road (NM 153) and Lee Road near Gila, New Mexico in Grant County.

To view the application and supporting documentation contact the State Engineer District Office to arrange a date and time for an appointment located at District 3 Office, 321 W. Spruce St., Deming, NM 88030.

Any person, firm or corporation or other entity asserting standing to file objections or protests shall do so in writing (objection must be legible, signed, and include the writer's complete name, phone number, email address, and mailing address). If the protest does not include the complete name, phone number, email address, and mailing address, it may be deemed invalid and not accepted for filing unless Protester provides with the protest an affidavit stating that it does not have one of the above-listed elements/requirements (phone number, mailing address, email address, etc.). The objection to the approval of the application must be based on: (1) Detriment; if detriment, you must specifically identify your water rights; and/or (2) Public Welfare/Conservation of Water; if public welfare or conservation of water within the state of New

Mexico, you shall be required to provide evidence showing how you will be substantially and specifically affected. The written protest must be filed, in triplicate, with the State Engineer, 321 W. Spruce St., Deming, NM 88030, phone number 575-546-2851, on or before August 28, 2020. Facsimiles (faxes) will be accepted as a valid protest if the hard copy is hand-delivered or mailed and postmarked within 24-hours of the facsimile. Mailing postmark will be used to validate the 24-hour period. Protests can be faxed to the Office of the State Engineer, 575-546-2290. If no valid protest or objection is filed, the State Engineer will evaluate the application in accordance with the provisions of Chapter 72 NMSA 1978.

Legal

The regular meeting of the Cobre Board of Education will be held on Monday, July 6, 2020 at 5:00 p.m. via YouTube Live Stream. For public viewing please call 1-860-420-2293 PIN 137794775#. All public questions or concerns please email to: support@cobre.k12.nm.us Agendas are available at the Cobre Administration Office or may be viewed at www.cobre.k12.nm.us.

Obituaries



ESPINOSA: Gloria Esther Espinosa passed away May 27, 2020, in Tucson, Ariz., at the age of 71. Gloria was "born in space" in Santa Rita, N.M., to Dionisio and Consuelo Gomez Espinosa in 1949. She was proud of her ties to Santa Rita and Grant County, where so many memories were made. Gloria was an avid country music fan, with Loretta Lynn being her favorite. She loved card games and it was not unusual to see Gloria with a deck of cards, ready to win. Gloria is survived by many family members; her brothers, Dionisio Jr. (Norma), Raul (Melisha), and Ramiro Espinosa; her sisters, Delia Correa (Rudy), Lilia Adame (Rudy), Rosalinda Silva (Gilbert), Elvia Lambe, Elma Fernandez (Rudy), and Bonnie Espinosa; along with many nieces, nephews, and other family. "Many wonderful memories will carry us through this difficult time and we are comforted knowing she is finally healthy for eternity."

WOODWARD: Robert Woodward Jr., born Sept. 16, 1956, and originally from Champaign, Ill., passed away June 8, 2020. He is survived by his mother, Rosemary Woodward; his aunt, Joanne Jackson; brothers, Rusty and Lucas Woodward; sister, Samantha Mitchell; several nieces and nephews; several aunts; special nephews, Nicholas Woodward, Joshua Woodward, Mike Deloff and RJ Orrantia; as well as his sister, Nicole Smith. He was preceded in death by his father, Robert Woodward Sr. He moved to New Mexico in 1990 and worked 21 years with the maintenance and custodial department at Western New Mexico University. Robert took great pride in looking after the animals he raised. He took particularly to history during his life as well as collecting newspapers. Cremation has taken place under the direction of **Bright Funeral Home**, "A Loving and Caring Place to Celebrate, Honor, and Remember a Life Lived." 210 W. College Ave., Silver City. Phone 575-388-1911. In lieu of flowers, contributions may be made to Bright Funeral Home. Remembrances can be made at www.brightfuneral.net.

CARREON: Susie Carreon, 95, of Bayard, entered eternal rest Monday, June 29, 2020, at Fort Bayard Medical Center.

WOODWARD: Robert Woodward Jr., born Sept. 16, 1956, and originally from Champaign, Ill., passed away June 8, 2020. He is survived by his mother, Rosemary Woodward; his aunt, Joanne Jackson; brothers, Rusty and Lucas Woodward; sister, Samantha Mitchell; several nieces and nephews; several aunts; special nephews, Nicholas Woodward, Joshua Woodward, Mike Deloff and RJ Orrantia; as well as his sister, Nicole Smith. He was preceded in death by his father, Robert Woodward Sr. He moved to New Mexico in 1990 and worked 21 years with the maintenance and custodial department at Western New Mexico University. Robert took great pride in looking after the animals he raised. He took particularly to history during his life as well as collecting newspapers. Cremation has taken place under the direction of **Bright Funeral Home**, "A Loving and Caring Place to Celebrate, Honor, and Remember a Life Lived." 210 W. College Ave., Silver City. Phone 575-388-1911. In lieu of flowers, contributions may be made to Bright Funeral Home. Remembrances can be made at www.brightfuneral.net.

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OBITUARIES Page 10

Legal

STATE OF NEW MEXICO
COUNTY OF GRANT
SIXTH JUDICIAL DISTRICT

No. D-608-CV-2020-00120
JPMORGAN CHASE BANK, NATIONAL ASSOCIATION,
Plaintiff,
vs.

CHARRY R. IVANS; ROBERT W. HORNBECK; if living, if deceased, THE ESTATE OF ROBERT W. HORNBECK, Deceased; BETTY R. HORNBECK, if living, if deceased, THE ESTATE OF BETTY R. HORNBECK, Deceased; JOANNE CHINTIS, TAXATION AND REVENUE DEPARTMENT OF THE STATE OF NEW MEXICO, THE UNKNOWN HEIRS, DEVEISEES OR LEGATEES OF ROBERT W. HORNBECK, Deceased, and THE UNKNOWN HEIRS, DEVEISEES OR LEGATEES OF BETTY R. HORNBECK, Deceased,

NOTICE OF PENDENCY OF SUIT
TO: Defendant(s) Robert W. Hornbeck, if living, if deceased, the Estate of Robert W. Hornbeck, Deceased, Betty R. Hornbeck, if living, if deceased, the Estate of Betty R. Hornbeck, Deceased, the Unknown Heirs, Devises or Legatees of Robert W. Hornbeck, Deceased, and the Unknown Heirs, Devises or Legatees of Betty R. Hornbeck, Deceased

You are hereby notified that the above-named Plaintiff has filed a civil action against you in the above-entitled Court and cause, the general object thereof being to foreclose a mortgage on property located at 22 Willow Flat Road, in the City of Silver City, New Mexico, more particularly described as:

A tract of land, being part of Lots 19 and 20 of Offutt Estates Subdivision, Grant County, New Mexico, being described more particularly as follows:

Beginning at Corner No. 1, which is identical with the Northeast Corner of Lot 20; Thence S 89°57'08"W, 221.93 ft. to Corner No. 2; Thence S. 0°00'00" E., 517.75 ft. to Corner No. 3; thence S. 90°00'00" E., 197.27 ft to Corner No. 4; Thence N. 1°07'32"E., 138.45 ft. to Corner No. 5; Thence Northwesterly along a 50.00 ft radius Cul-de-sac for 151.25 ft., (Chord=N.16°29'37"W, 99.83 ft.) to Corner No. 6; Thence Northwesterly along a 20.00 ft radius curve to the left for 16.62 ft., (Chord=N.54°55'32"E., 16.15 ft.) to Corner No. 7; Thence N. 7°54'29"E., 277.27 ft. to point and place of beginning.

Which property may also be described as:
Lot 20 Offutt Estates Subdivision as shown on the amended plat of Lots 19 and 20 filed in the Office of the Grant County Clerk Silver City, New Mexico on July 17, 1996 in Book 7 of Plats Page 153,

and all improvements, including, but not limited to, the manufactured home attached thereto and more particularly described as a 1999 Redman, VIN No. 12328163.

That unless you respond to the First Amended Complaint within 30 days of completion of publication of this Notice, judgment by default will be entered against you.

Name, address, and phone number of Plaintiff's attorney: Tiffany & Bosco, P.A., PO Box 3509, Albuquerque, NM 87190-3509, (505) 248-2400 FAX: 505-254-4722.

WITNESS the Honorable JIM FOY, District Judge of the Sixth Judicial District Court of the State of New Mexico, and the Seal of the District Court of Grant County, this 26th day of June, 2020.
MICHAEL M. MEDINA
CLERK OF THE DISTRICT COURT
By Michael M. Medina
(SEAL) Deputy

Jy1,8,15

Legal

NOTICE OF SUBMISSION OF FINAL REMEDIATION PLAN

Date of Notice:
July 1, 2020 and July 7, 2020

Notice is hereby given by INTERA Incorporated (INTERA) of the planned submission of a Final Remediation Plan (FRP) on July 2, 2020, as follows:

1. The FRP proposes remediation of petroleum in the subsurface (soil and groundwater) caused by a release of petroleum products.
2. The petroleum release occurred at the New Mexico Department of Transportation (NMDOT) Cliff Patrol Yard located at 8157 Hwy 180, Cliff, Grant County, New Mexico. The remediation equipment will be located at this property.
3. The FRP proposes installing a small-scale soil vapor extraction (SVE) system to remove petroleum contamination. The soil vapor extracted by the

SVE system will be discharged to the atmosphere.

4. A copy of the FRP can be viewed by interested parties at the following website: <https://tinyurl.com/y9bhbnpw>

5. Public comments on the plan must be delivered by mail or e-mail no later than July 28, 2020 (21 days from the second notice date) to the PSTB Project Manager, Mr. Tim Noger (contact information listed below). Comments may also be submitted to the Secretary of the Environment Department. Please include the name of the site "NMDOT Cliff Patrol Yard, Cliff, New Mexico" with comments.

Tim Noger
Project Manager
NMED/Petroleum Storage Tank Bureau
Remedial Action Program
2905 Rodeo Park Drive East, Bldg. 1
Santa Fe, NM 87505
Email: tim.noger@state.nm.us
Jy1,7

Legal

AVISO DE PRESENTACION DEL PLAN FINAL DE REMEDIACION

Fecha de aviso:
Julio 1, 2020 and Julio 7, 2020
(segunda fecha de aviso)

Por este medio, INTERA INCORPORATED (INTERA) notifica la presentación previa de un Plan de Remediación Final (FRP) para el próximo 2 de julio de 2020, de la siguiente manera:

1. El FRP propone la remediación del petróleo encontrado en el subsuelo (suelo y agua subterránea) causado por la liberación de productos derivados del petróleo.
2. La liberación de petróleo ocurrió en el Cliff Patrol Yard del Departamento de Transporte de Nuevo México (NMDOT) ubicado en 8157 Hwy 180, Cliff, Condado de Grant, Nuevo México. El equipo de remediación estará ubicado dentro de esta propiedad.
3. El FRP propone instalar un sistema de extracción de vapor de suelo (SVE) a pequeña escala para eliminar la contaminación

por petróleo. El vapor del suelo extraído por el sistema SVE se descargará a la atmósfera.

4. Las partes interesadas pueden ver una copia del FRP en el siguiente sitio web: <https://tinyurl.com/y9bhbnpw>

5. Los comentarios públicos sobre el plan deben enviarse por correo o correo electrónico a más tardar el julio 28, 2020 (21 días a partir de la segunda fecha de notificación) al Gerente de Proyecto PSTB, Sr. Tim Noger (la información de contacto se detalla a continuación). También se pueden enviar comentarios al Secretario del Departamento de Medio Ambiente. Incluya el nombre del sitio "NMDOT Cliff Patrol Yard, Cliff, New Mexico" con comentarios.

Tim Noger
Project Manager
NMED/Petroleum Storage Tank Bureau
Remedial Action Program
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Santa Fe, NM 87505
Email: tim.noger@state.nm.us

**AVISO DE PRESENTACIÓN
DEL PLAN FINAL DE REMEDIACIÓN**

Fecha de aviso:

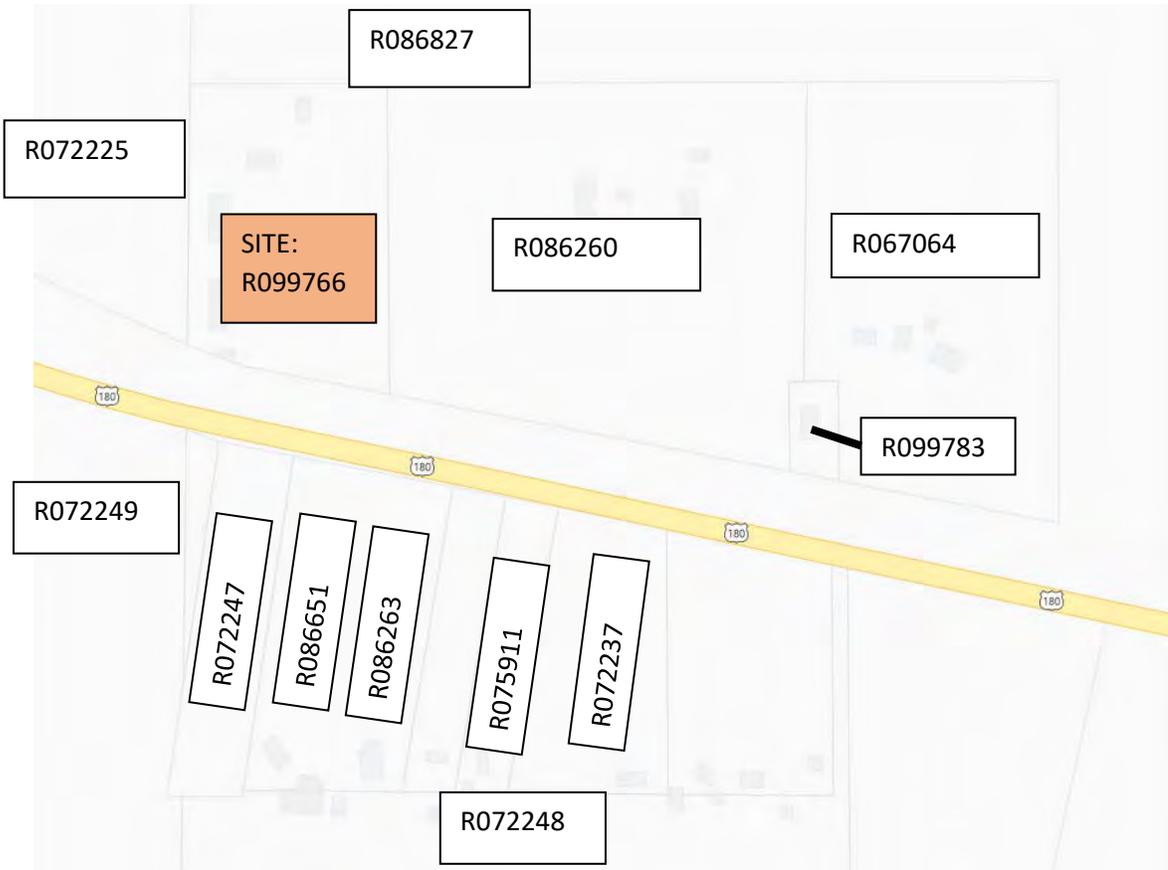
Julio 1, 2020 and Julio 7, 2020 (segunda fecha de aviso)

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Adjacent Property Owners
Final Remediation Plan, Public Notice



Account #	Property Code	Owner Name	Mailing Address
R075911	RESIDENTIAL IMPROVED	BARNWELL MICHAEL L BARNWELL PATRICIA O	PO BOX 245, Gila NM 88038
R099783	RESIDENTIAL IMPROVED	DAVIS SCOTT & DAVIS HARA	PO BOX 433, Cliff, NM 88028
R067064	RESIDENTIAL IMPROVED/NON-RESIDENTIAL MISC	DAVIS SCOTT & DAVIS HARA	PO BOX 433, Cliff, NM 88028
R072248	NON-RESIDENTIAL MISC	DINWIDDIE SPURR CATTLEWORKS LLC	PO BOX 149, Cliff, NM 88028
R086651	RESIDENTIAL IMPROVED	FEELEY PATRICK S FEELEY EDNA B	PO Box 126, Cliff, NM 88028
R072247	NON-RESIDENTIAL MISC	FEELEY PATRICK S FEELEY EDNA B	PO Box 126, Cliff, NM 88028
R086260	AGRICULTURAL/RESIDENTIAL IMPROVED/NON-RESIDENTIAL MISC	GEARHART LE MAR II	PO Box 292, Gila, NM 88038
R072237	RESIDENTIAL IMPROVED/NON-RESIDENTIAL MISC	GEREN JAMIE LEE	PO BOX 298, Cliff, NM 88028
R086263	RESIDENTIAL IMPROVED	GIERHART JULIA F	PO BOX 311, Cliff, NM 88028
R086827	LAND-GRZ	FREEMAN RAYMOND H	PO BOX 120, GLENWOOD, NM 88039
R072225	LAND-GRZ	D-CROSS RANCH LLC	PO BOX 121 CLIFF, NM 88028
R072249	LAND-NR-MISC	DINWIDDIE SPURR CATTLEWORKS LLC	PO BOX 149, Cliff, NM 88028

AVISO DE PRESENTACIÓN
DEL PLAN FINAL DE REMEDIACIÓN

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Email: tim.noger@state.nm.us

Appendix H

Implementation Schedule

APPENDIX E Implementation Schedule

ID	Task Name	Duration	Start	Finish	7/20	8/20	9/20	10/20	11/20	12/20	1/21	2/21	3/21	4/21	5/21	6/21	7/21	8/21	9/21	10/21	11/21	12/21	1/22
1	First Public Notice	0 days	Thu 7/9/20	Thu 7/9/20	◆ 7/9																		
2	Final FRP Submittal	0 days	Mon 7/13/20	Mon 7/13/20	◆ 7/13																		
3	Second Public Notice	21 days	Tue 7/14/20	Mon 8/3/20	■																		
4	Receive PSTB and Public Comments	0 days	Wed 8/12/20	Wed 8/12/20		◆ 8/12																	
5	Address PSTB and Public Comments	14 days	Wed 8/12/20	Tue 8/25/20		■																	
6	FRP Approval	8 days	Wed 8/26/20	Wed 9/2/20			■																
7	Work Plan for FRP Implementation	15 days	Wed 9/2/20	Wed 9/16/20			■																
8	Work Plan Approval	31 days	Wed 9/16/20	Fri 10/16/20				■															
9	Equipment Procurement	32 days	Fri 10/16/20	Mon 11/16/20				■															
10	Equipment Installation and Startup	8 days	Mon 11/16/20	Mon 11/23/20					■														
11	Weekly Visits 11/30/21 to 12/14/21	14 days	Mon 11/30/20	Mon 12/14/20						◆◆◆													
15	Biweekly Visits 12/28/20 to 1/11/21	14 days	Mon 12/28/20	Mon 1/11/21							◆	◆											
18	Monthly Site Visits 2/2021 to 1/2022	334 days	Thu 2/11/21	Tue 1/11/22									◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

Appendix I

HASP

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Monitoring Well Installation and Groundwater Monitoring

**NMDOT Cliff Patrol Yard, NMED Facility # 29647;
Release ID # 1869**

Cliff, Grant County, New Mexico

Prepared for:  **New Mexico** DEPARTMENT OF
TRANSPORTATION
MOBILITY FOR EVERYONE

New Mexico Department of Transportation
Environmental Geology Section
1120 Cerrillos Road
Room 201
Santa Fe, NM 87504

Prepared by: E.J. Anderson



6000 Uptown Boulevard NE, Suite 220
Albuquerque, New Mexico 87110

January 2016

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EMERGENCY CONTACTS & PROCEDURES

Emergency Contacts List
Hospital Route Map
Written Directions to Hospital
Site Emergency Response Plan

LIST OF FIGURES

Figure 1	Site Location Map
Figure 2	Site Plan

LIST OF FORMS

Form 1	Site Personnel Acknowledgement Form
Form 2	Safety Meeting Attendance Forms
Form 3	Job Safety Analysis Forms
Form 4	Behavior Based Safety Encounter Form
Form 5	Incident Investigation Report Form
Form 6	Site Visitor Log
Form 7	Vehicle Inspection Checklist
Form 8	Hot Work Permit

LIST OF ATTACHMENTS

Attachment A	Job Safety Analyses Program
Attachment B	Behavior Based Safety Program
Attachment C	Heat and Cold Stress Casualty Prevention Program
Attachment D	Health and Safety Requirements for Drilling Operations
Attachment E	Health and Safety Requirements for Heavy and Light Equipment
Attachment F	HazCom Program and Chemical Safety Data Sheets
Attachment G	Respiratory Protection Program
Attachment H	Confined Space Program

ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
AST	aboveground storage tank
ASVE	air sparging/soil vapor extraction
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylene
CFR	Code of Federal Regulations
CGI	combustible gas indicator
COPC	contaminant of potential concern
CPR	cardiopulmonary resuscitation
EDB	1,2-dibromoethane
EDC	1,2-dichloroethane
EPA	Environmental Protection Agency
eV	electron volt
ft	feet
HazCom	Hazard Communication
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSO	Health and Safety Officer
INTERA	INTERA Incorporated
IDLH	immediately dangerous to life or health
JSA	Job Safety Analysis
LEL	lower explosive limit
LFG	landfill gas
MSDS	Material Safety Data Sheet
MTBE	methyl tert-butyl ether
NIOSH	National Institute for Occupational Safety and Health
NMWQCC	New Mexico Water Quality Control Commission
OSHA	Occupational Safety and Health Administration
P.E.	Professional Engineer
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
SCBA	self-contained breathing apparatus
SDS	safety data sheet
Site	Franks Conoco
SOW	scope of work
SSHASP	Site-Specific Health and Safety Plan
SSO	Site Safety Officer
TWA	time weighted average
UST	underground storage tank
VOCs	volatile organic compounds

**New Mexico Environment Department
Petroleum Storage Tank Bureau
Monitoring Well Installation and Groundwater Monitoring;
NMDOT Cliff Patrol Yard
(Facility # 29647; Release ID # 1869)**

SITE-SPECIFIC HEALTH AND SAFETY PLAN

INTERA Incorporated's (INTERA) Site-Specific Health and Safety Plan (SSHASP) is a dynamic document that is subject to change during the performance of the INTERA scope of work (SOW) designed for the Monitoring Well Installation and Groundwater Monitoring/NMDOT Cliff Patrol Yard (Facility # 29647; Release ID # 1869) (Site) located near Cliff, NM. (**Figure 1**). The purpose of this SSHASP is to protect personnel involved in the ongoing activities at the Site. All INTERA personnel and INTERA subcontractor personnel involved in activities at the Site must review this SSHASP and sign the Personnel Acknowledgment Form (**Form 1**) prior to beginning work at the Site.

Project Manager	Eileen Marcillo – INTERA	505) 428-0066
Site Safety Officer (SSO)	Lee Dalton – INTERA	(505) 246-1600, ext. 1213
Field Sampler(s)	Lee Dalton – INTERA E.J. Anderson- INTERA	(505) 246-1600, ext. 1213 (505) 246-1600, ext. 1215
INTERA Corporate Health and Safety Officer (HSO)	Amy Andrews, P.E. – INTERA	(505) 246-1600, ext. 1243
Client Project Manager	Jim Mullany - NMDOT	(505) 827-5512
PSTB Project Manager	Tim Noger – PSTB	(505) 476-6034

SSHASP Prepared By Matt Sophy, INTERA in accordance with applicable provisions of the Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120.

SSHASP Reviewed By: Amy Andrews, INTERA

INTERA Project No.: NMGSD.M002.CPY

1.0 SITE LOCATION AND DESCRIPTION

Site Address: 8157 US-180 Cliff, NM. (**Figure 1**)

General Location and Site Description:

The NMDOT Cliff Patrol Yard (PY) is located approximately 2.5 miles northwest of Cliff off of US Highway-180 (**Figure 2**). The Site is square shaped, fully fenced, and covers approximately 4.5 acres. Access to the Site is from the south from US-180. Entrance into the Site is obtained solely through a gate located on the northwest boundary of the Site.

Land around the site is a mixture of undeveloped vacant land and residential (**Figure 2**).

Site Access Description:

- Access to the Site is from the driveway off of US-180. The Site is an active NMDOT Patrol Yard (**Figure 2**).

Contaminants of potential concern (COPS) list:

- Petroleum Hydrocarbons:
 - Benzene, Ethylbenzene, Total Xylenes, naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene

General Site Hazards:

- On-Site contamination
- Traffic throughout the Site
- Physical hazards (See Table 4-1)

In the event of an emergency – the muster point is the south side of US-180 across the street from the PY. The **Emergency Contacts List**, **Site Emergency Response Plan** and **Hospital Route Map** are located in the **Emergency Contacts & Procedures Tab**.

1.1 SITE HISTORY

Unleaded gasoline and diesel fuels were stored in 2-1,000 gallon underground storage tanks (USTs) and dispensed by underground distribution lines and a pump island until April 1989 (**Figure 2**). In April 1989, the dispensers, USTs, and lines were removed after the system failed tightness testing. Soils impacted with petroleum hydrocarbons were detected beneath the former USTs and dispenser islands. Groundwater beneath the facility was also found to be impacted. The dissolved-phase hydrocarbon plume followed the local groundwater gradient and migrated north from the former dispenser area (Duke Engineering Services, 2001).

A Subsurface Volatilization and Ventilation System (U.S. Patent Nos. 5,221,159; 5,227,518; and 5,472,294) was installed at the Site in November 1994. System start-up was performed between November 1994 and January 1995. Regular system operation and maintenance occurred in 1995; however, Site “brown-outs” prevented optimal performance until late 1995, when the electrical problem was corrected. Because of budgetary constraints on the NMED

PSTB reimbursement program, regular maintenance and operation of this Site was discontinued in early 1996. The system, however, continued to operate unattended until May 9, 1997, when it was shut down completely pending PSTB approval of continued operation. The system was restarted in October 1997 (Duke Engineering & Services, 2001).

From March through June 1998, general system repairs were made, the system operating in the southern portion of the Site was deactivated, and remedial action was focused on the northern portion of the Site where groundwater contamination persisted. The remediation system operated continuously in this modified configuration throughout the remainder of the second and most of the third quarter of 1998 (Duke Engineering & Services, 2001).

The air-injection portion of the system was deactivated in September 1998. The vapor extraction portion of the system was deactivated on September 20, 1999, after it was determined that limited volatile organic compounds (VOCs) were being recovered. The system was re-evaluated in the first quarter of 2000, and pumps were moved from Williamsburg, New Mexico, to the Site. The re-evaluation led to a decision to use monitored natural attenuation to remediate the dissolved-phase plume, and groundwater monitoring continued throughout 2000 (Duke Engineering & Services, 2001).

Groundwater monitoring has continued periodically from 2000 to present. Seven monitoring wells were abandoned and the remediation system was decommissioned in April 2003 (INTERA, 2003). Three additional wells were abandoned and a light non-aqueous phase liquid (LNAPL) - absorbent sock was installed in MW-13 in December 2006 (INTERA, 2007). In July 2012, the sock was removed from MW-13 and the well was aggressively redeveloped in hopes of removing residual LNAPL within the filter pack and sediments near the borehole wall. This sock and all of the previously removed socks, were removed from the Site and properly disposed. No sock was redeployed in MW-13. Based upon the absence of LNAPL in MW-13 and the magnitude of detected VOCs in MW-13 during the previous monitoring event (January 2013) it is suggested that mobile LNAPL is not present at or in the vicinity of MW-13. The most recent groundwater monitoring event (January 2015) confirmed that dissolved-phase VOCs continue to be detected at concentrations above the NMQWCC Standards at the Site.

1.2 TASKS TO BE PERFORMED UNDER THIS SSHASP

The following provides a summary of INTERA's tasks associated with this project. Please refer to other project documents for specific objectives and detailed task information. All tasks performed by INTERA and INTERA subcontractors will be covered by this SSHASP. **Additional tasks can be hand-written into this list as they are added to the project scope.** These tasks include:

- Drilling, well installation, and development
- Handling investigation derived waste
- Survey monitoring well locations
- Measure fluid levels
- Collect groundwater samples

Hazardous materials likely encountered at the Site include gasoline, diesel fuels, and possibly oils and grease: Specific COPCs identified in groundwater at the Site include: benzene, ethylbenzene, xylenes, naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene,

Potential activities likely to involve direct contact with wastes or COPCs include:

- Drilling
- Field screening,
- Collecting soil samples,
- Installing wells
- Rehabilitating wells
- Handling investigation derived waste,
- Decontaminating non disposable sampling equipment,
- Collecting water level measurements and groundwater samples, and
- Preparing analytical samples for shipment.

2.0 ROLES AND RESPONSIBILITIES

The responsibilities of the INTERA Project Management team are outlined below. All personnel have the authority and responsibility to stop an activity if it is being performed in a hazardous manner. If an employee believes that he or she is being asked to perform work in an unsafe environment, that employee is authorized to decline the request.

Project Manager – Responsible for any changes to the SOW and oversight of all general operations of the project on a day-to-day basis. Project Manager responsibilities include the following:

- Evaluate each new Site activity for hazards and conduct a hazard assessment.
- Assist in preparation of this SSHASP, as necessary.
- Review each revision of this SSHASP or designate a qualified individual to conduct the review, as appropriate.
- Supervise the implementation of the current and approved SSHASP with assistance from the INTERA Corporate Health and Safety Officer (HSO)
- Assign a Site Safety Officer (SSO) for the Site.
- Assign trained personnel to the Site and verify that personnel assigned to the Site are in compliance with respect to OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and annual 8-hour refresher training in accordance with OSHA regulation 29 Code of Federal Regulations (CFR) 1910.120 for general site workers.
- Verify that personnel assigned to the Site are in compliance with regard to the necessary Medical Surveillance.
- Verify that personnel assigned to the Site are in compliance with regard to necessary respirator training, fit-testing requirements, and medical monitoring, as appropriate for job requirements.
- Determine that the project is performed in a manner consistent with this SSHASP.
- Determine compliance with this SSHASP by INTERA and contractor personnel, as appropriate.
- Report safety-related incidents or accidents to the INTERA Corporate HSO.

SSO – Responsible for Site health and safety and work operations. The SSO is responsible for reporting all safety and health concerns to the Project Manager and the INTERA Corporate HSO. SSO responsibilities include the following:

- Assist the Project Manager and INTERA Corporate HSO in implementing this SSHASP.
- Assist the Project Manager in conducting hazard assessments.
- Direct health and safety activities on Site, including the implementation and maintenance of a Site-specific Hazard Communication (HazCom) Program.
- Monitor compliance with the current and approved SSHASP.
- Assist the Project Manager in assessing and providing proper personal protection equipment (PPE) and other health and safety equipment for the project.
- Maintain health and safety equipment on-site, as specified in this SSHASP.
- Assist the Project Manager and INTERA Corporate HSO in implementing this SSHASP.
- Inform Site visitors as to on-site procedures, conditions, and hazards before allowing visitors to enter the Site.
- Report safety-related incidents or accidents to the Project Manager and the HSO.
- Implement emergency action and evacuation procedures, as necessary, in response to Site conditions and events.

- Direct personnel to change work practices if they are deemed to be hazardous to the health and safety of personnel.
- Make PPE exceptions for Site personnel based on Site-specific information such as air monitoring data, visual observations, and weather data/observations.
- Suspend work or otherwise limit exposure to personnel if the SSHASP appears to be unsuitable or inadequate.
- Remove personnel from the project if their actions or condition endangers their health and safety or the health and safety of co-workers.

INTERA Corporate HSO – Responsible for implementing, maintaining, and evaluating the INTERA Corporate Health and Safety Program. Responsibilities include serving as the program administrator for the Respiratory Protection Program, assisting Project Managers in assessing hazardous sites, supporting the development and evaluation of SSHASPs and associated programs and plans, and assisting employees in obtaining and maintaining training necessary to perform their tasks.

3.0 COMPREHENSIVE PLAN FOR SITE SAFETY

INTERA considers the prevention of illness, injury, and accidents in the workplace to have greater importance than any other facet of the work. Safety shall always take precedence over expediency or shortcuts, and every attempt shall be made to reduce the possibility of injury, illness, or accident occurrence. All Site activities shall be conducted in accordance with the established safety regulations of the Occupational Safety and Health Administration (OSHA), and other applicable Federal, State, County, and City regulations. The requirements and actions summarized in the following sections will be completed by INTERA and INTERA subcontracted personnel (as necessary). Personnel must sign the Site Personnel Acknowledgment Form included as **Form 1** indicating that they have read and understood this SSHASP. This SSHASP does not cover any activities that the client, or personnel subcontracted to the client, may perform at the Site without INTERA involvement.

INTERA subcontractors are responsible for having their own Health and Safety Plan, which must be at least as stringent as INTERA's SSHASP, and are responsible for complying with all applicable OSHA regulations. Subcontractors may be requested to provide their Health and Safety Plan to the Project Manager for review prior to commencement of work at the Site. Subcontractors will be monitored for compliance with all INTERA SSHASP requirements as well as all applicable OSHA regulations.

The training and medical surveillance requirements described in the following sections apply to all INTERA employees and INTERA subcontractor employees.

3.1 HEALTH AND SAFETY TRAINING REQUIREMENTS

Site personnel must have completed the 40-hour OSHA 1910.120 HAZWOPER training and must be up to date on their 8-hour HAZWOPER refresher training. This training includes general training for hazard recognition, use of Site monitoring instruments, and use of PPE. Equivalent training may be acceptable, but must be approved by the Project Manager. Site personnel are also required to have completed a minimum of three days of actual field work under the direct supervision of a trained, experienced supervisor before they will be allowed to engage in hazardous substance removal or other activities that have the potential to expose workers to hazardous substances and health hazards.

On-site project managers and Site supervisors will have completed at least eight additional hours of specialized training at the time of job assignment on such topics as, but not limited to, the employer's safety and health program and the associated employee training program, PPE program, spill containment program, and health hazard monitoring procedure and techniques.

Site personnel should have up-to-date training in first aid, blood-borne pathogens, and cardiopulmonary resuscitation (CPR).

Emergency response by Site personnel is limited to system maintenance needs. Medical or fire emergencies will be handled by trained Emergency Medical Personnel. Personnel who will respond to system maintenance emergencies shall be properly trained in the operation of the system they are responding about.

Personnel will not be allowed to work or supervise work at the Site until they have received all project training necessary for the level of their job responsibilities. Complete copies of certification documents recording that all Site personnel have had the necessary training will be kept by the Project Manager. Copies of these documents will be provided to the Client upon request.

3.2 MEDICAL SURVEILLANCE

All Site personnel who may need to wear a respirator or who may be exposed to hazardous substances above published exposure levels for 30 days or more a year are required to participate in their employer-sponsored medical surveillance program (this includes subcontractors). All INTERA field personnel are given the option of participating in the medical surveillance program even if they do not fall under the previous requirements, at no cost to themselves.

Employees participating in the medical surveillance program will receive a medical examination by a physician at least once every 12 months. This examination must certify that the employee is fit to work around hazardous substances and is fit to use appropriate respiratory protection equipment required to perform job responsibilities.

3.3 ACCIDENT/INCIDENT PREVENTION PROGRAM

Accidents can be prevented, and INTERA values employee involvement to provide a safe and healthy working environment for our employees, subcontractors, and clients, and to protect the public and preserve Site assets and property.

3.3.1 TAILGATE SAFETY MEETINGS

All Site personnel (INTERA personnel, subcontractors, and Site visitors) are required to participate in Tailgate Safety Meetings prior to starting work each day and at the beginning of each new task. The purpose of Tailgate Safety Meetings is to review the health and safety concerns at the Site. Topics to be presented include PPE, chemical and physical hazards, mobile phone availability, emergency procedures, hospital route, special equipment used on-site for that day (if any), and other topics as necessary. Personnel will sign a Safety Meeting Attendance Form (**Form 2**) at the conclusion of the health and safety meeting.

3.3.2 HAZARD RECOGNITION AND REPORTING

All INTERA personnel have the authority to stop an activity if it is being performed in a hazardous manner. If an employee believes that he or she is being asked to perform work in an unsafe environment, that employee is authorized to decline the request. Every employee has the right and responsibility to communicate their health and safety concerns to management and to implement changes to work procedures where needed to reduce injury and illness exposures in the workplace.

Each time a new task is started at the Site, a Job Safety Analysis (JSA) will be completed prior to commencement of the task. A new JSA will not need to be created each time the task is to be repeated (i.e.: a JSA for ground water sampling will be filled out prior to the first sampling event, and field personnel will review the JSA at the beginning of each subsequent sampling event, but will not need to recreate the JSA).

The Job Safety Analysis Program can be seen in **Attachment A** and completed JSAs, as well as blank forms can be found under **Form 3**.

3.3.3 BEHAVIOR BASED SAFETY PROGRAM

The Behavior-Based Safety (BBS) Program is a safety audit process that helps personnel identify and choose a safe behavior over an unsafe one. This process is designed to open the communication lines between personnel to reinforce safe behaviors and correct unsafe behaviors in order to eliminate incidents, including accidents and illnesses. BBS Audits can be

performed by any field personnel who are observing other field personnel (i.e.: if there is a team of two personnel doing ground water sampling, one person may do an audit by watching the other person perform the sampling). Safety in the workplace is based on the following components:

- A specific person's physical capabilities, experience, and training.
- The environment the specific person works in, including engineering controls, equipment available for the task, and the job task itself.
- The specific person's behavior while performing the task.

The BBS Program is based on behavioral observations by someone not involved in the task, a review of the observations (both safe and unsafe behaviors), positive reinforcement on the safe behaviors, non-threatening feedback on the unsafe behaviors, and improvement goals. These observations provide direct, measurable information on safe work practices.

Specific instructions on how to perform a BBS Encounter can be found in **Attachment B** and the BBS Encounter Forms are available as **Form 4**. Completed BBS Encounter Forms will be kept in this SSHASP and reviewed occasionally by the INTERA Corporate HSO to ensure that safe behaviors are being continued. A BBS Encounter should be performed for each task a minimum of once a year. Complicated tasks or tasks performed on a regular basis should have more frequent BBS Encounters.

3.3.4 INCIDENT INVESTIGATION

All incidents (injuries, illnesses, fatalities, and near-misses) must be reported to the Project Manager, the INTERA Corporate HSO IMMEDIATELY. Incidents must be documented by the employee(s) who witnessed the event (and with the Project Manager's involvement) on the INTERA Incident Investigation Report Form. The INTERA Incident Investigation Report Form is included as **Form 5**. *The completed form must be submitted to the INTERA Corporate HSO as follows:*

- IMMEDIATELY for a fatality (Must also be reported to OSHA IMMEDIATELY, and no longer than 8 hours after the incident).
- BY THE END OF THE WORK SHIFT for an injury.
- WITHIN 24 HOURS for a near-miss.

The INTERA Corporate HSO will perform an investigation following any personal injury accidents, equipment or property damage accidents, and near-misses in order to properly ascertain the cause of the incident and to prevent future incidents.

3.4 SITE CONTROL

Visits to project sites by persons not directly involved in tasks identified in the project work plan are discouraged. Persons designated as "Site visitors" will sign in on a Site Visitor Log (included as **Form 6**) and will be briefed by the SSO as to Site procedures, conditions, and hazards before entering the Site. Site visitors shall provide their own PPE as required for the area that they are visiting and shall be expected to follow applicable procedures and protocols. Site visitors will be asked to remain in the Clean Zone (if applicable) unless accompanied by INTERA personnel.

3.5 TRANSPORTATION OF SITE MATERIALS

Potential Site materials generated during implementation of the activities described herein shall be managed by field personnel accordingly. Transportation of Site materials off-site other than anticipated contact waste and collected ground water samples is not anticipated. Personnel shall not transport any contaminated Site materials or product from the Site in company vehicles or rental vehicles. Contaminated materials and/or product shall be disposed of properly via a subcontractor using the proper chain of custody applicable by regulations for disposal of hazardous or non-hazardous waste. For any potentially hazardous media, field personnel shall comply with DOT requirements which may require alternate arrangements for transporting these types of media, as required.

In the event that free product (e.g. LNAPL) is encountered during monitoring at the Site and removal is required, product shall be skimmed, bailed, or pumped into drums for temporary storage. Care shall be taken during pumping that the product is not spilled or an overflow does not occur. Personnel shall don the proper PPE during the handling and containerizing of free product. Dermal protection including gloves, long sleeve shirts, and pants (or coveralls/tyvek) shall be worn during product pumping activities for added personnel protection. Breathing exposure levels shall be recorded using the photoionization detector (PID) meter during the product draw-down test to monitor personnel exposures (**Section 5.4**). Level C PPE shall be donned if necessary (**Section 5.1**). The drums shall be labeled according to their contents and stored temporarily in a safe manner.

To prevent risks to the health and safety of laboratory personnel, laboratory directors or contacts shall be informed of any contaminant levels in collected samples that would require special handling procedures upon transfer of sample custody.

Site litter may also be transported offsite by INTERA as part of good housekeeping procedures.

4.0 SITE HAZARDS

4.1 PHYSICAL HAZARDS

There are numerous physical hazards at any site. All personnel have the authority and responsibility to stop an activity if it is being performed in a hazardous manner. If an employee believes that he or she is being asked to perform work in an unsafe environment, that employee is authorized to decline the request. All field personnel shall follow the **Site Emergency Response Plan** included in the **Emergency Contacts & Procedures Tab**, and shall report any new hazards to the SSO and the INTERA Corporate HSO so steps can be taken to mitigate the hazard.

A list of potential physical health and safety hazards associated with the activities at the Site are provided in **Table 4-1**. This list is not all-inclusive; additional physical hazards may be listed on task-specific JSAs found in **Attachment A**.

Table 4-1: Potential Physical Hazards		
Potential Hazard	Source of Potential Hazard	Hazard Mitigation Control
Heat or cold stress	<ul style="list-style-type: none"> • Adverse weather conditions can occur any time of the year • PPE such as respirators, gloves, and protective clothing can exacerbate heat stress 	<ul style="list-style-type: none"> • Drink plenty of fluids and be aware of potential heat stress conditions. Notify supervisor of any adverse physical conditions before and during the task. • See Attachment C for more information on the Heat and Cold Stress Casualty Prevention Plan.
Slip, trip, and fall hazards	<ul style="list-style-type: none"> • Construction zone conditions, debris, and wet ground 	<ul style="list-style-type: none"> • Be aware of surroundings while working and don't leave equipment on the ground in work areas.
Straining and pinching hazards	<ul style="list-style-type: none"> • Working around machinery and equipment (including drill rigs) • Rushing too quickly to finish a task • Using an improper tool to complete the job 	<ul style="list-style-type: none"> • Ensure that you have the proper training and tools to perform the job. • Be aware of your surroundings, and know the hazards of the machinery or equipment you are using. • See Attachment D for Health and Safety Requirements for Drilling Operations. • See Attachment E for Health and Safety Requirements for Heavy and Light Equipment. • Slow down and take the time to do the job right. • Use the vehicle inspection checklist (Form 7) to ensure that vehicles are in proper working order.

Table 4-1: Potential Physical Hazards		
Potential Hazard	Source of Potential Hazard	Hazard Mitigation Control
Automobile and pedestrian accidents	<ul style="list-style-type: none"> • Traveling on paved roads to get to the Site • Traveling on dirt roads to get to a work location • Working around heavy equipment 	<ul style="list-style-type: none"> • Be aware of your surroundings and designate standing and working areas that are away from driving areas. • See Attachment E for Health and Safety Requirements for Heavy and Light Equipment. • Use the vehicle inspection checklist (Form 7) to ensure that vehicles are in proper working order.
Head injuries	<ul style="list-style-type: none"> • Overhead hazards • Heavy equipment 	<ul style="list-style-type: none"> • Wear a hard hat when working around overhead hazards. • Be aware of overhead hazards at all times.
Falling from heights	<ul style="list-style-type: none"> • Working at heights 	<ul style="list-style-type: none"> • All personnel will be harnessed and anchored when working at heights above 6 feet, or where there is a danger of falling.
Electric shock	<ul style="list-style-type: none"> • Heavy equipment, including drill rig malfunction or incorrect use • Remediation system equipment malfunction or incorrect use • Buildup of static electricity • Drilling near overhead or buried electric lines while still energized 	<ul style="list-style-type: none"> • Inspect equipment prior to use. • Follow correct procedures for discharging energy prior to repair or maintenance as described in the Lock Out/Tag Out Program in Section 5.8. • Consider all electric lines to be energized unless the power company is on-site to verify shutoff with lockout/tagout procedures. Drilling or raising the mast within 20 feet of overhead power lines is not allowed. • See Attachment D for Health and Safety Requirements for Drilling Operations.
Fire	<ul style="list-style-type: none"> • Steel cutting, brazing, welding, and other activities that generate heat, sparks, or open flames 	<ul style="list-style-type: none"> • Performing these tasks in windy conditions or near ignitable materials is discouraged. • A Hot Work Permit (Form 8) shall be requested from INTERA prior to performing these tasks, and the established procedures described in Section 5.9 shall be followed.
Whipping Hoses and fluid burns	<ul style="list-style-type: none"> • Release of pressurized hydraulic or pneumatic lines 	<ul style="list-style-type: none"> • Inspect hoses regularly for exposed reinforcement wires, leaks, damaged or corroded fittings, excessive dirt or grease buildup, and missing guards, shields, and clamps.

Table 4-1: Potential Physical Hazards		
Potential Hazard	Source of Potential Hazard	Hazard Mitigation Control
Noise hazards	<ul style="list-style-type: none"> • Operation of heavy equipment (including drill rigs) • Traffic • Operation of remediation equipment (blowers, pumps, compressors, etc.) 	<ul style="list-style-type: none"> • Wear appropriate hearing protection for the job. • Hearing protection must be worn when the 8-hour time-weighted average noise level reaches or exceeds 85 decibels. • In general, if you have to raise your voice for someone to hear you at arm's length, you should be wearing hearing protection.
Lightning strikes	<ul style="list-style-type: none"> • Working during thunderstorms 	<ul style="list-style-type: none"> • If lightning is heard, the "15-15" rule should be employed – if the time between the lightning and thunder is 15 seconds or less, work should be stopped and shelter should be found. Work should not resume until 15 minutes or more has passed from hearing the last thunder. • If the lightning cannot be seen but thunder is heard, then it is likely that lightning is within striking range. • The nearest acceptable shelter is usually inside a vehicle. If moving to a vehicle is not immediately practical, the "lightning crouch" should be employed. This involves squatting on the ground with feet together and head tucked while covering one's ears.

4.2 CHEMICAL HAZARDS

Personnel and Site visitors may be exposed to chemical hazards through four routes of exposure: inhalation, ingestion, skin contact, and eye contact. Ingestion of chemical hazards shall be controlled by prohibiting eating, drinking, or smoking in the immediate vicinity of the work area and any known hazardous chemicals, and by requiring all field personnel to wash hands (and face, if necessary) before eating, drinking, or smoking.

Skin and eye contact with chemical hazards can cause serious burns, rashes, or irritations. All field personnel shall follow the **Site Emergency Response Plan** included in the **Emergency Contacts & Procedures Tab**, and shall report any skin or eye contact symptoms to the SSO and the INTERA Corporate HSO so steps can be taken to eliminate similar exposures.

The best assurance of protection against hazardous chemicals is avoidance. Whenever possible, Site personnel shall avoid direct contact with contaminated (or potentially contaminated) surfaces. Workers shall not kneel or place equipment on potentially contaminated ground. If contact is unavoidable in order to perform a required task, potential hazards are minimized by using appropriate PPE to protect against exposure to toxic materials.

A list of potential chemical hazards associated with the activities at this Site is provided in **Table 4-2**. This list is not all-inclusive; additional chemical hazards may be listed on task-specific JSAs found in **Attachment A**. Chemicals that are brought on Site by INTERA or INTERA subcontractors are part of the HazCom Program and will be listed on the Hazardous Chemicals List in **Attachment F**. Information on chemicals expected to be encountered at the Site can be found on the provided safety data sheets (SDSs) (**Attachment F**).

Table 4-2: Potential Chemical Hazards		
Potential Hazard	Source of Potential Hazard	Hazard Mitigation Control
Contaminated soils	<ul style="list-style-type: none"> • Potential known or unknown contaminated soils within the work area • Dusty working conditions 	<ul style="list-style-type: none"> • Wear appropriate PPE (nitrile gloves, dust mask, etc.). • Limit exposure to known contaminated areas. • Discontinue work if extremely dusty conditions persist. • Be aware of unusual odors and ground color while excavating. • Wash hands before eating, drinking, or applying cosmetics/sunscreen.
Chemical burns	<ul style="list-style-type: none"> • Spills or other contact with preservatives in ground water sampling bottles 	<ul style="list-style-type: none"> • Wear appropriate PPE (nitrile gloves, eye protection). • Avoid skin contact with preservatives. • Wash hands before eating, drinking, or applying cosmetics/sunscreen. • Avoid tipping over preservative bottles before they are filled with sample water.

Table 4-2: Potential Chemical Hazards		
Potential Hazard	Source of Potential Hazard	Hazard Mitigation Control
Exposure to heavy metals or other contaminants in ground water	<ul style="list-style-type: none"> • Ingestion or skin contact with ground water 	<ul style="list-style-type: none"> • Wear appropriate PPE (nitrile gloves, eye protection). • Avoid skin contact with ground water. • Wash hands before eating, drinking, or applying cosmetics/sunscreen. • Avoid spilling filled sample bottles. • Be aware of purge water location.
Chemical release	<ul style="list-style-type: none"> • Spills that occur during fueling or when lubricating equipment and vehicles • Spills from equipment malfunction 	<ul style="list-style-type: none"> • Fuel or lubricate equipment in a designated area with appropriate spill preventions in place. • Be prepared to clean up all contamination resulting from accidental spills.
Fuel Oils, Gasoline, and other Volatile Organic Compounds	<ul style="list-style-type: none"> • Contaminated water or soil within the work area. • Spills that occur during fueling or when lubricating equipment and vehicles • Spills from equipment malfunction 	<ul style="list-style-type: none"> • Wear appropriate PPE (nitrile gloves). • Limit exposure to known contaminated areas. • Fuel or lubricate equipment in a designated area with appropriate spill preventions in place. • Be prepared to clean up all contamination resulting from accidental spills. • Be aware of unusual odors and ground color while excavating. • Wash hands before eating, drinking, or applying cosmetics/sunscreen.

Fuel oils are generally low in toxicity, have low volatility, and are not readily absorbed through the skin; however, they may cause skin irritation, or "dermatitis", upon contact. Waste oils may contain certain cancer causing components such as heavy metals and oil derivatives which can be absorbed through the skin.

Gasoline is considered more toxic than oils; it has relatively high volatility, and certain components are readily absorbed through the skin. Gasoline contains certain components, such as benzene, which are classified as potential carcinogens.

VOCs represent the primary COPCs at the Site; therefore, caution should be taken to limit potential exposure to VOCs via inhalation as a result of volatilizing from contaminated ground water. The symptoms of inhalation over-exposure to petroleum products include dizziness, loss of coordination, general malaise, headaches, and nausea. If any of these symptoms occur, the project manager and the nearest hospital should be contacted. The dangers associated with over-exposure to petroleum products should be acknowledged and taken seriously.

4.3 BIOLOGICAL HAZARDS

Numerous types of pests and organisms may be present at the Site. A list of potential biological health and safety hazards associated with the activities at the Site is provided in **Table 4-3**. This list is not all-inclusive; additional biological hazards may be listed on task-specific JSAs found in **Attachment A**.

Table 4-3: Potential Biological Hazards		
Potential Hazard	Source of Potential Hazard	Hazard Mitigation Control
Poisoning or allergic reaction	<ul style="list-style-type: none"> • Stinging or biting insects (bees, wasps, spiders) • Venomous snakes 	<ul style="list-style-type: none"> • Avoid exposing hands or other body parts to cool, dark areas where these pests are known to dwell. • Use caution opening well vaults and other cool, dark enclosures. • Do not intentionally approach snakes or insects except to move them away from the working area, if this can be done safely.
Bite lacerations	<ul style="list-style-type: none"> • Feral or domestic animals and livestock • Rodents • Reptiles 	<ul style="list-style-type: none"> • Avoid exposing hands or other body parts to cool, dark areas where these pests are known to dwell. • Use caution when walking in rocky terrain where reptiles could be hiding. • Avoid contact with feral or domestic animals and livestock. • Contact authorities if an unrestrained animal is exhibiting aggressive behavior toward Site personnel.
Exposure to Hanta Virus or Plague	<ul style="list-style-type: none"> • Contact with rodents or rodent excrement • Agitating dried rodent urine or droppings greatly increases the potential for exposure 	<ul style="list-style-type: none"> • Areas with visible evidence of rodent activity and excrement should be avoided. • If avoidance is not possible, it is important to NOT stir up dust by sweeping or vacuuming up droppings, urine, or nesting materials. While wearing a dust mask and latex or nitrile gloves, spray with a mixture of 1 part bleach to 10 parts water. Use paper towels to collect the excrement, and place in a trash bag.
Exposure to unknown biological pathogens	<ul style="list-style-type: none"> • Blood-borne pathogen exposure from an injury 	<ul style="list-style-type: none"> • If contact is unavoidable in order to perform a required task, potential hazards are minimized by using appropriate PPE to protect against exposure. • All Site personnel will be up to date on first aid and blood-borne pathogen training.

5.0 SITE HEALTH & SAFETY PROCEDURES

Personnel who are new to the Site should have reviewed this SSHASP prior to arrival at the Site. Upon arrival at the Site, the SSO or other supervisory personnel should lead a general Site orientation. The following topics should be covered during this orientation:

- Discussion of the Site's history and any identified COPCs
- Discussion and identification of Site work zones and control measures (exclusion zone, contamination reduction zone, clean zone, PPE, and location of emergency equipment).
- Identification of "shut-off" switches located on any equipment to be used and familiarization with their use.
- Discussion of the location and use of the nearest phone(s).
- Review of emergency procedures and the location of the nearest hospital. The **Hospital Route Map** is included in the **Emergency Contacts & Procedures Tab**.
- Personnel must sign the Site Personnel Acknowledgment Form included as **Form 1** indicating that they have read and understood this SSHASP.

General good housekeeping practices to be followed at the Site are as follows:

- If necessary, ONE CALL Notification should be completed prior to beginning Site work. Location of power, gas, phone, and cable lines will be verified with the individual utility departments.
- A Tailgate Safety Meeting: Conducted prior to the start of work each day and at the beginning of each new task. All personnel (INTERA and any associated subcontractors) will attend this health and safety meeting to review the safety concerns at the Site. Topics to be presented include PPE, chemical and physical hazards, mobile phone availability, emergency procedures, hospital route, special equipment used on Site for that day (if any), and other topics as necessary. Personnel will sign a Safety Meeting Attendance Form (**Form 2**) at the conclusion of each daily meeting.
- Proper PPE shall be selected for the work to be performed (see **Section 5.1**).
- Bottled water or a water source shall always be available on-site for use as an eye wash and for use when administering first aid. Personnel are responsible for bringing drinking water to the Site to prevent dehydration (wash hands and/or face before drinking).
- A first aid kit will be in the field vehicle for use during work activities, and any injuries shall be reported to the SSO, Project Manager, and INTERA Corporate HSO IMMEDIATELY.
- A telephone (cell phone is acceptable) for emergency situations must be easily accessible and in working order when performing any type of fieldwork. All Site workers shall be made aware of the location of a telephone each day before work activities begin. If cell phone service at the Site is limited, workers must be aware of the nearest location where cell service is known to work.

5.1 SAFETY EQUIPMENT

To provide a better understanding about how to properly protect the head, eyes, skin, feet, and respiratory system, this subsection discusses general safety equipment and PPE. The SSO has the authority to make PPE exceptions for Site personnel if he/she deems it in the best interest of the field personnel's wellbeing. Such a PPE exception (i.e., modification to the guidance laid out in this SSHASP) shall be based on Site-specific information such as air monitoring data, visual observations, and weather data/observations. An example of such a modification to the

SSHASP is a decrease in the use of respirators, hard hats, or poorly breathable clothing if heat stress is a primary concern during Site activities and the use of the PPE was intended for a low-risk precaution. The SSO shall not make a PPE exception/modification if personnel shall be without the protection needed to be safe or to properly protect their health. If it appears that proposed and readily available PPE is inadequate, Site work shall be suspended until new PPE or planning allows personnel to work safely.

5.1.1 OSHA PPE PROTECTION LEVELS

OSHA divides PPE used to protect the body against contact with known or anticipated chemical hazards into four categories (i.e., Levels A, B, C, and D) according to the degree of protection afforded. The levels of protection that may be used at the Site are as follows, and the PPE used with each level is shown in **Table 5-1** below.

- Level C – The concentration(s) and type(s) of airborne substance(s) is known and criteria for using air purifying respirators are met.
 - The types of air contaminants have been identified, concentrations have been measured, and an air-purifying respirator is available that can remove the contaminants.
 - All criteria for the use of air-purifying respirators have been met.
 - Vapors and gases are known to not contain high levels of chemicals harmful to skin or are not capable of being absorbed through the skin, but skin contact with liquid chemicals is hazardous.
- Level D – A work uniform affording minimal protection; used for nuisance contamination only.
 - The atmosphere contains no known hazard.
 - Work functions preclude splashes, immersion, or the potential for unexpected inhalation of, or contact with, hazardous levels of any chemicals

Table 5-1: PPE Required for OSHA Protection Levels		
Protection Level	Required PPE	PPE Modifications (as needed)
Level C	Full-face or half-mask air purifying respirators Hooded chemical-resistant clothing Chemical-resistant outer gloves Chemical-resistant inner gloves	Coveralls or appropriate work clothes (under chemical resistant clothing) Chemical-resistant steel-toe boots Chemical-resistant boot covers Hard hat Escape mask Face shield
Level D	Coveralls or appropriate work clothes Chemical-resistant steel-toe boots	Chemical resistant gloves Chemical-resistant boot covers Safety glasses or splash goggles Hard hat Escape mask Face shield

5.1.2 PPE LEVELS APPROVED FOR THE SITE

The levels of protection that may be applicable to the anticipated activities specified in this SSHASP are:

- Level D,
- Modified Level D, and in certain cases,
- Level C

Level D: This level of PPE will be required during basic Site maintenance activities. This includes steel-toe boots, long pants, long-sleeve shirts (short-sleeve shirts will be allowed in hot weather and as activities permit), and safety glasses. High-visibility safety vests and hard hats will be required when working near roadways or while heavy equipment (including drill rigs) is operational. Hearing protection is required when working around heavy equipment or any other time high noise levels are anticipated.

Modified Level D: This level of PPE will be required during groundwater sampling or any time direct contact with soil, groundwater or a waste stream is expected. This level includes all the requirements of Level D, with the addition of chemical-resistant gloves and chemical splash goggles (if necessary).

Modified Level C: *It is recommended that all Site personnel be prepared for this contingency level of protection.* This level of PPE will be required when personnel will be working in conditions where concentrations of contaminants in air have the potential to be above the action levels shown in the Respiratory Protection Section of this SSHASP (**Section 5.4.1**), and oxygen levels are measured to be above 19.5%. This level includes all the requirements of Level D, with a full-face respirator and the proper cartridges, as determined by the situation. To fulfill this requirement, medical surveillance and respirator training shall have been completed by personnel before work commences. Each employee shall have his/her own respirator fit-tested to ensure proper fit. Proof of respirator training and fit testing should be submitted to the Project Manager before work commences. A copy of the INTERA respirator selection and maintenance procedures are included in **Attachment G**.

NOTE: In the event that Site conditions require the use of Level A or Level B PPE, the Corporate HSO will be notified immediately to verify that proper training and procedures are in place prior to conduct of fieldwork. Revisions to this SSHASP will also be necessary.

Personnel are NOT authorized to work in immediately dangerous to life or health (IDLH) conditions.

5.1.3 GENERAL PPE REQUIREMENTS

Any PPE provided must meet NIOSH or American National Standards Institute (ANSI) specifications.

- **General Work Clothing:** Clothing must be close fitting and comfortable, but without loose ends, straps, drawstrings, or belts, or otherwise unfastened parts that might catch on rotating or moving components of equipment. Long pants and long-sleeve shirts (short-sleeve shirts will be allowed in hot weather and as activities permit) are required at all times.
- **Chemical Protective Clothing:** In the event that free product is encountered, Tyvek shall be worn over general work clothing if deemed necessary by the SSO.

- **Safety Headgear:** Head protection shall be nonconductive to prevent limited electrical shock and shall meet the requirements of ANSI Standard Z89.1. Required when working near roadways, while heavy equipment (including drill rigs) is operational, or where an overhead hazard is present.
- **Safety-toe Boots:** Foot protection shall meet the requirements of ANSI Standard Z41.1, Class 75 (steel-toe boots, steel shank, chemical resistant, 6- to 8-inch tops, etc.). Required by all Site personnel and visitors at all times.
- **High Visibility Safety Vests:** Must be fluorescent orange, yellow, or green with high-visibility reflective tape. Required when working near roadways or while heavy equipment (including drill rigs) is operational.
- **Safety Glasses:** All eye protection shall meet ANSI Z87.1 standards. Prescription glasses shall be an approved safety type or safety glasses that fit over the prescription glasses must be used. Eye protection should be worn at all times, and splash goggles should be worn when splashes present a significant hazard to eyes.
- **Gloves:** Specific gloves should be selected based on the activities being performed. Puncture resistant (i.e., leather) gloves shall be worn for protection against cuts and abrasions that could occur while handling tools or other sharp objects. Chemical-resistant gloves shall be worn during activities that could result in contact with hazardous chemicals, ground water, or other contamination. Care should be taken to select the proper glove type based on the chemicals to be handled (i.e., nitrile gloves for ground water sampling, or butyl gloves for sulfuric acid handling).
- **Hearing Protection:** Ear plugs will be available to site personnel if necessary. Hearing protection is required when working around heavy equipment, or any other time high noise levels are anticipated.
- **Fall Protection:** Full body harnesses with shock absorbing lanyards will be required when working above 6 feet, or when there is a danger of falling (this also applies to the use of ladders).

5.2 WORK ZONES

To minimize the movement of contaminants from work sites to uncontaminated areas, three work zone areas will be established as-needed at work areas where contact with contamination or hazardous chemicals occurs. The work zone areas may be revised as contaminant data is collected at the Site. The three work zones include the following:

- Zone 1: Exclusion Zone
- Zone 2: Contamination Reduction Zone
- Zone 3: Clean Zone

Exclusion Zone: The Exclusion Zone is the zone where contamination does or could occur. Persons entering this zone shall wear the level of protection deemed necessary in the Safety Equipment Section (**Section 5.1**). Smoking, eating, and drinking are not allowed in this zone.

Contamination Reduction Zone: Between the Exclusion Zone and the Clean Zone is the personal Contamination Reduction Zone, which provides a transition zone between the contaminated and clean areas of the Site. This zone shall be located directly outside the Exclusion Zone. Personnel shall decontaminate in the Contamination Reduction Zone when leaving the Exclusion Zone. Decontamination procedures shall be followed as shown in **Section 5.3**. Smoking, eating, and drinking are not allowed in this zone.

Clean Zone: The Clean Zone shall be an uncontaminated area from which operations shall be directed. It is essential that contamination from the work area be kept out of this area.

At excavations and drilling sites where contamination is anticipated, the boundaries of the Exclusion Zone will be defined with flagging and caution tape. The Contamination Reduction Zone at excavations will be defined with marking paint and/or stakes and will extend 50 feet (or as far as deemed necessary by the SSO) from the boundary of the Exclusion Zone.

During ground water sampling activities at well vaults with contamination, the Exclusion Zone will be defined by the bollards surrounding each vault (if applicable). If no bollards are present, cones will be placed to define the boundaries of the Exclusion Zone. The Contamination Reduction Zone will extend 10 feet (or as far as deemed necessary by the SSO) from the Exclusion Zone boundary and will be marked with cones or stakes.

5.3 DECONTAMINATION PROCEDURES

- Remove gross contamination from tools, respirator (if used), monitoring equipment, etc., prior to leaving the Site using either de-ionized water or an Alconox/water solution.
- Either completely decontaminate soiled equipment at the work site using detergent and water (if possible) or wrap equipment in a plastic bag for transport until complete decontamination is possible. Decontamination of excavation equipment is not necessary unless municipal waste and/or stained soil with odor is encountered during digging or drilling.
- Dispose of contaminated gloves, Tyvek suits, used respirator cartridges, paper towels, etc., by placing in a plastic bag and discarding in a designated waste container for the Site (non-hazardous waste).
- Wash hands (and face, if necessary) thoroughly with soap and water before lunch or coffee breaks and after finishing work for the day.

5.4 AIR QUALITY MONITORING

Air monitoring will be conducted, as necessary, for oxygen content, combustible vapors, and toxic vapors during any field investigation work. As applicable, monitoring shall be conducted using a Combustible Gas Indicator (CGI) for LFG, a PID for organic vapors, and meters measuring specific toxic vapors (such as hydrogen sulfide) for Site investigation or remediation tasks. The PID and CGI meters shall be used to establish background levels at the Site prior to initiation of activities. Readings shall be used in conjunction with information about known or suspected contaminants at the Site to determine the level of protection required. Readings above background shall be recorded on an air monitoring log and/or in the field log book.

For the activities described herein, only monitoring for organic vapors is anticipated to be required. A PID, equipped with a 10.6 electron volt (eV) lamp, is considered sufficient to provide a response to the COPCs identified for this Site. The 10.6 eV lamp responds to carbon aliphatic compounds greater than C₄ (methane) including all olefins and all aromatics, and responds to inorganic compounds such as hydrogen sulfide, ammonia, bromine, and iodine, i.e., any compound with an ionization potential of less than 10.6 eV. Specifically, the PID will be used to detect for the presence of non-methane organic compounds in the breathing zone. A PID equipped with a 10.6 eV lamp should provide the sensitivity necessary to identify the typical LFG constituents (other than methane). Even though the PID can identify hydrogen sulfide, it cannot distinguish it from other compounds of similar ionization potential.

PID measurements above background will be recorded in the field logbook or logged by the meter. Alarm set points will be set for audible response.

5.4.1 AIR QUALITY ACTION LEVELS

For this Site, air-quality and field personnel exposure to organic vapors shall be monitored using both the PID and/or olfactory/visual cues.

In general, for a Site with potential exposure to organic vapors the following action levels are applicable:

1. PID breathing zone readings
 - 0 to 10 parts per million (ppm) – remain in LEVEL D or MODIFIED LEVEL D, continue air monitoring.
 - 10 to 25 ppm – Remove unnecessary personnel, establish work zones as described in **Section 5.2**, continue air monitoring.
 - Greater than 25 ppm and less than 75 ppm — Discontinue work and NOTIFY PROJECT MANAGER of readings between 25 ppm and 75 ppm. Personnel working in exposure areas must be prepared in LEVEL C PPE (half-face respirators are acceptable at this action level) with organic vapor cartridges.
 - At levels consistently above 75 ppm in the breathing zone, discontinue work and wait for notification to either proceed or evacuate site. The PROJECT MANAGER SHALL NOTIFY THE CORPORATE HSO of readings higher than 75 ppm. Personnel working in exposure areas must be prepared in LEVEL C PPE (full-face respirators are required at this action level) with organic vapor cartridges.
2. Detection through senses – If soils contaminated with oil and/or gasoline are detected with visual or olfactory senses by an employee, personnel shall move upwind of the odor and inform the Site Project Manager of the location of the odor.

The following table (**Table 5-2**) presents specific COPCs that may be present at the Site and their associated exposure limits. The OSHA Permissible Exposure Limit (PEL) are regulatory limits on the amount or concentration of a substance in the air at which workers will be protected against the health effects of exposure to hazardous substances. OSHA PELs are based on an 8-hour time weighted average (TWA) exposure. The IDLH level is an atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere (29 CFR* 1910.120).

Table 5-2: COPC Exposure Limits and Overexposure Effects			
COPC	OSHA PEL-TWA (ppm)	IDLH	Routes and Symptoms of Exposure
Benzene	10 for 8Hr-TWA 50 for 10 min	500	Routes: Inhalation, absorption, and contact Symptoms of Exposure: Acute: Eye/skin irritant, headache, dizziness, drowsiness, confusion, tremors and loss of consciousness; Chronic: aplastic anemia, leukemia, multiple myeloma, chromosomal aberrations
Ethylbenzene	100 for 8Hr-TWA	800	Routes: Inhalation, absorption, and contact Symptoms of Exposure: Eye and throat sensitivity, dizziness

Table 5-2: COPC Exposure Limits and Overexposure Effects			
COPC	OSHA PEL-TWA (ppm)	IDLH	Routes and Symptoms of Exposure
Toluene	200 for 8Hr-TWA 500 for 10 min	2000	Routes: Inhalation, absorption, and contact Symptoms of Exposure: tiredness, confusion, weakness, drunken-type actions, memory loss, loss of appetite, and hearing and color vision loss, light-headedness, nausea, unconsciousness
Total Xylenes	100 for 8Hr-TWA	1000	Routes: Inhalation, absorption, and contact Symptoms of Exposure: headache, dizziness, nausea and vomiting; weakness, irritability, slowed reaction time
Naphthalene	10 for 8Hr-TWA	250	Routes: Inhalation, absorption, and contact Symptoms of Exposure: fatigue, lack of appetite, restlessness, pale skin, confusion, nausea, vomiting, diarrhea
MTBE	50 for 8Hr-TWA	-	Routes: Inhalation, absorption, and contact Symptoms of Exposure: headaches, upset stomach, dizziness, lightheadedness, confusion and soreness in the nose or throat.
EDC	100 for 8Hr-TWA 200 for 5min/3HR	-	Routes: Inhalation, absorption, and contact Symptoms of Exposure: respiratory irritant, headaches, drowsiness, nausea, unconsciousness
EDB	30 for 8Hr-TWA 50 for 5min	-	Routes: Inhalation, absorption, and contact Symptoms of Exposure: respiratory/eye/nose/skin irritant; weakness, coughing, chest pain, abdominal pain, vomiting, diarrhea, loss of appetite, loss of consciousness
Fuel Oils general (Diesel Fuel)	400	NA	Routes: Inhalation, ingestion, and absorption Symptoms of Exposure: Breathing diesel fuel for long periods of time may cause kidney damage and lower your blood's ability to clot. Short term exposure may cause nausea, eye irritation, increased blood pressure, headache, and light-headedness.
Gasoline general (unleaded)	300	1500	Routes: Inhalation, absorption, and contact Symptoms of Exposure: eye/respiratory irritant, dermatitis, neurological effects, sudden death from cardiac arrest, and hematologic changes.

Information on any additional chemicals that may be utilized on-Site is provided in the HAZCOM section of this SSHASP (**Attachment F**).

5.5 RESPIRATORY PROTECTION PROGRAM

No respirator is capable of preventing all airborne contaminants from entering the wearer's breathing zone. Properly selected and used respirators help protect against certain airborne contaminants by reducing airborne contaminant concentrations in the breathing zone to below recommended exposure levels. Misuse of respirators may result in overexposure to the

contaminant and cause sickness or death. For this reason, proper respirator selection, training, use, and maintenance are mandatory in order for the wearer to be properly protected.

The Respiratory Protection Program Administrator is the INTERA Corporate HSO (see **Attachment G** for INTERA's Respiratory Protection Program). The administrator's duties are to oversee the development of the respiratory program and to ensure it is carried out correctly. The administrator will evaluate the program regularly to ensure that procedures are followed, respirator use is monitored, and respirators continue to provide adequate protection when job conditions change.

The following tasks at the Site may require respirators:

- Excavation of contaminated soils.
- Operation or maintenance of soil vapor extraction pilot testing.
- Sampling of contaminated soils.
- When air monitoring Action Levels (see **Section 5.4.1**) are reached during field tasks.

5.5.1 RESPIRATOR SELECTION CRITERIA

*Respirators approved for use at this Site are LEVEL C, air purifying respirators (for more information on respirator PPE protection levels, please see **Section 5.1.1**). **Air purifying respirators can only be used when ambient oxygen levels are measured above 19.5%.***

These respirators will be used if organic vapors (as measured with a PID in the breathing zone) reach greater than 50 ppm, and INTERA determines (using the CGI) that these levels of organic vapors are not caused by the presence of hydrogen sulfide. Work will be discontinued temporarily while personnel prepare to switch to LEVEL C respiratory protection. Combination organic vapor/particulate cartridges will be used with full face respirators. It should be noted that hydrogen sulfide will be monitored with a CGI, and if hydrogen sulfide is measured in excess of 10 ppm, then the area will be evacuated immediately. Only LEVEL B, supplied air respirators can be used in situations where hydrogen sulfide is present.

NOTE: In the event that Site conditions require the use of Level A or Level B PPE, the Corporate HSO will be notified immediately to verify that proper training and procedures are in place prior to conducting the fieldwork. Revisions to this SSHASP will also be necessary.

The following guidance should be used when Site conditions warrant additional attention and personnel suspect that the respiratory protection level they are currently at (or about to switch to) may not be adequate. The respirator selected must have an assigned protection factor adequate for the particular workplace exposure. Divide the air contaminant concentration by the occupational exposure limit to obtain a hazard ratio. Then select a respirator with an assigned protection factor greater than or equal to that hazard ratio. Respirator selection guidance for specific contaminants can also be found on the SDS sheets in **Attachment F**.

$$\text{Hazard Ratio} = \frac{\text{Airborne Contaminant Concentration}}{\text{Occupational Exposure Limit}}$$

Assigned protection factors per OSHA 29 CFR 1910.134 are as follows:

- Air purifying respirators
 - Half facepiece (filtering facepiece, both disposable and reusable): 10
 - Full facepiece: 50
- Powered air purifying respirators
 - Loose-fitting facepiece: 25

- Half facepiece: 50
- Full facepiece, helmet, or hood: 1,000
- Continuous flow supplied air respirators
 - Loose-fitting facepiece: 25
 - Half facepiece: 50
 - Full facepiece, helmet, or hood: 1,000
- Pressure demand supplied air respirators
 - Full facepiece: 1,000
 - With escape SCBA: 10,000
 - With pressure demand SCBA: 10,000

5.5.2 FIT TESTING

All personnel who must wear a respirator will be fit-tested before using their respirator, and fit testing will be repeated annually in accordance with INTERA's Respiratory Protection Program (**Attachment G**). Prior to fit testing, personnel will be required to participate in the medical surveillance program as described in **Section 3.2** to ensure that they are healthy enough to wear a respirator. Fit testing will also be done when a different respirator facepiece is chosen, when there is a physical change on an employee's face that would affect fit, or when personnel or a medical provider state that the fit is unacceptable.

Employees will not be allowed to wear respirators with tight-fitting facepieces if they have facial hair (e.g., beards, stubble, bangs), are not wearing normally worn dentures, have facial deformities (e.g., scars, deep skin creases, prominent cheekbones), or have other facial features that interfere with the facepiece seal or valve function. Jewelry or headgear that projects under the facepiece seal is also not allowed.

5.6 CONFINED SPACES

No one shall enter a confined space without the proper training and documentation needed to perform confined space work activities. Following are definitions associated with a confined space and the procedures that should be used in the event that a confined space is encountered. Please refer to **Attachment H** for INTERA's Confined Spaces Program.

A **confined space** is an enclosed or partially enclosed space that:

1. Has been identified as such in a risk assessment.
2. Is not intended or designed primarily as a place of work.
3. May have restricted entry and exit.
4. May:
 - a. Have an atmosphere which contains potentially harmful levels of contaminant.
 - b. Not have a safe level of oxygen, e.g., following a nitrogen purge.
 - c. Cause entrapment or engulfment.

Confined spaces may include, but are not limited to:

1. Storage tanks, process vessels, boilers, pressure vessels, tank-like compartments that have only a manhole for entry, and ceiling and floor spaces.
1. Open-topped pits, grease traps, or excavations more than 1.5 meters deep.
2. Pipes, pumps, sewers, shafts, ducts, drains, tunnels, cellars, basements, or similar.
3. Abandoned mine workings and adits.

Contaminant: Any dust, fume, mist, vapor, gas, or other substance in liquid or solid form, the presence of which may be harmful to health and safety.

Entry to confined space: This occurs when a person's whole body, upper body, or head is within the confined space. However, this is not intended to prevent a person from inserting a hand or an arm into a confined space while holding a test instrument or probe as part of the evaluation procedure provided that this procedure is duly authorized.

Identification: Confined spaces must be identified and signs erected at the entry points denoting that a permit is required prior to entry. Where signage is impractical, for example with adits, other means of highlighting the dangers need to be used.

Permit-Required Confined Space: A confined space that requires a permit before the space can be entered because it has, or has the potential for, one or more of the following characteristics:

- An atmosphere that can become IDLH due to toxic, flammable, or asphyxiating characteristics.
- The potential for engulfment.
- A size or shape that can trap or asphyxiate.
- Any other recognized serious hazard.

Confined spaces are not anticipated on-Site. If a confined space is encountered, a sign stating that entry is prohibited shall be posted and the Project Manager and Corporate HSO shall be notified. No one shall enter a confined space without the proper training and documentation needed to perform confined space work activities. Confined space entry will not be performed during the execution of this SOW. Hazardous gases can accumulate in confined spaces. All personnel shall not enter a confined space for any reason at any time. If it is determined that a confined space must be entered during this project, work must stop while this SSHASP is being revised to include a Confined Space Program.

5.7 HAZARD COMMUNICATION (HAZCOM) PROGRAM

The Site-specific HazCom Program designates the project personnel responsible for the implementation and maintenance of hazardous chemical labeling and provides information for employee training on HazCom requirements for the Site. The HazCom program in **Attachment F** includes the Hazardous Chemical List for the Site and includes the Safety Data Sheets (SDSs) for each chemical that is at the Site or will be brought to the Site. SDSs provide detailed information on specific chemicals, including potential hazardous effects, physical and chemical characteristics, and recommendations for appropriate protective measures.

5.8 LOCK OUT/TAG OUT PROGRAM

Some Site activities may require working on equipment that is typically energized or under pneumatic pressure. Minimum requirements for the lock-out of energy isolating devices whenever maintenance or servicing is done on machines or equipment must be followed. Lock-out/tag-out procedures shall be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources, and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or the release of stored energy could cause injury.

All employees are required to comply with the restrictions and limitations imposed upon them during the use of lock-out. The authorized employees are required to perform the lock-out in

accordance with approved procedures. All employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance, shall not attempt to start, energize, or use that machine or equipment.

5.8.1 DEFINITIONS:

- **Hazardous energy:** Electrical, pneumatic, hydraulic, stored (springs, batteries), potential (by virtue of position), heat (hot water, steam).
- **Isolation Officer:** Whenever a piece of equipment is to be isolated, there must be a person designated to carry out the Isolation Procedure. That person is referred to as the Isolation Officer. No person may be designated as the Isolation Officer for a piece of equipment unless he or she has been trained, tested, and certified as competent to carry out the Isolation Procedure for that piece of equipment. Tests for voltage, for example, require competency in electrical work as outlined in the electrical standard.
- **Isolation Procedure:** All designated systems and equipment must have written procedures for isolation. This procedure will set out how the system or equipment is to be made safe and kept safe. It will include for example: decontamination; venting of stored energy; securing of rotors or fan blades; shocking of vehicles; and disconnecting, blocking, or bleeding of equipment, cables, pipes, and vessels. It will show any connections to Distributed Control Systems. It will also show the isolation points for lock-out and test procedures.

5.8.2 PREPARATION FOR LOCK-OUT/TAG-OUT

- Obtain the proper Isolation Procedure for the equipment or machine to be locked out or tagged out.
- Identify the Isolation Officer and other affected employees by name (or job title) who may be involved in the impending lock-out/tag-out work.

5.8.3 SEQUENCE OF LOCK-OUT

- The Isolation Officer will notify all affected persons that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.
- The Isolation Officer shall refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy.
- If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.).
- De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).
- Lock-out the energy isolating device(s) with assigned individual lock(s). The Isolation Officer's Lock must be the first to be applied and the last to be removed. The Isolation Officer's lock must be a master series lock since it will remain on the equipment when handing over to subsequent shifts. Keys to the Isolation Officer's lock must only be held by other designated Isolation Officers for that equipment. Where isolation involves only one person and it is not appropriate for a master series lock to be utilized, the person must be an Isolation Officer and he or she must apply his or her personal lock.
- After locking and tagging, the Isolation Officer must clear the area of personnel before a trial step to ensure that the equipment has been isolated. In case of electrical isolation, a test for voltage must be carried out after turning off the switching device to ensure the absence of voltage. Stored or residual energy (such as that in capacitors, springs,

elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure) must be dissipated or restrained by methods such as grounding, repositioning, blocking, and bleeding down. The Isolation Officer will ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verifying the isolation of the equipment by operating the push button or other normal operating control(s), or by testing to make certain the equipment will not operate.

- Caution: Return operating control(s) to the neutral or “off” position after verifying the isolation of the equipment.

The machine or equipment is safely locked out if the above steps are taken. If other personnel are performing work on the same system or related system, a separate independent lock-out/tag-out procedure shall be followed. Lock-outs shall be placed on the original lock-out. The process shall be repeated for each individual task. Everyone, including the Isolation Officer, who has to perform work on the equipment or system, must first apply a personal lock and identification tag in accordance with the Isolation Procedure. Personal locks must be such that they can only be unlocked by their owner. Personal locks may never be removed other than by the person to whom they belong, unless in the presence of and under the supervision of the Project Manager or his or her appointed nominee, and in accordance with a written procedure.

5.8.4 RESTORING EQUIPMENT TO SERVICE

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken.

1. Check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.
2. Check the work area to ensure that all employees have been safely positioned or removed from the area.
3. Verify that the controls are in neutral.
4. Check for other lock-outs or tags that may have been placed on the machine or equipment by others.
 - a. Personnel will remove their lock-out devices, and the Isolation Officer will remove his or her lock-out device last.
 - b. Re-energize the machine or equipment. Note: The removal of some forms of blocking may require re-energization of the machine before safe removal.
 - c. Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

5.9 HOT WORK

This section is primarily a contingency for subcontractors that may need to do hot work. All temporary operations involving open flames or purposefully producing heat and/or spark shall be performed with the proper safety controls and equipment in place to eliminate the risk associated with igniting combustible materials. No hot work shall be conducted without first completing a Hot Work Permit.

A Hot Work Program shall be followed when performing any brazing, cutting, grinding, soldering, welding, or other activity that results in the production of excessive heat. Properly designed and operated “intrinsically safe” equipment are excluded from the Hot Work Program.

The permit requirement may be fulfilled by completing the permit form included as **Form 8** and abiding by the Hot Work Program. The Hot Work Program includes the following procedures:

- Establish permissible areas for hot work.
- Ensure that only approved apparatus, such as torches, manifolds, regulators, and pressure reducing valves, are used.
- Ensure that all individuals involved in the hot work operations are familiar with Hot Work Program requirements.
- Ensure that all individuals involved in the hot work operations are trained in the safe operation of their equipment and the safe use of the process. These individuals must have an awareness of the risks involved and understand the emergency procedures in the event of a fire.
- Determine Site-specific flammable materials, hazardous processes, or other potential fire hazards present or likely to be present in the work location.
- Ensure combustibles are protected from ignition by the following means:
 - Move the work to a location free from combustibles or flammable gasses.
 - If the work cannot be moved, ensure the combustibles are moved to a safe distance or have the combustibles properly shielded against ignition, and ventilate the area and continuously monitor for flammable gasses.
 - Ensure hot work is scheduled such that operations that could expose flammables or combustibles to ignition do not occur during hot work operations.
 - If any of these conditions cannot be met, then hot work must not be performed.
- Determine that fire protection and extinguishing equipment are properly located and readily available.
- Ensure sufficient local exhaust ventilation is provided to prevent accumulation of any smoke and fumes.
- Ensure that an individual is posted to watch for fire (fire watch) when hot work is performed in a location where other than a minor fire might develop, or where the following conditions exist:
 - Combustible materials in building construction or contents are closer than 35 feet to the point of hot work.
 - Combustible materials are more than 35 feet away, but are easily ignited by sparks.
 - Wall or floor openings are within 35 feet and expose combustible materials in adjacent areas. This includes combustible materials concealed in walls or floors.
 - Combustible materials are adjacent to the opposite side of partitions, walls, ceilings, or roofs, and are likely to be ignited.
- Where a fire watch is not required, a final inspection shall be conducted 1/2-hour after the completion of hot work operations to detect and extinguish possible smoldering fires.

An operator must cease hot work operations if unsafe conditions develop or are suspected.

EMERGENCY CONTACTS AND PROCEDURES

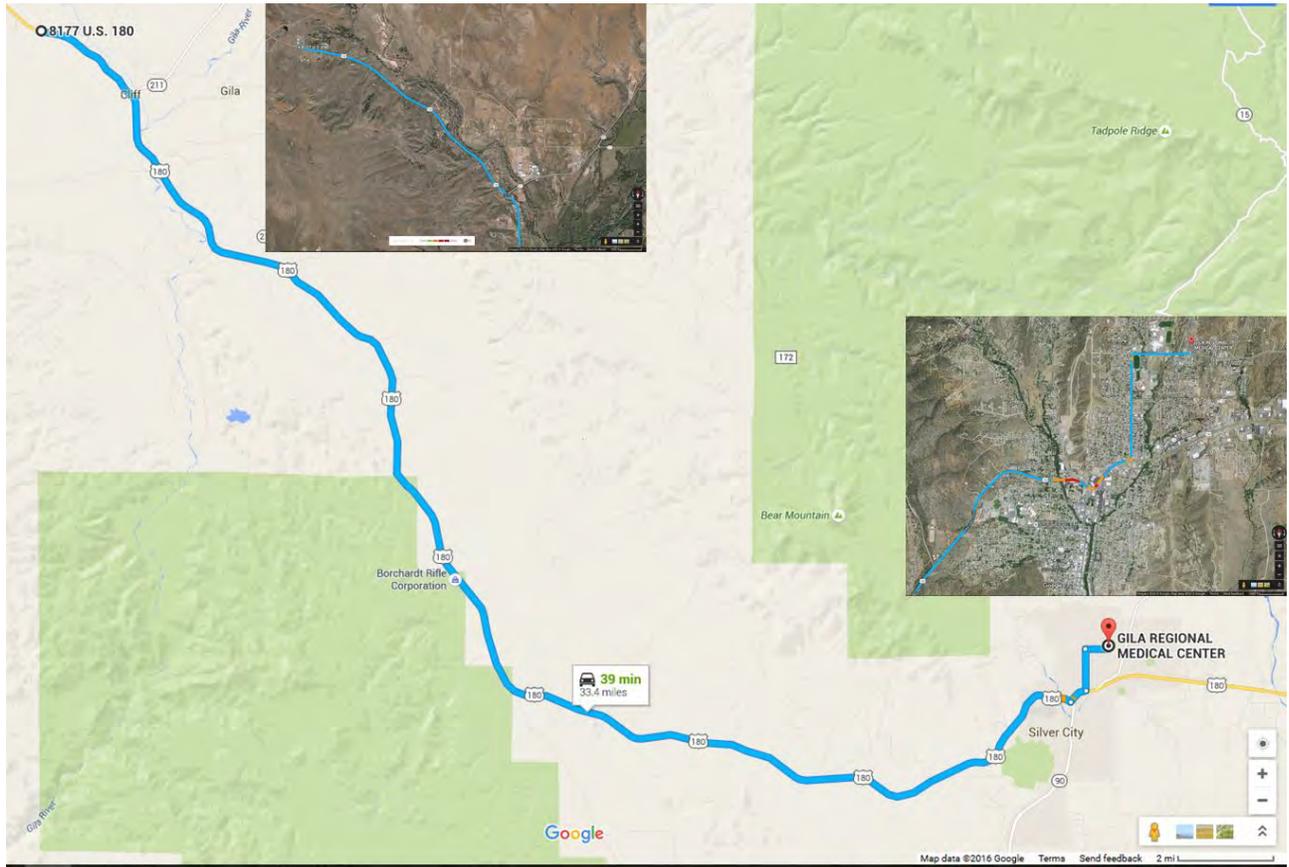
Emergency Contacts List
Hospital Route Map
Written Directions to Hospital
Site Emergency Response Plan

EMERGENCY CONTACTS LIST

AMBULANCE:	911
FIRE:	911
POLICE:	911 (Silver City Police Dept: (575) 538-3723 non-emergency)
POISON CONTROL:	1-800-222-1222
SITE ADDRESS:	8157 U.S. Highway 180 Cliff, NM 88038 NM State Highway Transportation Department District No 1- Cliff Maintenance Patrol 41-44
HOSPITAL: Address: Hospital Phone Number:	Gila Regional Medical Center 1313 E. 32 nd Street Silver City, NM 88061
LOCATION OF NEAREST HOSPITAL:	See Map
LOCATION OF NEAREST PHONE:	Mobile (pocket), DOT Office Building

Project Manager	Eileen Marcillo – INTERA	505) 428-0066
Site Safety Officer (SSO)	Lynda Price- INTERA Matt Sophy- INTERA	(505) 246-1600, ext. 1239 (505) 246-1600, ext. 1208
Field Sampler	Lynda Price – INTERA Matt Sophy- INTERA	(505) 246-1600, ext. 1239 (505) 246-1600, ext. 1208
INTERA Corporate Health and Safety Officer (HSO)	Amy Andrews, P.E. – INTERA	(505) 246-1600, ext. 1243
Client Project Manager	Jim Mullany - NMDOT	(505) 827-5512
PSTB Project Manager	Tim Noger – PSTB	(505) 476-6034

HOSPITAL ROUTE MAP



WRITTEN DIRECTIONS TO HOSPITAL

Gila Regional Medical Center
1313 East 32nd Street
Silver City, NM 88061

Approximate Travel Time: 39 minutes (33.4miles)

1. Drive east on US. 180 East toward Arena Road
2. Turn Left onto Silver Heights Blvd
3. Turn left onto North Swan Street
4. Turn right onto East 32nd Street

EMERGENCY RESPONSE PLAN

Any incident or accident must be reported to the Project Manager and the INTERA Corporate HSO immediately. Incidents must be documented by the employee(s) who witnessed the event (and with the Project Manager's involvement) on the INTERA Incident Investigation Report Form.

EMERGENCY COMMUNICATION PROTOCOLS:

In the case of an emergency, *CALL 911*.

- Talk in a controlled and steady manner
- Pass on as much information as possible (Person, Location, Nature or Emergency, Injuries, Assistance required, any other important detail)
- Verify that the emergency communication has been heard and understood

The person receiving the call should:

- Record all details
- Seek clarification on all details as necessary
- Begin organizing emergency responders and contacting persons that need to know

Other Site Personnel

- Make yourself ready in case you are called up to assist in the emergency response

PERSONAL INJURY: Check the accident scene to determine if you or anyone else is in danger. FOLLOW EMERGENCY COMMUNICATION PROTOCOLS. Keep all non-essential personnel out of the area. Remove personnel from immediate danger if there is no suspicion of neck or back injury. If there is a question about whether it is safe to move the victim, DO NOT move the victim; instead, make him or her as comfortable as possible while waiting for emergency assistance. Administer appropriate minor first aid only within your competency and training. Wait for emergency personnel to assist, and notify the Project Manager and INTERA Corporate HSO as soon as personnel are out of immediate danger.

CHEMICAL EXPOSURE: For signs of inhalation exposure, retreat to fresh air for recovery. If symptoms are serious, such as nausea or fainting, FOLLOW EMERGENCY COMMUNICATION PROTOCOLS and discontinue work at that location. In the case of skin or eye irritation due to chemical contact FOLLOW EMERGENCY COMMUNICATION PROTOCOLS, and wash affected skin with soap and water, or flush eyes with generous amounts of water while waiting for emergency response. Notify the Project Manager and INTERA Corporate HSO as soon as personnel are out of immediate danger.

FIRE: If fire occurs, FOLLOW EMERGENCY COMMUNICATION PROTOCOLS. After the alarm has been raised, if the fire can be easily contained and extinguished, do so with a portable fire extinguisher. Project vehicles will have working fire extinguishers in them for use in the event of small fires. Personnel shall only use extinguishers in cases of small fires, when the individual has been trained to use a portable fire extinguisher and is comfortable attempting to put out the fire. If the fire cannot be contained and extinguished with a portable fire extinguisher, or if explosion risk is present, evacuate all personnel to the muster point. There is no building or equipment that is more valuable than a person. It is preferable that the fire creates damage

rather than injury. All unnecessary personnel must be kept back from the fire and out of harm's way.

SITE EVACUATION: If an emergency Site evacuation becomes necessary for any reason, the SSO shall alert all personnel to leave the Site and notify the Project Manager of the situation. Personnel shall not return to the Site until an all-clear notification has been received from the SSO.

EMERGENCY SITUATIONS INVOLVING THE SURROUNDING COMMUNITY: In the highly unlikely event that a Site emergency has the potential to affect the community surrounding the Site, FOLLOW EMERGENCY COMMUNICATION PROTOCOLS and notify the Project Manager as soon as practical. No communication is to be made to community or media groups, if calls come in from either of these groups, contact details such as names and numbers are to be collected and passed onto the Project Manager (and then to the Client) to formulate a response.

SPILL RESPONSE: Where chemicals are unknown or the hazard is great, FOLLOW EMERGENCY COMMUNICATION PROTOCOLS then establish an exclusion zone. This exclusion zone must be maintained until cleanup has been completed or the area determined safe. All appropriate PPE must be worn as per the SDS for cleanup and response to a chemical spill.

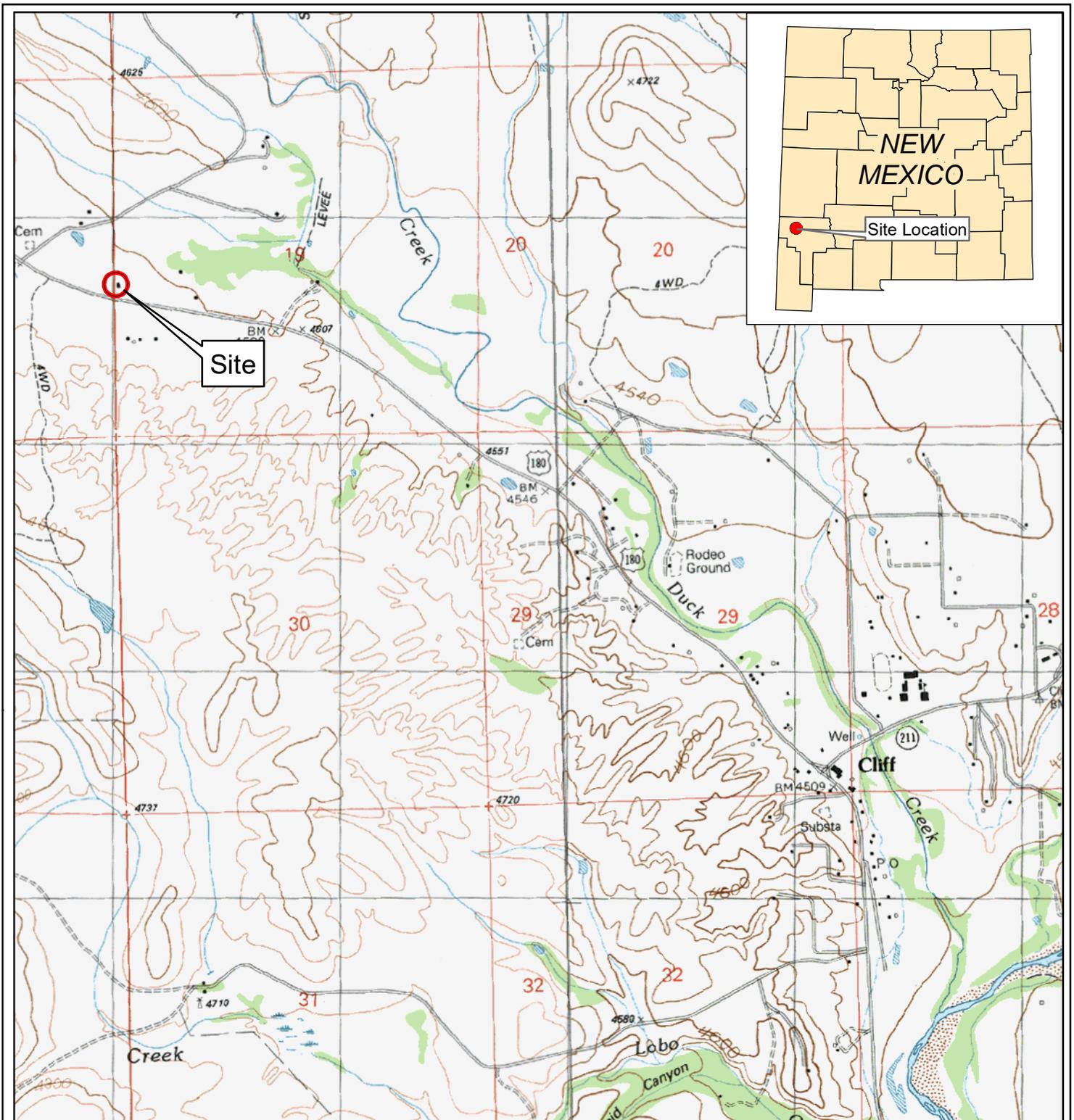
For known low-hazard spills - a Spill Kit may be available at the Site. Small spills may be cleaned up with a shovel and a bucket. An external resource may need to be engaged for larger spills.

Any amount of any material in such quantity as may with reasonable probability injure or be detrimental to human health, animal or plant life, or property, or may unreasonably interfere with the public welfare or the use of property, must be reported to the New Mexico Environment Department (505-827-9329). This includes chemical, biohazardous, petroleum-product, and sewage spills and incidents. In addition to recent spills, the discovery of evidence of previous unauthorized discharges, such as contaminated soil or ground water, also must be reported. New Mexico has not established reportable quantities. Verbal notification must be provided as soon as possible after learning of a discharge, but in no event more than twenty-four (24) hours thereafter.

FIGURES

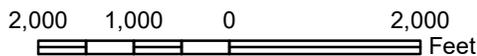
Figure 1
Figure 2

Site Location Map
Site Plan



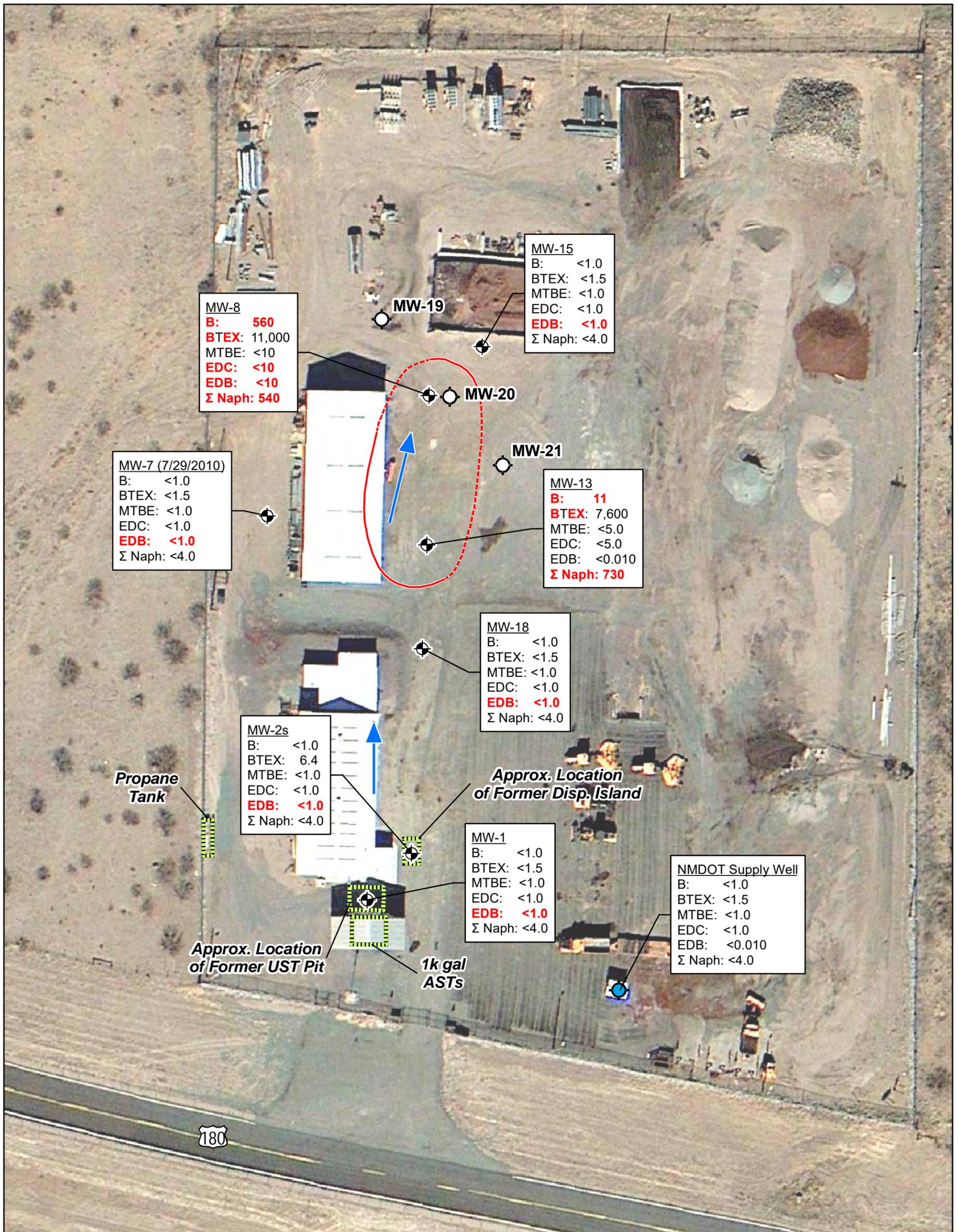
USGS 7.5 Minute Topographic Map: Cliff Quadrangle & Antelope Ridge Quadrangle 1990, Canteen Canyon Quadrangle & Buckhorn Quadrangle 1965; Contour Interval 40 Feet

W/2, Sec.19, T.15S, R.17W Longitude: 108.64581 W, Latitude: 32.98315N



Sources:
Topo – Terrain Navigator Pro/USGS

Figure 1
Site Location Map
NMDOT Patrol Yard – Cliff, New Mexico



Legend

- Monitoring Well
- Proposed Monitoring Well
- Water Supply Well
- Estimated Extent of Actionable Dissolved-Phase Contamination (dashed where inferred)
- Approximate Groundwater Flow Direction

Well ID
 Analyte: Results in µg/L (micrograms per liter),
Red/Bold indicates value or laboratory reporting limit in excess of the NMWQCC standards and/or PSTB Action Level

B= Benzene
 BTEX = Benzene + Toluene + Ethylbenzene + Total Xylenes
 EDC = 1,2-dichloroethane
 EDB = 1,2-dibromoethane
 Σ Naph = Naphthalene + 1,Methyl naphthalene + 2, Methyl naphthalene

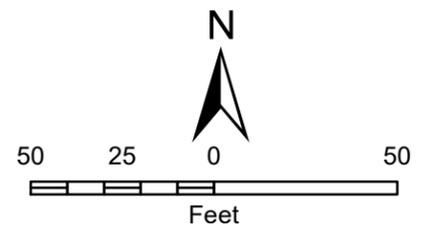


Figure 2
 Site Plan with
 Distribution of Contaminants,
 January 28-29, 2015
 NMDOT Patrol Yard – Cliff, New Mexico

FORM 1

Site Personnel Acknowledgement Form

FORM 2

Safety Meeting Attendance Forms



SAFETY MEETING ATTENDANCE FORM

Date: _____ Project Number: _____

Project Title & Task: _____

Has a Job Safety Analysis Form been completed for this task? Yes No (if no, fill it out now)

SAFETY TOPICS PRESENTED (describe specifics)

Protective Clothing/Equipment _____

Emergency Procedures _____

Chemical Hazards _____

Confirm that Safety Data Sheets are available for listed hazardous chemicals/substances. Yes N/A

Location of Nearest Hospital _____

Physical Hazards _____

Location of Mobile Phone _____

Special Equipment _____

Other _____

ATTENDEES

Printed Name

Signature

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Meeting Conducted by:

Printed Name

Signature

FORM 3

Job Safety Analysis Forms



JOB SAFETY ANALYSIS (JSA) AND PERSONAL PROTECTIVE EQUIPMENT (PPE) WORKSHEET

Project Site Evaluated: _____ Project Task Evaluated: _____

Name of Person Completing Assessment: _____ Project Number: _____ Date: _____

Use additional sheets as necessary.

<input style="width: 100%; height: 100%;" type="text"/> Step # DESCRIPTION OF JOB STEP:	POTENTIAL HAZARD	RISK HAZARD RANK PROBABILITY	BODY PART AFFECTED	HAZARD MITIGATION CONTROL:
			TYPE OF AFFECT	
	SOURCE OF POTENTIAL HAZARD	CONSEQUENCE	IS PPE REQUIRED?	
		HAZARD CLASSIFICATION	TYPE OF PPE REQUIRED:	
<input style="width: 100%; height: 100%;" type="text"/> Step # DESCRIPTION OF JOB STEP:	POTENTIAL HAZARD	RISK HAZARD RANK PROBABILITY	BODY PART AFFECTED	HAZARD MITIGATION CONTROL:
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	SOURCE OF POTENTIAL HAZARD	CONSEQUENCE	IS PPE REQUIRED?	
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			TYPE OF AFFECT	
	SOURCE OF POTENTIAL HAZARD	CONSEQUENCE	IS PPE REQUIRED?	
		HAZARD CLASSIFICATION	TYPE OF PPE REQUIRED:	
<input style="width: 100%; height: 100%;" type="text"/> Step # DESCRIPTION OF JOB STEP:	POTENTIAL HAZARD	RISK HAZARD RANK PROBABILITY	BODY PART AFFECTED:	HAZARD MITIGATION CONTROL:
			TYPE OF AFFECT:	
	SOURCE OF POTENTIAL HAZARD	CONSEQUENCE	IS PPE REQUIRED?	
		HAZARD CLASSIFICATION	TYPE OF PPE REQUIRED:	

DIRECTIONS

For complete directions filling out the JSA, please refer to Appendix 12 of the Corporate Health and Safety Plan. Use a separate form for each task. Examples of tasks include groundwater monitoring, drilling, or system maintenance. This form should be completed by employees who have good attention to detail, think logically, and have a good grasp of the procedures required to complete each task.

<p>1ST COLUMN</p> <p>Step #: List consecutive numbers for each step in the task. Examples of steps in the task include loading equipment, driving to the site, setting up at the site, each step in performing the task, or cleanup at the site.</p> <p>Description of Job Step: The wording for each job step should begin with an “Action” word like “remove,” “open,” or “weld.” The action is completed by naming the item to which the action (verb) applies; for example, “remove extinguisher,” “aim hose,” “squeeze lever.”</p>	<p>3RD COLUMN</p> <p>Risk Hazard Rank: The identified hazards for each step should be described in terms of probability, consequence and hazard classification. The probability, or likeliness, that the hazard will occur should be ranked from <u>A (almost certain) to E (rare)</u>, and the consequence, or severity, of the injury if it were to happen, should be ranked from <u>1 (minor) to 5 (catastrophic)</u>. The consequence and probability are then cross-referenced in the matrix to determine the classification of the hazard, from <u>low to critical</u>. The classification of the hazard can then be used to prioritize hazard mitigation controls and show workers where they need to pay the most attention on the job.</p> <table border="1" style="margin-left: auto; margin-right: auto; text-align: center; border-collapse: collapse;"> <tr> <td colspan="2" rowspan="2"></td> <td colspan="5">Consequence</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td colspan="2"></td> <td>Minor</td> <td>Medium</td> <td>Serious</td> <td>Major</td> <td>Catastrophic</td> </tr> <tr> <td rowspan="5" style="writing-mode: vertical-rl; transform: rotate(180deg);">Probability</td> <td>A – Almost Certain</td> <td>Moderate</td> <td>High</td> <td>Critical</td> <td>Critical</td> <td>Critical</td> </tr> <tr> <td>B – Likely</td> <td>Moderate</td> <td>High</td> <td>High</td> <td>Critical</td> <td>Critical</td> </tr> <tr> <td>C – Possible</td> <td>Low</td> <td>Moderate</td> <td>High</td> <td>Critical</td> <td>Critical</td> </tr> <tr> <td>D – Unlikely</td> <td>Low</td> <td>Low</td> <td>Moderate</td> <td>High</td> <td>Critical</td> </tr> <tr> <td>E – Rare</td> <td>Low</td> <td>Low</td> <td>Moderate</td> <td>High</td> <td>High</td> </tr> </table>			Consequence					1	2	3	4	5			Minor	Medium	Serious	Major	Catastrophic	Probability	A – Almost Certain	Moderate	High	Critical	Critical	Critical	B – Likely	Moderate	High	High	Critical	Critical	C – Possible	Low	Moderate	High	Critical	Critical	D – Unlikely	Low	Low	Moderate	High	Critical	E – Rare	Low	Low	Moderate	High	High
				Consequence																																															
		1	2	3	4	5																																													
		Minor	Medium	Serious	Major	Catastrophic																																													
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	C – Possible	Low	Moderate	High	Critical	Critical																																													
	D – Unlikely	Low	Low	Moderate	High	Critical																																													
	E – Rare	Low	Low	Moderate	High	High																																													
<p>2ND COLUMN</p> <p>Potential Hazard: Examples of hazards are “head injuries,” “electric shock,” or “trench collapse.”</p> <p>Source of Potential Hazard: Examples of hazard sources are “overhead equipment,” “working around high voltage,” or “working in trenches.”</p> <p>Ask and discuss these questions:</p> <ol style="list-style-type: none"> 1. Is there a danger of striking against, being struck by, or otherwise being injured by contacting an object? 2. Can the worker be caught in, on, or between objects? 3. Can the worker slip or trip? Could they fall on the same level or to another? 4. Can the worker strain themselves by pushing, pulling, or lifting? 5. Is the environment hazardous (toxic gasses, vapors, mists, fumes, dusts or heat)? 6. Can the tools cause a problem, can they cut, fail or malfunction? 7. Can things splash or be thrown toward the employee? 8. Could dangers be created if the task steps are completed out of sequence? 9. Are there gages or other instruments that must be watched and reacted to properly if the job is to be done safely? 	<p>5TH COLUMN</p> <p>Hazard Mitigation Control: Mitigation controls should precisely state what to do and how to do it. Example: Set wrench securely. Test its grip by exerting a slight pressure on it. Brace yourself against something immovable, or take a solid stance with feet wide apart, before exerting pressure. This prevents loss of balance if the wrench slips.</p> <p>General precautions like “Be alert,” “Use caution,” or “Be careful” are not useful.</p>																																																		
<p>4TH COLUMN</p> <p>Body Part Affected: What body part could be injured by the potential hazard?</p> <p>Type of Affect: i.e., inhalation, impact, splash, falling object, etc.</p> <p>Is PPE Required? Yes or No</p> <p>Type of PPE Required: i.e., hard hat, safety glasses, steel toes, Tyvek, gloves, etc.</p>																																																			

Completed JSAs should be stored in the SSHASP and reviewed during the Daily Safety Meeting.

FORM 4

Behavior Based Safety Encounter Form



BEHAVIOR BASED SAFETY ENCOUNTER FORM

Project Title & Task: _____

Observer's Name: _____ Project Number: _____

Encounter Date: _____ Time: _____ Duration: _____

How many people were observed?		
Task Observed		
Interaction Comments:		
Was a pre-task hazard assessment conducted? (yes or no):		
Remedial Actions (Commitments by Participants):	By who:	Date to be completed:

BEHAVIOR BASED SAFETY ENCOUNTER FORM (continued)

Project Title & Task: _____

Observer's Name: _____ Project Number: _____

Encounter Date: _____ Time: _____ Duration: _____

Interaction Categories		Select all the categories that apply and indicate a desired (✓) and/or undesired (✗) behaviour count for each.
Condition of Work Area		
<input type="checkbox"/> Work area Clean & Orderly	<input type="checkbox"/> Slips, Trips Fall Hazards	<input type="checkbox"/> Adequate lighting
<input type="checkbox"/> Work area barrier in place	<input type="checkbox"/> Air Quality	<input type="checkbox"/> Visibility to heavy equipment
Body position and ergonomics		
<input type="checkbox"/> Movements & positions - lifting / carrying	<input type="checkbox"/> Contact with-Electric current	<input type="checkbox"/> Movements & positions-Avoiding pinch points
<input type="checkbox"/> Movements & positions - overexertion / strain	<input type="checkbox"/> Movements & positions - bending / twisting	<input type="checkbox"/> Movements & positions - repetitive acts / movements
Body protection and PPE		
<input type="checkbox"/> Protecting hearing	<input type="checkbox"/> Protecting respiratory system	<input type="checkbox"/> Protecting the-body
<input type="checkbox"/> Protecting the-head	<input type="checkbox"/> Protecting the-eyes / face	<input type="checkbox"/> Protecting the-feet
<input type="checkbox"/> Protecting the-hands / arms		
Equipment and tools		
<input type="checkbox"/> Tool / equipment selection - correct for job and proper use	<input type="checkbox"/> Tool/equipment selection - good condition/proper storage	<input type="checkbox"/> Pre-op equipment inspection
Practices and housekeeping		
<input type="checkbox"/> Controls implemented for identified hazards	<input type="checkbox"/> Hazardous materials - use and storage requirements followed	<input type="checkbox"/> Communicating with others about hazards / risks
<input type="checkbox"/> Rushing / multi-tasking	<input type="checkbox"/> Walking and working surfaces/platforms (clear and clean)	<input type="checkbox"/> Proper workplace housekeeping maintained
Procedures / permits		
<input type="checkbox"/> Proper procedures followed	<input type="checkbox"/> Management of change	<input type="checkbox"/> Run-off is controlled
<input type="checkbox"/> Work at heights (protecting from fall hazards)	<input type="checkbox"/> Lifting (following safe work practices)	<input type="checkbox"/> Isolation (proper use of lock-out/tag-out)
<input type="checkbox"/> Confined spaces (following safe work practices)	<input type="checkbox"/> Hot work (following safe work practices)	<input type="checkbox"/> Dust control procedures followed (minimizing dust)
<input type="checkbox"/> Hazardous materials - proper segregation & disposal	<input type="checkbox"/> Hydrocarbon pollution prevention measures taken	
Vehicles / mobile equipment and driving		
<input type="checkbox"/> Eyes on direction of travel	<input type="checkbox"/> Pre-shift inspection	<input type="checkbox"/> Securing parked vehicles
<input type="checkbox"/> Vehicle speed (driving to conditions / speed limits)	<input type="checkbox"/> Wearing seatbelt	<input type="checkbox"/> Operating Safely (interaction between people & equipment)
Weather		
<input type="checkbox"/> Protecting from cold stress	<input type="checkbox"/> Protecting from heat stress	<input type="checkbox"/> Protecting from lightning
<input type="checkbox"/> Protecting from rain	<input type="checkbox"/> Protecting from (UV exposure)	

FORM 5

Incident Investigation Report Form

INCIDENT INVESTIGATION REPORT FORM

Attach additional pages as necessary, if more than one employee was injured, each employee must fill out their own form. This form should also be used to report near-misses and property or environmental damage.

Incident Investigator to fill out:		
Reportable / Recordable / Non-Recordable / Near Miss / Property Damage / Environmental Damage		Case Number from OSHA 300 Log:
Site:	Project Number:	
SECTION 1: INCIDENT REPORT		
<u>Employee Injured, Ill, or Deceased</u> (Skip this box for near-miss and property or environmental damage)		
Name:		
Address:		
Date of Birth:		
Date Hired:		
Male / Female		
<u>Names and Project Roles of Other Affected Personnel</u> (Witnesses of incident and/or personnel involved in near-miss or property or environmental damage)		
Site Project Manager		
Event Date	Event Time	Time Personnel Began Work
Exact Location of Event: (description or address, if available)		
Event Resulted in: (circle one) Fatality / Injury / Illness / Near-Miss / Property Damage / Environmental Damage		
If fatality, date of death: ___ / ___ / ___		
Nature of the Event: (brief summary including body parts affected and/or property that was damaged)		
Object or substance that directly harmed the employee or property: (Leave blank if not applicable)		
Task Being Performed Just Prior To The Incident: (Describe the work objective, the specific activity being carried out, and any tools or equipment being used)		

SECTION 1

Incident Investigator to fill out:	
Reportable / Recordable / Non-Recordable / Near Miss / Property Damage / Environmental Damage	Case Number from OSHA 300 Log:
Site:	Project Number:
Did the incident involve a vehicle? (include full description of vehicle and rental agency information if appropriate)	
Full Description of Incident: (include task being performed, how the event occurred, equipment being used at the time, materials involved, workplace condition, and any other impacts)	
Was First Aid Given? (Yes or No – Skip to next section if No)	
	Name of First Aid Attendant(s):
	List First Aid Given:
Was Medical Treatment Beyond First Aid Necessary? (Yes or No – Skip to next section if No)	
	Was Employee Treated in an Emergency Room? (Yes or No)
	Was Employee Hospitalized overnight as an in-patient? (Yes or No)
	Type of Emergency Transportation: (i.e., ambulance)
	Location of Medical Treatment Facility: Name: Address: Phone number:
	Name of Doctor Providing Medical Treatment:
	Expected Length of Medical Leave Resulting from Incident:
	Medical Diagnosis:
Section 1 Completed by: _____ Title: _____ Phone: _____ Date: _____	

SECTION 1

Incident Investigator to fill out:																															
Reportable / Recordable / Non-Recordable / Near Miss / Property Damage / Environmental Damage	Case Number from OSHA 300 Log:																														
Site:	Project Number:																														
SECTION 2: INVESTIGATION REPORT (to be filled out by Incident Investigator)																															
<p>Witness statements: (attach sheets as necessary, or NA if no witnesses)</p> 																															
<p>Evidence collected:</p> 																															
<p>Factors in Incident: (check all that apply)</p> <table style="width:100%; border: none;"> <tr> <td><input type="checkbox"/> Mental stress factor</td> <td><input type="checkbox"/> Fatigue</td> <td><input type="checkbox"/> Remote site health</td> </tr> <tr> <td><input type="checkbox"/> Alcohol/drugs</td> <td><input type="checkbox"/> Exposure to sound/noise</td> <td><input type="checkbox"/> Exposure to particulates</td> </tr> <tr> <td><input type="checkbox"/> Biological exposure</td> <td><input type="checkbox"/> Mechanical vibration</td> <td><input type="checkbox"/> Cold Stress</td> </tr> <tr> <td><input type="checkbox"/> Chemical exposure</td> <td><input type="checkbox"/> Travel health</td> <td><input type="checkbox"/> Heat Stress</td> </tr> <tr> <td><input type="checkbox"/> Exposure to ionizing radiation</td> <td><input type="checkbox"/> Exposure to non-ionizing radiation</td> <td><input type="checkbox"/> Pre-existing medical condition</td> </tr> <tr> <td><input type="checkbox"/> Exposure to gas or vapour</td> <td><input type="checkbox"/> Repetitive movements</td> <td><input type="checkbox"/> Working at height</td> </tr> <tr> <td><input type="checkbox"/> Other muscular stress</td> <td><input type="checkbox"/> Other health/exposure</td> <td><input type="checkbox"/> Workplace design</td> </tr> <tr> <td><input type="checkbox"/> Non-compliance</td> <td><input type="checkbox"/> Equipment/property design</td> <td><input type="checkbox"/> Lifting/Hoisting</td> </tr> <tr> <td><input type="checkbox"/> Electrical</td> <td><input type="checkbox"/> Equipment/property fire</td> <td><input type="checkbox"/> Equipment/property damage</td> </tr> <tr> <td><input type="checkbox"/> Equipment failure</td> <td><input type="checkbox"/> Housekeeping</td> <td><input type="checkbox"/> Not otherwise specified</td> </tr> </table>		<input type="checkbox"/> Mental stress factor	<input type="checkbox"/> Fatigue	<input type="checkbox"/> Remote site health	<input type="checkbox"/> Alcohol/drugs	<input type="checkbox"/> Exposure to sound/noise	<input type="checkbox"/> Exposure to particulates	<input type="checkbox"/> Biological exposure	<input type="checkbox"/> Mechanical vibration	<input type="checkbox"/> Cold Stress	<input type="checkbox"/> Chemical exposure	<input type="checkbox"/> Travel health	<input type="checkbox"/> Heat Stress	<input type="checkbox"/> Exposure to ionizing radiation	<input type="checkbox"/> Exposure to non-ionizing radiation	<input type="checkbox"/> Pre-existing medical condition	<input type="checkbox"/> Exposure to gas or vapour	<input type="checkbox"/> Repetitive movements	<input type="checkbox"/> Working at height	<input type="checkbox"/> Other muscular stress	<input type="checkbox"/> Other health/exposure	<input type="checkbox"/> Workplace design	<input type="checkbox"/> Non-compliance	<input type="checkbox"/> Equipment/property design	<input type="checkbox"/> Lifting/Hoisting	<input type="checkbox"/> Electrical	<input type="checkbox"/> Equipment/property fire	<input type="checkbox"/> Equipment/property damage	<input type="checkbox"/> Equipment failure	<input type="checkbox"/> Housekeeping	<input type="checkbox"/> Not otherwise specified
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<input type="checkbox"/> Non-compliance	<input type="checkbox"/> Equipment/property design	<input type="checkbox"/> Lifting/Hoisting																													
<input type="checkbox"/> Electrical	<input type="checkbox"/> Equipment/property fire	<input type="checkbox"/> Equipment/property damage																													
<input type="checkbox"/> Equipment failure	<input type="checkbox"/> Housekeeping	<input type="checkbox"/> Not otherwise specified																													
<p>Details: (from Factors in previous section)</p> 																															

SECTION 2

Incident Investigator to fill out:

Reportable / Recordable / Non-Recordable / Near Miss / Property Damage / Environmental Damage	Case Number from OSHA 300 Log:
--	--------------------------------

Site:	Project Number:
-------	-----------------

Actual Consequence Level (1 to 5 from Section 3.0 of Incident Investigation Program)

Potential Risk Classification Table (This table is used for any incident, near-miss, or property or environmental damage to determine if the Actual Consequence Level was a reasonably expected outcome or if the outcome could have been even worse. If the Maximum Reasonable Outcome was High or Critical, Corrective Actions must be put in place to lower future Reasonable Outcomes.)

		Consequence				
		1 Minor	2 Medium	3 Serious	4 Major	5 Catastrophic
Probability	A – Almost Certain	Moderate	High	Critical	Critical	Critical
	B – Likely	Moderate	High	High	Critical	Critical
	C – Possible	Low	Moderate	High	Critical	Critical
	D – Unlikely	Low	Low	Moderate	High	Critical
	E – Rare	Low	Low	Moderate	High	High

Max Reasonable Consequence (1 to 5)		Max Reasonable Outcome <input type="checkbox"/> Critical <input type="checkbox"/> High <input type="checkbox"/> Moderate <input type="checkbox"/> Low
Max Reasonable Probability (A to E)		

Summary of Investigation Findings:

SECTION 2

Incident Investigator to fill out:	
Reportable / Recordable / Non-Recordable / Near Miss / Property Damage / Environmental Damage	Case Number from OSHA 300 Log:
Site:	Project Number:
Corrective Actions Taken to Prevent Recurrence of Event:	
Date Corrective Actions Implemented: ___ / ___ / ___	
Risk Analysis: (does the corrective action generate a new risk?)	
Section 2 Completed by: _____ Title: _____	
Phone: _____ Date: _____	

SECTION 2

List of Necessary Contacts for Notification of Incident:

- INTERA Corporate Health and Safety Officer
- INTERA Branch Office Health and Safety Coordinator
- INTERA Project Manager, as applicable
- INTERA Human Resources Manager
- Client Project Manager, as applicable
- OSHA, as applicable

Form 6

Site Visitor Log

Form 7

Vehicle Inspection Checklist

PASSENGER VEHICLE INSPECTION CHECKLIST

Project Title & Task: _____

Name of Inspector: _____ Project Number: _____

License Plate: _____ Make/Model/Color: _____

Insert a check mark  if ok, or an  if there is an item deficiency.

Date							
Tire inflation							
Lug nuts							
Exhaust System							
Brakes							
Parking brake							
Engine lubricants							
Engine Coolants							
Steering							
Windshield							
Windshield Wipers							
Heater / Defroster							
Head / tail lights							
Turn indicators							
Instrument gauges							
<i>Initials of Operator</i>							

DESCRIPTION OF DEFICIENCIES: _____

REMEDY FOR DEFICIENCIES: _____

COMMENTS: _____



HEAVY EQUIPMENT INSPECTION CHECKLIST

Project Title & Task: _____

Date: _____ Project Number: _____

Name of Inspector: _____

License Plate: _____ Make/Model/Color: _____

Insert a check mark if ok, or an if there is an item deficiency.

FROM THE GROUND

Bucket or Blade	Excessive Wear or Damage, Cracks	
Bucket or Blade Cylinder & Linkage	Excessive Wear, Damage, Leaks, Lubricate	
Stick, Cylinder	Wear, Damage, Leaks, Lubricate	
Boom, Cylinders	Wear, Damage, Leaks, Lubricate	
Underneath Machine	Final Drive Leaks, Swing Drive Leaks, Damage	
Track Sag	Tightness, Wear	
Pivot Shafts	Oil Leaks	
Carbody	Cracks, Damage	
Undercarriage	Wear, Damage, Tension	
Steps and Handholds	Condition and Cleanliness	
Batteries & Hold Downs	Cleanliness, Loose Bolts & Nuts	
Windshield Wipers & Washers	Wear, Damage, Fluid Level	
Fire Extinguisher	Charge, Damage	
Engine Coolant	Fluid Level	
Primary/Secondary Fuel Filters	Leaks, Drain Water Separator	
Air Filter	Restriction Indicator	
Hydraulic Oil Tank	Fluid Level, Damage, Leaks	
Hydraulic Oil	Filter Leaks	
Radiator	Fin Blockage, Leaks	
Hydraulic Oil Cooler	Fin Blockage, Leaks	
AC Condenser	Fin Blockage, Leaks	
Lights and Mirrors	Damage	
Engine Oil Filter	Filter Leaks	
Hydraulic Oil Filter	Filter Leaks	
Overall Machine	Loose/Missing Nuts, Bolts, Guards, Cleanliness	

ENGINE COMPARTMENT

Engine Oil	Fluid Level	
Gear Oil	Fluid Level, Leaks	
Fuel Tank	Fuel Level, Damage, Leaks	
All Hoses	Cracks, Wear Spots, Leaks	
All Belts	Tightness, Wear, Cracks	
Overall Engine Compartment	Trash or Dirt Buildup, Leaks	

INSIDE THE CAB

Seat	Adjustment	
Seat belt & Mounting	Damage, Wear, Adjustment, Age	
Horn, Travel Alarm, Lights	Proper Function	
Indicators	Proper Function	
Monitor Panel	Proper Function	
Switches	Proper Function	
Travel Controls	Correct Operation	
Mirrors Adjustment	Adjustment, Cracks/Broken	
Heating and Cooling System	Proper Function	
Overall Cab Interior	Overall Cab Interior Cleanliness	

COMMENTS: _____

Form 8

Hot Work Permit

HOT WORK PERMIT

All temporary operations involving open flames or producing heat and/or sparks require a Hot Work Permit. This includes, but is not limited to, Brazing, Cutting, Grinding, Soldering, Thawing, and Welding.

INSTRUCTIONS FOR SAFETY SUPERVISOR

1. Verify precautions listed at right (or do not proceed with the work).
2. Complete page 1 and retain for job files.
3. Post page 2 in vicinity of hot work.

Date	Job No.
Location (Be Specific)	
Description of Work Being Performed	
Name of Person/Contractor Doing Hot Work	
The above location has been examined, the precautions checked on the Hot Work Checklist have been taken to prevent fire, and permission is authorized for this work.	
Signed: _____ (Permit Authorizing Individual)	
Signed: _____ (Person doing Hot Work)	
Signed: _____ (Fire Watch)	
Time Started: Date: _____ Time: _____ AM/PM	
Date: _____ Time: _____ AM/PM	
FIRE WATCH SIGNOFF Work area and all adjacent areas to which sparks and heat might have spread were inspected during the fire watch period and were found fire safe.	
Signed: _____	
FINAL CHECKUP (minimum 30 minutes after Hot Work) Work area was monitored for _____ hour(s) following Hot Work and found fire safe.	
Signed: _____	

HOT WORK CHECKLIST

OK NA

- Hot Work Equipment in good condition (e.g., power source, welding leads, torches, etc.).
- Multi-purpose fire extinguisher and/or water pump can.

REQUIREMENTS WITHIN 35 FEET OF WORK

- Debris, flammable Liquids, dry weeds, flammable solids, and oily deposits removed.
- Explosive atmosphere in area checked for and eliminated.
- Combustible surfaces wet down and covered with damp sand or fire blankets.
- Remove flammable and combustible material where possible. Otherwise protect with fire blankets, guards, or metal shields.

WORK IN CONFINED SPACES

- Confined space cleaned of all combustibles (example: grease, oil, flammable vapors).
- Containers purged of flammable liquids/vapors.
- Follow confined space guidelines.

FIRE WATCH/HOT WORK AREA MONITORING

- Fire watch will be provided during and for 30 minutes after work, including any coffee or lunch breaks.
- Fire watch is supplied with an extinguisher, and/or water pump can, also making use of other extinguishers located throughout work area.
- Fire watch is trained in use of this equipment and familiar with fire notification procedures.
- Fire watch may be required for opposite side of vent shafts, plates, scrap metal, etc.
- Post warning sign when others are working in the vicinity

OTHER PRECAUTIONS TAKEN (LIST)

WARNING!

HOT WORK IN PROGRESS WATCH FOR FIRE!

IN CASE OF AN EMERGENCY:

CALL: FIRE DEPARTMENT

AT: 911

WARNING!

Attachment A

Job Safety Analysis Program

TABLE OF CONTENTS

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2.0	RESPONSIBILITY.....	1
3.0	PROCEDURES FOR COMPLETING A JSA AND PPE EVALUATION	1
4.0	TRAINING	4

LIST OF FORMS

Form 1: Job Safety Analysis and Personal Protective Equipment Worksheet

1.0 PURPOSE

The purpose of this Job Safety Analysis (JSA) and Personal Protective Equipment (PPE) Plan (Plan) is to provide for the protection of employees from workplace hazards by training them to identify the hazards or potential risks associated with each step of the job and to develop a solution for each hazard that will eliminate, reduce or control the exposure to the hazard. This Plan will result in a series of JSAs (which include PPE evaluations) that provide written, step-by-step procedures for reducing hazards for routine and non-routine project tasks/jobs, as necessary, along with the required PPE for each step. This Plan is an integral piece of the overall INTERA Corporate Health and Safety Program (CHSP).

2.0 RESPONSIBILITY

The Corporate Health and Safety Officer (Amy Andrews) is designated as the Plan Administrator and, as such, is responsible for the implementation of the Plan and has full authority to make the decisions necessary to provide for the success of the Plan. This authority includes hiring personnel and purchasing the equipment necessary to implement and operate the Plan. Branch Health and Safety Coordinators are the designated representative of the Corporate Health and Safety Officer, and are responsible for implementation and operation of the Plan in each branch office. The Plan has been developed in accordance with the requirements of 29 CFR 1910.132 and covers each of the basic elements in the regulations. The Corporate Health and Safety Officer will review the Plan annually and will amend these instructions when necessary.

INTERA employees whose work includes performing field activities at client sites and locations that where job hazards may exist (including, but not limited to, hazardous wastes) and/or PPE is required for the safe conduct of work will be trained to the Plan. The Corporate Health and Safety Officer or Branch Health and Safety Coordinator will be responsible for ensuring that these employees are trained in the provisions of this Plan.

All INTERA personnel have the authority to stop an activity if it is being performed in a hazardous manner. If an employee believes that he or she is being asked to perform work in an unsafe environment, that employee is authorized to decline the request. Employees are encouraged to communicate their health and safety concerns to the Corporate Health and Safety Officer, Branch Health and Safety Coordinators, Project Managers and/or Site Safety Officers to implement changes to work procedures where needed to reduce injury and illness exposures in the workplace. Additionally, the Corporate Health and Safety Officer, Branch Health and Safety Coordinators, Project Managers and/or Site Safety Officers have the authority to halt operations because of non-compliance with the provisions of this Plan. It is the responsibility of the Site Safety Officer to inspect field project areas for compliance with the Plan.

3.0 PROCEDURES FOR COMPLETING A JSA AND PPE EVALUATION

JSAs (which include PPE evaluations) should be completed for each routine and non-routine project task, as necessary, prior to that task being performed and when there are changes in the steps of the task. The JSA process is to be used when required by the host facility, when directed by the Corporate Health and Safety Officer, Branch Office Health and Safety Coordinator, Project Manager or Site Safety Officer, or when the Risk Hazard Rank presented below is moderate or higher. By developing JSAs, which include a PPE evaluation, and using them for employee training, employees will have a better idea of the hazards involved with the various tasks/jobs that they may perform during conduct of activities in the field. JSAs will allow employees to think about the steps required to complete each task, to identify the hazards associated with each step of the task, and to eliminate, reduce or control the identified hazards including the appropriate PPE to use to mitigate the hazard. Employees who are new to a job will receive instructions in hazard avoidance in a logical, organized manner, and employees who are familiar with the job will be reminded of

tasks that require more attention to detail in order to complete them safely. Safety observations can be made by using the completed JSA as a guide during the safety audit review process described in the Behavior-Based Safety Program in **Appendix 13** or as part of the Incident Investigation procedures in **Appendix 3**.

Create the Right Environment

Personnel who complete JSAs should be employees who have good attention to detail, think logically, and have a good grasp of the procedures required to complete each task/job. JSAs should be completed in advance of the activity being performed, although it is acceptable to fill it out at the site, immediately before the task will be performed. At the beginning of each work day, applicable JSAs should be incorporated into the Safety Meeting attended by everyone who will be involved with the task(s) (including subcontractors). Items to discuss during the Safety Meeting include the proper steps necessary to complete each task/job, associated hazards with each step and the procedures to be used to eliminate, reduce or control the identified hazards, including use of appropriate PPE. The hazard assessment is meant to determine if hazards are present, or are likely to be present, that necessitate the use of PPE or other hazard mitigation measures. PPE will be selected that best protects affected employees from the hazards identified. Written certification that the hazard assessment has been completed is required per 1910.132(d)(2) and is accomplished through completion of the form **Job Safety Analysis and Personal Protective Equipment Worksheet** which is included as **Form 1** at the end of this Plan. Worksheets will be kept with the Site-Specific Health and Safety Plan (SSHASP) or on file in designated corporate health and safety file cabinets and/or each branch office, as appropriate. Employees need to know that the purpose of the JSA is to study the job and make it standardized and safer. Workers are welcome to add to the JSA whenever they feel a hazard exists that has not been identified as part of the task and has not already been addressed in the JSA.

Identify Job Steps

When completing a JSA Worksheet, attached as **Form 1** to this Plan, step numbers are listed in the first column of the worksheet followed by a description of the step in the worksheet of an action in the second column of the worksheet. The wording for each job step should begin with an “Action” word like “remove,” “open,” or “weld.” The action is completed by naming the item to which the action (verb) applies; for example, “remove extinguisher,” “aim hose,” “squeeze lever.”

Identify Potential Hazards and Sources of Hazards

In the 3rd and 4th columns of the worksheet, hazards and hazard sources should be listed for each step. Employees and subcontractors may be actively involved in the hazard identification process, as appropriate. Examples of hazards are “head injuries,” “electric shock,” or “trench collapse.” Examples of hazard sources are “overhead equipment,” “working around high voltage,” or “working in trenches.” Examples of mitigation procedures are “wear hardhat that is properly fitted and in good condition”, “follow proper lock out/tag out procedures” or “follow proper trench collapse protection procedures”. The JSA should identify hazards that are present or could be present along with any problems that have occurred in the past. Additionally, for each identified hazard, a method for mitigating the exposure to the hazard should be identified. The purpose of the JSA is to identify hazards produced by the environment (tools, workstation, and site) as well as hazards connected with the job procedure. The following list of questions that will serve as initial training in identifying hazards

1. Is there a danger of striking against, being struck by, or otherwise being injured by contacting an object?
2. Can the worker be caught in, on, or between objects?
3. Can the worker slip or trip? Could they fall on the same level or to another?

4. Can the worker strain themselves by pushing, pulling, or lifting?
5. Is the environment hazardous (toxic gasses, vapors, mists, fumes, dusts or heat)?
6. Can the tools cause a problem, can they cut, fail or malfunction?
7. Can things splash or be thrown toward the employee?
8. Could dangers be created if the task steps are completed out of sequence?
9. Are there gages or other instruments that must be watched and reacted to properly if the job is to be done safely?

Risk Hazard Rank

In the next three columns, the identified hazards should be described in terms of probability, consequence and hazard classification, according to the table below. The probability, or likeliness, that the hazard will occur should be ranked from A (almost certain) to E (rare), and the consequence, or severity, of the injury if it were to happen, should be ranked from 1 (minor) to 5 (catastrophic). The consequence and probability should then be cross-referenced in the table below to determine the classification of the hazard, from low to critical. The classification of the hazard can then be used to prioritize hazard mitigation controls and show workers where they need to pay the most attention on the job.

		Consequence				
		1 Minor	2 Medium	3 Serious	4 Major	5 Catastrophic
Probability	A – Almost Certain	Moderate	High	Critical	Critical	Critical
	B – Likely	Moderate	High	High	Critical	Critical
	C – Possible	Low	Moderate	High	Critical	Critical
	D – Unlikely	Low	Low	Moderate	High	Critical
	E – Rare	Low	Low	Moderate	High	High

Develop Recommendations for PPE

In the next four columns, a determination for the required PPE is made. Columns 8 and 9 indicate the body part and type of affect anticipated by the hazard identified for the job step such as, the hazard is a contaminated groundwater during water well sampling, the body part impacted could be the eyes, and the type of affect could be chemical splash. Then in columns 10 and 11 eleven, whether PPE is necessary and what type of PPE would be required. In our example column ten would indicate yes and 11 would indicate splash-proof glasses/goggles.

The results of this assessment will be included in the SSHASP. Employees will be notified of the JSA results and the reasons why specific types of PPE were chosen for the work activities. The types of PPE selected for specific work activities will be also be defined in the SSHASP, which employees must read and sign prior to commencing work (refer to the [Site Personnel Acknowledgement Form in Appendix 9](#)). Acknowledgement Forms will be kept with the SSHASP in project files for the duration of the project.

Employees will be provided with the proper, clean, and reliable PPE for the job at no charge to the employee. Efforts will be made (when practical) to provide the employees with a selection of PPE types so they can choose the best PPE for their needs and comfort. Employees are responsible for inspecting their personal protective equipment before each use. If it is damaged or defective, or even appears so, it is not to be used, and the employee is to obtain replacement PPE. INTERA must pre-approve the use of any employee-provided PPE.

Develop Recommendations for Mitigating Hazards

In the last column, the Hazard Mitigation Control should be listed for each step of the process. Hazard Mitigation Controls must be specific and concrete. General precautions like “Be alert,” “Use caution,” or “Be careful” are not useful. Mitigation controls should precisely state what to do and how to do it. This recommendation – “make certain the wrench does not slip or cause loss of balance” is only partially helpful. It does not tell how to prevent the wrench from slipping. An effective mitigation control tells both “what” and “how” as illustrated by the following example: “Set wrench securely. Test its grip by exerting a slight pressure on it. Brace yourself against something immovable, or take a solid stance with feet wide apart, before exerting pressure. This prevents loss of balance if the wrench slips.”

Proper Job Instruction

After the JSA has been completed, it should be readily available to all workers for review during the Daily Safety Meetings. JSAs will also be available at the job site if questions arise regarding how to perform the job safely and efficiently. JSAs should be reviewed daily and at the beginning of each task and are not to be used only for occasional reference, such as when an incident occurs.

When conducting training on job-specific JSAs and PPE:

1. Have a plan. By reading the JSA, the trainer can obtain the knowledge to do the job correctly and safely. Convey to the employee how much skill you expect him/her to have and how soon you expect them to have that skill.
2. Have everything ready. The right equipment, materials, PPE and supplies should be in place before you begin teaching the employee so the steps will occur in an orderly, organized fashion. Have the workplace arranged as the employee will see it when they work and as they are expected to keep it.

Job-specific training will be performed by the Project Manager or Site Safety Officer at the beginning of the job and whenever job duties change. Training will be documented on the [Daily Safety Meeting Form](#), which can be found in **Appendix 9** of this CHSP.

4.0 TRAINING

INTERA employees who are working in areas where job hazards may exist or who may be required to use and wear PPE will be trained in the contents of this Plan. Training to the Plan is accomplished through reading and acknowledgement. Employees receive a copy of the JSA and PPE Plan (**Appendix 12** of the CHSP) at commencement of employment and after each revision. Employees working in an area where job hazards may exist or identified as having to use and wear PPE are required to sign the Acknowledgment page at the front of the Plan confirming that they have read, understood, are familiar with, and will comply with the standards that have been established in the Plan. Signing of an Acknowledgment page is also required upon receipt of revisions to the Plan. Signed acknowledgement pages will be kept with a master copy of the CHSP on file in designated health and safety file cabinets at each branch office and a copy will be kept in the designated corporate health and safety files.

In addition, employees that are working in areas where job hazards exist or who use and/or need to wear PPE will be trained before start of work at each site where job hazard exist or that requires the use of PPE

as specified by 29 CFR 1910.132. Site-specific job safety training and PPE training will be documented using the **Safety Meeting Attendance Form** at the beginning of each project. Daily review of site requirements for JSAs and PPE will also be recorded on the **Safety Meeting Attendance Form** along with additional training in the event that PPE requirements change. The **Safety Meeting Attendance Form** is included in **Appendix 9** of this CHSP. PPE training will include the following:

- When PPE is necessary;
- What PPE is necessary;
- How to properly don, doff, adjust and wear PPE;
- Limitations of the PPE; and
- The proper care, maintenance, useful life and disposal of the PPE.

Retraining is required under the following circumstances:

- Changes in workplace render previous training obsolete;
- Changes in the types of PPE to be used render previous training obsolete; and
- Inadequacies in an employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill.

In addition to the initial and site-specific PPE training as described above, annual PPE training and review is provided for employees that may be exposed to hazardous substances as part of their OSHA 40-hour HAZWOPER training and annual 8-hour refresher training for general site workers. PPE training records will be kept on file in designated health and safety file cabinets in the corporate office and/or each branch office, as appropriate.



JOB SAFETY ANALYSIS (JSA) AND PERSONAL PROTECTIVE EQUIPMENT (PPE) WORKSHEET

Project Site Evaluated: _____ Project Task Evaluated: _____

Name of Person Completing Assessment: _____ Project Number: _____ Date: _____

Use additional sheets as necessary.

<input style="width: 100%; height: 100%;" type="text"/> Step # DESCRIPTION OF JOB STEP:	POTENTIAL HAZARD	RISK HAZARD RANK PROBABILITY	BODY PART AFFECTED	HAZARD MITIGATION CONTROL:
		CONSEQUENCE	TYPE OF AFFECT	
	SOURCE OF POTENTIAL HAZARD	HAZARD CLASSIFICATION	IS PPE REQUIRED?	
			TYPE OF PPE REQUIRED:	
<input style="width: 100%; height: 100%;" type="text"/> Step # DESCRIPTION OF JOB STEP:	POTENTIAL HAZARD	RISK HAZARD RANK PROBABILITY	BODY PART AFFECTED	HAZARD MITIGATION CONTROL:
		CONSEQUENCE	TYPE OF AFFECT	
	SOURCE OF POTENTIAL HAZARD	HAZARD CLASSIFICATION	IS PPE REQUIRED?	
			TYPE OF PPE REQUIRED:	
<input style="width: 100%; height: 100%;" type="text"/> Step # DESCRIPTION OF JOB STEP:	POTENTIAL HAZARD	RISK HAZARD RANK PROBABILITY	BODY PART AFFECTED	HAZARD MITIGATION CONTROL:
		CONSEQUENCE	TYPE OF AFFECT	
	SOURCE OF POTENTIAL HAZARD	HAZARD CLASSIFICATION	IS PPE REQUIRED?	
			TYPE OF PPE REQUIRED:	
<input style="width: 100%; height: 100%;" type="text"/> Step # DESCRIPTION OF JOB STEP:	POTENTIAL HAZARD	RISK HAZARD RANK PROBABILITY	BODY PART AFFECTED:	HAZARD MITIGATION CONTROL:
		CONSEQUENCE	TYPE OF AFFECT:	
	SOURCE OF POTENTIAL HAZARD	HAZARD CLASSIFICATION	IS PPE REQUIRED?	
			TYPE OF PPE REQUIRED:	

Attachment B

Behavior Based Safety Program

TABLE OF CONTENTS

1.0	PURPOSE.....	1
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3.0	GUIDANCE FOR PERFORMING BEHAVIOR-BASED SAFETY ENCOUNTERS	2
4.0	TRAINING	3

LIST OF FORMS

Form 1: Behavior-Based Safety Encounter Form

1.0 PURPOSE

The purpose of this Behavior-Based Safety (BBS) Program is to maintain a superior organizational safety culture and communication throughout INTERA. A behavior-based safety approach promotes people-focused interventions, incorporating one-on-one or group observations of employees performing work tasks, setting goals for improving task safety and giving feedback on safety-related behavior. This Program is an integral piece of the overall INTERA Corporate Health and Safety Program (CHSP). The BBS Program is designed to:

- Engage, motivate, assist, reinforce and sustain safe behaviors,
- Examine motivation underlying behaviors in order to increase safe behavior,
- Be an on-going effort continually promoting sustainable, positive results,
- Emphasize increasing safe behaviors, and
- Aims to understand causes of incidents and near misses and correct them through behavior of appropriate people.

The BBS Program is a safety audit process that helps personnel identify and choose a safe behavior over an unsafe one. This process is designed to open the communication lines between personnel to reinforce safe behaviors and correct unsafe behaviors in order to eliminate incidents, including accidents and illnesses. Safety in the workplace is based on the following components:

- A specific person's physical capabilities, experience, and training.
- The environment the specific person works in, including engineering controls, equipment available for the task, and the job task itself.
- The specific person's behavior while performing the task.

The BBS Program is based on behavioral observations by someone not involved in the task, a review of the observations (both safe and unsafe behaviors), positive reinforcement on the safe behaviors, non-threatening feedback on the unsafe behaviors, and improvement goals. These observations provide direct, measurable information on safe work practices, and personnel should be aware that they may be observed at any time.

2.0 RESPONSIBILITY

The Corporate Health and Safety Officer (Amy Andrews) is designated as the Program Administrator and, as such, is responsible for this Program and has the authority to make necessary decisions regarding hiring personnel and purchasing the equipment necessary to implement and operate the Program. Branch Health and Safety Coordinators are the designated representative of the Corporate Health and Safety Officer and are responsible for implementation and operation of this Program in each branch office. The Corporate Health and Safety Officer will review the Program annually and will amend these instructions as necessary.

INTERA employees whose work includes performing field activities at client sites will be trained to this Program. The Corporate Health and Safety Officer or Branch Health and Safety Coordinator will be responsible for ensuring that these employees are trained in the provisions of this Program.

All INTERA personnel have the authority to stop an activity if it is being performed in a hazardous manner. If an employee believes that he or she is being asked to perform work in an unsafe environment, that employee is authorized to decline the request. Employees are encouraged to communicate their health and safety concerns to the Corporate Health and Safety Officer, Branch Health and Safety Coordinators, Project Managers and/or Site Safety Officers to implement changes to work procedures where needed to reduce injury and illness exposures in the workplace. Additionally, the Corporate Health and Safety Officer,

Branch Health and Safety Coordinators, Project Managers and/or Site Safety Officers have the authority to halt operations because of non-compliance with the provisions of this Program. It is the responsibility of the Site Safety Officer to inspect field project areas for compliance with the Program.

3.0 GUIDANCE FOR PERFORMING BEHAVIOR-BASED SAFETY ENCOUNTERS

Employees performing behavior-based observations will be trained on how to accurately and effectively use the Behavior-Based Safety Encounter Form, Form 1 of this appendix. Initial training is provided in the following guidelines. Additional training will take place on-the-job by an experienced employee, Project Manager or Site Safety Officer or by third-party training consultants. Employees performing observations:

- shall inform the person that they are being observed and shall remain clearly visible during observation,
- shall look for both safe and at-risk behaviors,
- shall complete the Behavior-Based Safety Encounter Form, Form 1 of this appendix by completing the appropriate sections for the task being performed,
- shall consider what behaviors mean when observing, reporting and delivering feedback,
- shall consider feedback training and role play and/or mentoring and coaching when appropriate,
- shall give prompt and effective feedback based on the observation summarizing positive safety behaviors that were observed then one or two areas that require change.

Behavior-Based Safety Encounter Forms are available as Form 1 of this Appendix. The steps for a person conducting a BBS Encounter are as follows:

1. Identify a person doing a job task for observation.
2. Familiarize yourself with the potential risks of this task.
3. Observe the work being performed and ask yourself these questions:
 - a. Is the person wearing the proper Personal Protective Equipment (PPE) for the task?
 - b. Is the person following a logical sequence of work?
 - c. Is the person performing any safe or unsafe acts?
 - d. Are the working conditions safe?
4. After the person has finished the task (do not interrupt), approach him or her to discuss your observations.
5. Recognize and complement the person for specific safe behaviors.
6. Involve the person in a discussion of the task (ask questions, listen). Ask these questions:
 - a. What PPE is required for this task?
 - b. Is there a Job Safety Analysis or a Standard Operation Procedure (SOP) for this task?
 - c. Is there anything we can do to make your job safer and do you have safety concerns?
7. Review behaviors and conditions that could be improved and ask the person to make a personal commitment to improve at least one aspect of his or her work.
8. Thank the person for taking the time to participate in your Behavior-Based Safety Encounter.
9. Document the encounter. Behaviors to be improved only need to be documented on the form if it is necessary to inform someone other than the person involved in the encounter.

Completed Behavior-Based Safety Encounter Forms will be kept in the SSHASP, branch Health and Safety files and Corporate Health and Safety Files and reviewed annually to ensure that safe behaviors are being

continued. Completed Behavior-Based Safety Encounter Forms will be used to gather data and perform trend analysis. Whenever possible, at least four Behavior-based Safety Encounter Forms will be prepared each year for trend analysis which will be performed annually. Once the trend analysis is performed, if the trend analysis indicates a need for improvement, an action plan will be developed and communicated to employees by personal communication, safety meeting, or email. The action plan should be specific and focused on the safety elements in need of improvement.

4.0 TRAINING

INTERA employees whose work includes performing field activities at client sites will be trained to this Program. Training to the BBS Program is accomplished through reading and acknowledgement. Employees receive a copy of the BBS Program (**Appendix 13** of the CHSP) at commencement of employment and after each revision, and employees identified as performing field activities at client sites are required to sign the Acknowledgment page at the front of the BBSP confirming that they have read, understood, are familiar with, and will comply with the standards that have been established in the Program. Signing of an Acknowledgement page is also required upon receipt of revisions to the Program. Signed acknowledgement pages will be kept with a master copy of the CHSP on file in designated health and safety file cabinets at each branch office and a copy will be kept in the designated corporate health and safety files.

BEHAVIOR-BASED SAFETY ENCOUNTER FORM

Work Site Observed:		
Interaction Date:	Interaction Start Time:	Interaction Duration:
Observers Names:		
How many people were observed?		
Task Observed		
Interaction Comments:		
Was a pre-task hazard assessment conducted? (yes or no):		
If yes, what hazards were identified?		
Remedial Actions (Commitments by Participants):	Who:	Date to be completed:

BEHAVIOR-BASED SAFETY ENCOUNTER FORM (continued)

Interaction Categories		Select all the categories that apply and indicate a desired (✓) and/or undesired (✗) behaviour count for each.
Condition of Work Area		
<input type="checkbox"/> Work area Clean & Orderly	<input type="checkbox"/> Slips, Trips Fall Hazards	<input type="checkbox"/> Adequate lighting
<input type="checkbox"/> Work area barrier in place	<input type="checkbox"/> Air Quality	<input type="checkbox"/> Visibility to heavy equipment
Body position and ergonomics		
<input type="checkbox"/> Movements & positions - lifting / carrying	<input type="checkbox"/> Contact with-Electric current	<input type="checkbox"/> Movements & positions-Avoiding pinch points
<input type="checkbox"/> Movements & positions - overexertion / strain	<input type="checkbox"/> Movements & positions - bending / twisting	<input type="checkbox"/> Movements & positions - repetitive acts / movements
Body protection and PPE		
<input type="checkbox"/> Protecting hearing	<input type="checkbox"/> Protecting respiratory system	<input type="checkbox"/> Protecting the body
<input type="checkbox"/> Protecting the head	<input type="checkbox"/> Protecting the eyes / face	<input type="checkbox"/> Protecting the feet
<input type="checkbox"/> Protecting the hands / arms		
Equipment and tools		
<input type="checkbox"/> Tool / equipment selection - correct for job and proper use	<input type="checkbox"/> Tool/equipment selection - good condition/proper storage	<input type="checkbox"/> Pre-op equipment inspection
Practices and housekeeping		
<input type="checkbox"/> Controls implemented for identified hazards	<input type="checkbox"/> Hazardous materials - use and storage requirements followed	<input type="checkbox"/> Communicating with others about hazards / risks
<input type="checkbox"/> Rushing / multi-tasking	<input type="checkbox"/> Walking and working surfaces/platforms (clear and clean)	<input type="checkbox"/> Proper workplace housekeeping maintained
Procedures / permits		
<input type="checkbox"/> Proper procedures followed	<input type="checkbox"/> Management of change	<input type="checkbox"/> Run-off is controlled
<input type="checkbox"/> Work at heights (protecting from fall hazards)	<input type="checkbox"/> Lifting (following safe work practices)	<input type="checkbox"/> Isolation (proper use of lock-out/tag-out)
<input type="checkbox"/> Confined spaces (following safe work practices)	<input type="checkbox"/> Hot work (following safe work practices)	<input type="checkbox"/> Dust control procedures followed (minimizing dust)
<input type="checkbox"/> Hazardous materials - proper segregation & disposal	<input type="checkbox"/> Hydrocarbon pollution prevention measures taken	
Vehicles / mobile equipment and driving		
<input type="checkbox"/> Eyes on direction of travel	<input type="checkbox"/> Pre-shift inspection	<input type="checkbox"/> Securing parked vehicles
<input type="checkbox"/> Vehicle speed (driving to conditions / speed limits)	<input type="checkbox"/> Wearing seatbelt	<input type="checkbox"/> Operating Safely (interaction between people & equipment)
Weather		
<input type="checkbox"/> Protecting from cold stress	<input type="checkbox"/> Protecting from heat stress	<input type="checkbox"/> Protecting from lightning
<input type="checkbox"/> Protecting from rain	<input type="checkbox"/> Protecting from (UV exposure)	

Attachment C

Heat and Cold Stress Casualty Prevention Program

HEAT & COLD STRESS

CASUALTY PREVENTION PLAN

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1.0 HEAT STRESS CASUALTY PREVENTION PLAN

The increase in ambient air temperature and decreased body ventilation caused by protective outerwear creates an increase in the potential for injury, specifically, heat stress. Site personnel will be instructed in the identification of heat stress, the first-aid treatment procedures for the worker, and the prevention of heat stress casualties.

1.1 Sources of Heat Stress

Any process or job site that is likely to raise the workers deep core temperature (often listed as higher than 100.4 degrees F (38°C)) raises the risk of heat stress. Operations involving high air temperatures, radiant heat sources, high humidity, direct physical contact with hot objects, or strenuous physical activities have a high potential for inducing heat stress in employees. Outdoor operations conducted in hot weather especially those that require workers to wear semi-permeable or impermeable protective clothing, are also likely to cause heat stress among exposed workers.

Age, weight, degree of physical fitness, degree of acclimatization, metabolism, dehydration, use of alcohol or drugs, and a variety of medical conditions such as hypertension all affect a person's sensitivity to heat. However, even the type of clothing worn must be considered. Prior heat injury predisposes an individual to additional injury. Individual susceptibility varies. In addition, environmental factors include more than the ambient air temperature. Radiant heat, air movement, conduction, and relative humidity all affect an individual's response to heat.

1.2 Identification and Treatment of Heat Stress

Heat stress disorders include heat stroke (which can result in death), heat exhaustion (which can result in loss of consciousness, but responds well to treatment), heat cramps, heat rashes, and heat fatigue. The following sections list specifics on each condition, and how to treat the condition.

1.2.1 Heat Stroke

Heat Stroke is the most serious heat related disorder and occurs when the body's temperature regulation fails and body temperature rises to critical levels. The condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict. Heat stroke is a medical emergency that may result in death.

Symptoms: The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature (between 107°F and 110°F). Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly.

First Aid: If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady, cool 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 worker's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protests, 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.

1.2.2 Heat Exhaustion

Heat exhaustion can be a precursor to heat stroke. However, unlike heat stroke, heat exhaustion responds readily to prompt treatment.

Symptoms: Usually begins with headache, nausea, vertigo, muscle weakness, thirst, and giddiness. Vomiting is common and the bowels may move involuntarily. The worker is very pale, his skin is clammy, and he may perspire profusely. The pulse is weak and fast, and breathing is shallow. Heat collapse may occur unless he lies down. This may pass, but sometimes it remains and death could occur.

First Aid: Immediately remove the worker to in a shady or cool area with good air circulation (in Zone 2, the Contamination Reduction Zone, if at a contaminated site). Remove all protective outer wear. Treat the worker for shock (make him lie down, raise his feet 6-12 inches and keep him warm, but loosen all clothing). If the worker is conscious, it may be helpful to give him sips of a salt-water solution (one teaspoon of salt to one glass of water). If the worker does not respond quickly to first aid, obtain professional medical assistance.

1.2.3 Heat Collapse

Heat collapse is often associated with heat exhaustion. In heat collapse, the brain does not receive enough oxygen because blood pools in the extremities. As a result, the exposed individual may lose consciousness. This reaction is similar to that of heat exhaustion and does not affect the body's heat balance. However, the onset of heat collapse is rapid and unpredictable and can be dangerous especially if workers are operating machinery or controlling an operation that should not be left unattended. The worker may also be injured when he or she faints.

Symptoms: Rapid loss of consciousness, other symptoms are similar to heat exhaustion or heat stroke.

First Aid: Check to see if the worker is breathing. If he or she is breathing, position the person on his or her back. Raise the worker's legs at least 12 inches above the ground.

Remove all protective outer wear as gently as possible. Loosen any restrictive clothing or belts. If the worker does not regain consciousness within one minute, call 911. Check the person's airway to make sure it is not obstructed. Check again to see if the person is breathing, coughing, or moving. These are signs of positive circulation. If these signs are absent, start CPR until emergency personnel arrive. If the worker regains consciousness, follow first aid guidance under heat exhaustion.

1.2.4 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. Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution ($\pm 0.3\%$ NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to 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.

Symptoms: Muscle cramps, often in the legs, but could occur in any portion of the body.

First Aid: Recent studies have shown that drinking commercially available carbohydrate-electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

1.2.5 Heat Rashes

Heat Rashes are the most common problem in hot work environments where the skin is persistently wetted by unevaporated sweat.

Symptoms: Prickly heat is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Heat rash papules may become infected if they are not treated.

First Aid: In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

1.3 Prevention of Heat Stress

Acclimatize workers by exposing them to work in a hot environment for progressively longer periods. NIOSH (1986) suggests that workers who have had previous experience in jobs where heat levels are high enough to produce heat stress may acclimatize with a regimen of 50% exposure on day one, 60% on day two, 80% on day three, and 100% on day four. For new workers who will be similarly exposed, the regimen should be 20% on day one, with a 20% increase in exposure each additional day.

Replace Fluids by providing cool (50°-60°F) water or any cool liquid (except alcoholic beverages) to workers and encourage them to drink small amounts frequently, e.g., one cup every 20 minutes. Ample supplies of liquids should be placed close to the work area. Although some commercial replacement drinks contain salt, this is not necessary for acclimatized individuals because most people add enough salt to their summer diets.

Reduce the physical demands by reducing physical exertion such as excessive lifting, climbing, or digging with heavy objects. Spread the work over more individuals, use relief workers or assign extra workers. Provide external pacing to minimize overexertion.

Provide recovery areas such as air-conditioned enclosures, rooms, or work trucks and provide intermittent rest periods with water breaks.

Reschedule hot jobs for the cooler part of the day, and routine maintenance and repair work in hot areas should be scheduled for the cooler seasons of the year.

A work/rest guideline will be implemented for personnel required to wear Level C protection. The maximum wearing time guidelines are as follows:

Ambient Temperatures	Maximum Wearing Time
Above 90° F	½ hour
80° - 90° F	1 hour
70° - 80° F	2 hours
60° - 70° F	3 hours
50° - 60° F	4 hours
40° - 50° F	5 hours
30° - 40° F	6 hours
Below 30° F	8 hours

A sufficient period will be allowed for personnel to “cool down.” This may require shifts of workers during operations.

1.3.1 Personal Protective Equipment to Minimize Heat Stress

Reflective clothing, which can vary from vests and jackets to suits that completely enclose the worker from neck to feet, can reduce the radiant heat reaching the worker. However, since most reflective clothing does not allow air exchange through the garment, the reduction of radiant heat must more than offset the corresponding loss in evaporative cooling. For this reason, reflective clothing should be worn as loosely as possible. In situations where radiant heat is high, auxiliary cooling systems can be used under the reflective clothing.

Auxiliary body cooling ice vests, though heavy, may accommodate as many as 72 ice packets, which are usually filled with water. Carbon dioxide (dry ice) can also be used as a coolant. The cooling offered by ice packets lasts only 2 to 4 hours at moderate to heavy heat loads, and frequent replacement is necessary. However, ice vests do not tether the worker and thus permit maximum mobility. Cooling with ice is also relatively inexpensive.

Wetted clothing such as terry cloth coveralls or two-piece, whole-body cotton suits are another simple and inexpensive personal cooling technique. It is effective when reflective or other impermeable protective clothing is worn. This approach to auxiliary cooling can be quite effective under conditions of high temperature, good air flow, and low humidity.

1.4 Heat Stress Monitoring

Monitor workers who are at risk of heat stress, such as those wearing semi-permeable or impermeable clothing when the temperature exceeds 70°F, while working at high metabolic loads (greater than 500 kcal/hour). Personal monitoring can be done by checking the heart rate, recovery heart rate, oral temperature, or extent of body water loss.

Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by or 33%, while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33%.

The recovery heart rate can be checked by comparing the pulse rate taken at 30 seconds (P1) with the pulse rate taken at 2.5 minutes (P3) after the rest break starts. The two pulse rates can be interpreted using the following criteria.

Heart rate recovery pattern	P3	Difference between P1 and P3
Satisfactory recovery	<90	--
High recovery (Conditions may require further study)	90	10
No recovery (May indicate too much stress)	90	<10

Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period, and before the worker drinks water. Oral temperature (TO) at the beginning of the rest period should not exceed 99° F. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. However, if the TO exceeds 99.7° F at the beginning of the next period, the following work cycle should be further shortened by 33%. TO should be measured again at the end of the rest period to make sure it has dropped below 99° F.

1.5 Heat Stress Training

Workers should be properly trained on the above Heat Stress program, and should be aware of the following:

- Knowledge of the hazards of heat stress;
- Recognition of predisposing factors, danger signs, and symptoms;
- Awareness of first-aid procedures for, and the potential health effects of, heat stroke;
- Employee responsibilities in avoiding heat stress;
- Dangers of using drugs, including therapeutic ones, and alcohol in hot work environments;
- Use of protective clothing and equipment; and
- Purpose and coverage of environmental and medical surveillance programs and the advantages of worker participation in such programs.

1.6 Heat Stress References

<https://www.osha.gov/SLTC/emergencypreparedness/guides/heat.html>

2.0 COLD STRESS CASUALTY PREVENTION PLAN

Anyone working in a cold environment may be at risk of cold stress. Some workers may be required to work outdoors in cold environments and for extended periods, which creates an increase in the potential for cold stress injury. Site personnel will be instructed in the identification of cold stress, the first-aid treatment procedures for the worker, and the prevention of cold stress casualties.

2.1 Sources of Cold Stress

What constitutes extreme cold and its effects can vary across different areas of the country. In regions that are not used to winter weather, near freezing temperatures are considered "extreme cold." A cold environment forces the body to work harder to maintain its temperature. Whenever temperatures drop below normal and wind speed increases, heat can leave your body more rapidly. Wind chill is the temperature your body feels when air temperature and wind speed are combined. For example, when the air temperature is 40°F, and the wind speed is 35 mph, the effect on the exposed skin is as if the air temperature was 28°F. Cold stress occurs by driving down the skin temperature and eventually the internal body temperature (core temperature). This may lead to serious health problems, and may cause tissue damage, and possibly death.

Risk factors that contribute to cold stress include wetness/dampness, dressing improperly, and exhaustion, predisposing health conditions such as hypertension, hypothyroidism, and diabetes, and poor physical conditioning.

2.1 Identification and Treatment of Cold Stress

In a cold environment, most of the body's energy is used to keep the internal core temperature warm. Over time, the body will begin to shift blood flow from the extremities (hands, feet, arms, and legs) and outer skin to the core (chest and abdomen). This shift allows the exposed skin and the extremities to cool rapidly and increases the risk of frostbite and hypothermia. Combine this scenario with exposure to a wet environment, and trench foot may also be a problem.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is soaked in perspiration. Special protection of the hands is required to maintain manual dexterity for the prevention of accidents. Additional caution shall be exercised when workers are exposed to vibration, since blood circulation in extremities may already be impaired. Eye protection shall be worn by workers employed out of doors in a snow and/or ice terrain.

Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Provisions must be made to prevent hypothermia and secondary freezing of damaged tissues, in addition to providing for first aid treatment.

2.1.1 Hypothermia

Hypothermia occurs when body heat is lost faster than it can be replaced and the normal body temperature (98.6°F) drops to less than 95°F. Hypothermia is most likely at very cold temperatures, but it can occur even at cool temperatures (above 40°F), if a person becomes chilled from rain, sweat, or submersion in cold water.

Symptoms: In the mild symptoms of hypothermia, the exposed worker is still alert, but he or she may begin to shiver and stomp the feet in order to generate heat. As the body temperature continues to fall, symptoms will worsen and shivering will stop. The worker may lose coordination and fumble with items in

the hand, become confused and disoriented, he or she may be unable to walk or stand, pupils become dilated, pulse and breathing become slowed, and loss of consciousness can occur. A person could die if help is not received immediately.

First Aid: Call 911 immediately in an emergency; otherwise seek medical assistance as soon as possible. Move the person to a warm, dry area. Remove wet clothes and replace with dry clothes, cover the body (including the head and neck) with layers of blankets; and with a vapor barrier (e.g. tarp, garbage bag). Do not cover the face.

If medical help is more than 30 minutes away, give warm sweetened drinks if alert (no alcohol), to help increase the body temperature. Never try to give a drink to an unconscious person. Place warm bottles or hot packs in armpits, sides of chest, and groin. Call 911 for additional rewarming instructions.

If a person is not breathing or has no pulse, call 911 for emergency medical assistance immediately. Treat the worker as per instructions for hypothermia, but be very careful and do not try to give an unconscious person fluids. Check him/her for signs of breathing and for a pulse. Check for 60 seconds. If after 60 seconds the affected worker is not breathing and does not have a pulse, trained workers may start rescue breaths for 3 minutes. Recheck for breathing and pulse, check for 60 seconds. If the worker is still not breathing and has no pulse, continue rescue breathing. Only start chest compressions per the direction of the 911 operator or emergency medical services. Reassess patient's physical status periodically.

2.1.2 Frostbite

Frostbite is an injury to the body that is caused by freezing of the skin and underlying tissues. The lower the temperature, the more quickly frostbite will occur. Frostbite typically affects the extremities, particularly the feet and hands. Amputation may be required in severe cases.

Symptoms: Reddened skin develops gray/white patches. Numbness in the affected body part, and the body part feels firm or hard. In severe cases, blisters may occur in the affected part.

First Aid: Follow the recommendations described above for hypothermia. Do not rub the affected area to warm it because this action can cause more damage. Do not apply snow/water. Do not break blisters. Loosely cover and protect the area from contact. Do not try to rewarm the frostbitten area before getting medical help; for example, do not place in warm water. If a frostbitten area is rewarmed and gets frozen again, more tissue damage will occur. It is safer for the frostbitten area to be rewarmed by medical professionals. Give warm sweetened drinks, if the person is alert. Avoid drinks with alcohol.

2.1.3 Trench Foot

Trench Foot or immersion foot is caused by prolonged exposure to wet and cold temperatures. It can occur at temperatures as high as 60°F if the feet are constantly wet. Non-freezing injury occurs because wet feet lose heat 25-times faster than dry feet. To prevent heat loss, the body constricts the blood vessels to shut down circulation in the feet. The skin tissue begins to die because of a lack of oxygen and nutrients and due to the buildup of toxic products.

Symptoms: Redness of the skin, swelling, numbness, blisters

First Aid: Call 911 immediately in an emergency; otherwise seek medical assistance as soon as possible. Remove the shoes, or boots, and wet socks. Dry the feet.

2.2 Prevention of Cold Stress

Engineering controls can be used to warm the work area. For example, radiant heaters may be used to warm workers in outdoor stations. If possible, shield work areas from drafts or wind to reduce wind chill.

Safe work practices should be used to help prevent cold stress. For example, it is easy to become dehydrated in cold weather. Workers should be provided with plenty of warm sweetened liquids (avoid alcoholic drinks). If possible, heavy work should be scheduled during the warmer part of the day. Workers should be assigned to tasks in pairs (buddy system), so that they can monitor each other for signs of cold stress. Workers should be allowed to interrupt their work, if they are extremely uncomfortable. Workers should be allowed frequent breaks in warm areas (including inside a heated truck). Acclimatize new workers and those returning after time away from work, by gradually increasing their workload, and allowing more frequent breaks in warm areas, as they build up a tolerance for working in the cold environment.

Dressing properly is extremely important to preventing cold stress. The type of fabric worn also makes a difference. Cotton loses its insulation value when it becomes wet. Wool, silk and most synthetics, on the other hand, retain their insulation even when wet. The following are recommendations for working in cold environments:

Wear at least three layers of loose fitting clothing. Layering provides better insulation. Do not wear tight fitting clothing. An inner layer of wool, silk or synthetic helps keep moisture away from the body. A middle layer of wool or synthetic helps provide insulation even when wet. An outer wind and rain protection layer helps allows some ventilation to prevent overheating. Wear a hat or hood to help keep your whole body warmer. Hats reduce the amount of body heat that escapes from your head. Use a knit mask to cover the face and mouth (if needed). Use insulated gloves to protect the hands (water resistant if necessary). Wear insulated and waterproof boots (or other footwear).

2.3 Cold Stress Training

Workers should be properly trained on the above Heat Stress program, and should be aware of the following:

- Knowledge of the hazards and symptoms of cold stress.
- Monitor your physical condition and that of your coworkers.
- Dress properly for the cold.
- Stay dry in the cold because moisture or dampness (e.g. from sweating) can increase the rate of heat loss from the body.
- Keep extra clothing (including underwear) handy in case you get wet and need to change.
- Drink warm sweetened fluids (no alcohol).
- Use proper engineering controls, safe work practices, and personal protective equipment (PPE) provided by your employer.

2.4 Cold Stress References

<https://www.osha.gov/SLTC/emergencypreparedness/guides/cold.html>
<http://www.cdc.gov/niosh/topics/coldstress/>

Attachment D

Health and Safety Requirements for Drilling Operations

HEALTH AND SAFETY REQUIREMENTS FOR DRILLING OPERATIONS

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HEALTH AND SAFETY REQUIREMENTS FOR DRILLING OPERATIONS

1.0 INTRODUCTION & POLICY

INTERA Inc. (INTERA) considers the prevention of illness, injury, and accidents in the work place to have greater importance than any other facet of the work. Safety will always take precedence over expediency or shortcuts, and every attempt will be made to reduce the possibility of injury, illness, or accident occurrence in the performance of drilling operations.

All personnel, including INTERA subcontractors, lower tier subcontractors, consultants, and service personnel, who perform any task in relation to the drilling efforts or are visitors to the drilling site(s) must adhere to the provisions of these requirements

As personnel safety is of the highest priority in performance of the work at this site, INTERA personnel will suspend drilling operations when an unsafe practice or condition is observed. Drilling will not proceed until the unsafe practice or condition is corrected. The subcontractor shall not be compensated for efforts required to correct any unsafe practice or condition created by his/her actions.

All applicable Federal, State, County and City safety regulations and practices shall be strictly adhered to at all times. These regulations and practices shall include, but are not solely limited to, the wearing of approved safety hats, shoes, glasses, hearing protection, and etc. No unauthorized personnel, private vehicles, cameras, firearms, personal pets, illicit drugs, or alcoholic beverages will be allowed on the designated project area.

The contractor shall be responsible for monitoring of subcontractor personnel required by OSHA, e.g. silica and heavy metals. All subcontractor personnel shall adhere to the INTERA operational health and safety regulations. **The “Statement of understanding” contained in the back of the INTERA Health and Safety Regulations for Drilling Operations must be signed by all Subcontractor personnel (including any lower tier) prior to working on this project.**

2.0 RESPONSIBILITIES AND AUTHORITIES

2.1 GENERAL

All personnel, including subcontractors, and site visitors shall receive **daily** safety instruction and information regarding potential safety hazards at the site. Daily on-site safety briefings shall be conducted by the Site Health and Safety Officer. Such daily training will be documented in the project records. All visitors will be escorted by a representative during their presence at the drilling site(s).

All personnel, including INTERA and lower-tier subcontractors, (including replacement and/or additional personnel) working on the drilling project must have met the minimum training requirements and have proof of their training as set forth in the site-specific health and safety plan developed for the project. Each individual's training must be documented prior to that person performing any work on the project. The following responsibilities and authorities are assigned with respect to compliance and implementation of these minimum requirements:

2.2 PERSONNEL

- The **Project Manager** shall be responsible for assigning a qualified field supervisor to the project who is cognizant of the required tasks and knowledgeable of drilling techniques and drilling safety procedures. The Project Manager is also responsible for providing adequate logistical support to ensure maximum safety during the drilling operations.
- The **Site Manager** shall be responsible for the day-to-day field operations and compliance with these requirements. The Site Manager shall fully coordinate the field drilling activities with the on-site Health and Safety technician and other responsible field personnel to assure that all drilling tasks are performed in the safest manner possible. Any violation of the provisions of these requirements will be reported immediately to the INTERA Corporate Health and Safety Officer and to the Project Manager. Should any variance from standard drilling procedures be required in completion of the designated drilling tasks, the Site Manager shall obtain concurrence from the Project Manager and the INTERA Health and Safety Officer prior to implementation.
- The **Site Health and Safety Officer** is responsible for the on-site monitoring of industrial and environmental safety, monitoring for compliance with the health and safety requirements, and any site-specific health and safety plan(s). The Site Health and Safety Officer shall take immediate corrective action when a safety violation is observed or reported.
- It shall be the responsibility of all **Field Personnel** working on a drilling project to promote safety at all times in the performance of their assigned tasks. All field personnel shall be aware of suspected site-specific hazards and shall be adequately trained to respond to such hazards in a safe and timely manner. In addition, it is the responsibility of all field personnel to report any real or suspected unsafe situation, act, or questionable practice immediately to the Site Health and Safety Officer or Field Supervisor.

A INTERA representative shall be on site at all times when drilling operations are in progress.

2.3 SUBCONTRACTOR AND SUBCONTRACTOR PERSONNEL:

The subcontractor is responsible for the safety of his/her operations as well as those operations of his/her subcontractor(s), who are also subject to all provisions of these minimum requirements. Any injury/illness that occurs as a direct result of work being performed under a subcontract or purchase order requires the subcontractor to notify INTERA **immediately** as well as submitting an accident report covering the incident. The accident report is to be submitted to the INTERA Corporate Health and Safety Officer within 24 hours of the accident. The subcontractor is required to participate in any INTERA internal investigation of such accident(s). The subcontractor is responsible to notify OSHA in accordance with 29CFR1904, as applicable.

The subcontractor must have a written and functional safety program to protect site workers, the general public, and the environment. The scope of the subcontractor program will be determined by the size and complexity of the project and the recognizable hazards of the work to be performed. Before work commences, this safety management program and implementation plan must be reviewed and approved, in writing, by the INTERA Health and Safety Officer.

2.3.1 The Drill Rig (Driller) Operator:

- The subcontractor shall designate, in writing, the on-site person who is in full charge of subcontractor's operations. The drill rig operator shall:
- consider safety as the primary importance and have and exercise the required authority to enforce safety at all times.
- be the leader in using proper personal safety gear and set an example in adhering to the rules and regulations that are set forth for the project.
- enforce the use of proper personal protective safety equipment (PPE) and take appropriate corrective action when proper PPE equipment is not being used or being used improperly by other subcontractor personnel.
- understand that proper maintenance of tools and equipment and general "housekeeping" on and around the drill rig will provide an appropriate environment to promote and enforce safety.
- visually inspect the rig and ancillary equipment **daily**, and preferably at the start of each drilling shift, to insure that the required safety devices, e.g., emergency engine shut-down switches and back-up alarms, are installed and are functional.
- inspect the rig to insure that applicable safety placards are installed at potential safety hazard locations as recommended by the manufacturer.
- inspect the drill rig at least daily for structural damage, excessive wire rope and rigging wear, improper wire rope spooling, loose bolts and nuts, proper tension in chain drives, loose or missing guards or protective covers, fluid leaks, and damaged or non-functioning pressure gauges and pressure relief valves. Any discrepancy will be corrected prior to operation of the rig.
- document all inspections, including daily, weekly, or periodic on the daily drilling report form at the time of inspection.
- have had adequate training on that rig type and is thoroughly familiar with the rig's controls, capabilities, limitations, and operating parameters.
- assure that all crew members are aware of the location and are capable of operating all emergency shut-down devices.
- monitor all gauges and warning lights and that control levers are functioning properly while the rig is operating.
- assure that all new drill rig workers are informed of safe operating practices on and around the drill rig.
- assure that each new employee understands the safety requirements and practices and shall document the new employee's acceptance of the requirements.
- observe the mental, emotional, and physical capability of each worker to perform the assigned work in a proper and safe manner. No person who is obviously impaired to a point of being detrimental to safety or task performance will be allowed to work on the rig or remain on the immediate drill site.
- assure that there is a fully stocked first-aid kit and two 10-lb U.L.-listed, Class ABC rated, fire extinguishers (that meets DOT standards) on the rig at all times.
- be trained to proficiency and capable of using first-aid kits, fire extinguishers and all other safety devices and equipment. At least one member of the drill crew shall possess a valid certificate of First Aid/CPR training from the U.S. Bureau of Mines, American Red Cross, or equivalent training. Training shall be documented.
- maintain a current, posted list of addresses and telephone numbers of emergency assistance units (ambulance services, police, hospitals, etc.) and shall inform other members of the drill crew of the existence, location and proper use of the list.

3.0 Individual Protective Equipment

- Any personal protective equipment (PPE) provided must meet NIOSH/ANSI specifications
- Clothing must be close fitting and comfortable, but without loose ends, straps, draw strings or belts or otherwise unfastened parts that might catch on rotating or moving component of the drill.
- Safety Head Gear. Approved safety hats (hard hats) will be worn properly at all times by everyone working or visiting within the posted perimeter of the drill site. Head protection shall be non-conductive to prevent from limited electrical shock and shall meet requirements of ANSI Standard Z89.1. It is recommended that safety hats be worn anytime when within 100 feet of an active rig.
- Safety Shoes or Boots. Safety shoes or boots shall be worn by all drilling personnel and all visitors to the drill site that observe drilling operations within close (within posted perimeter of drill site) proximity of the drill rig. Foot protection shall meet the requirements of ANSI Standard Z41.1, Class 75.
- Safety Glasses. All drilling personnel and visitors to the drill site are required to wear approved safety glasses with side shields or goggles while the drill rig is in operation or other drilling functions are being performed. Prescription glasses shall be an approved safety type or goggles must be used. Additional eye protection is required for work more hazardous to eyes, e.g. welding, cutting, grinding, or handling of chemicals. All eye protection shall meet ANSI Z87.1 standards.
- Gloves. All drilling personnel shall wear gloves for protection against cuts and abrasion which could occur while handling wire rope or cable and from contact with sharp edges and burrs on drill rods, drill pipe and other drilling or sampling tools.
- Hearing Protection. All drill crew personnel, site workers, and drill site visitors shall wear noise reducing ear protection when appropriate. In accordance with USDOE Order 5480.4, hearing protection is mandatory on DOE sites when the time-weighted-average (TWA) noise level reaches or exceeds 85 dBA.
- Other Protective Equipment. For some drilling operations, the prevailing environment or regulations may dictate that other protective equipment be used. When drilling is performed in chemically- or radiologically-contaminated areas, special protective equipment and clothing will be used as required by the site-specific Health and Safety Plan for each given task.

4.0 Housekeeping On and Around the Drill Rig

- Suitable storage facilities shall be provided so that tools, materials and supplies can be conveniently and safely handled without creating a safety hazard for personnel on the drill site or in the adjacent area.
- Storing or transporting tools, materials, or supplies within or on the mast (derrick) of the drill rig is prohibited within the project site or area.
- Drill pipe, drill rods, casing, augers and similar drilling tools shall be properly stacked and secured on racks or sills to prevent spreading, rolling, or sliding.
- Penetration or other driving hammers shall be placed at a safe location on the ground or secured on the rig to prevent movement when not in use.
- Work areas, platforms, walkways, scaffolding and other access ways shall be kept free of materials, debris, obstructions, and substances such as ice, grease, or oil that could cause a surface to become slick or otherwise hazardous.
- All hand controls, control linkages, warning and operation lights and lenses shall be kept

free of excess oil, grease, ice, or other foreign material that may interfere with safe operation.

- Gasoline or other motor fuels or flammable liquids will not be stored in any container that does not meet current regulations for storage of the specific fuel or flammable liquid. Fueling of engines shall be done only from U.L.-approved safety cans or other approved bulk fueling system(s). Any engine to be refueled shall be shut off and sufficiently cooled before and during the refueling operation.
- All gasoline engines, when operated in fire danger areas or other areas as specified in the project SOW, will be equipped with exhaust spark arresters.
- All tanks, including fuel, water (potable and non-potable), hydraulic oil, etc., shall be labeled and placarded as to tank contents.
- All wiping clothes, oily rags, and other such materials used for maintenance shall be stored in an approved fire-resistant metal container until properly disposed of.

5.0 Maintenance Safety

- Shut down the drill rig and/or auxiliary equipment engine(s) to make repairs or adjustments or to lubricate fittings (except repairs or adjustments that can only be made with the engine(s) running. In such cases, a qualified operator shall remain at the shut-down control station during the maintenance). Take precautions to prevent accidental starting of an engine during maintenance by removing, locking, and tagging out the ignition key or ignition control(s).
- Block the rig carrier wheels and/or lower the leveling jacks or both and set parking brakes before working under a drill rig.
- When possible and appropriate, release all pressure on the hydraulic systems, the drilling fluid circulation system and the air pressure systems of the drill rig prior to performing maintenance or repairs. Use lockout/tagout controls.
- Welding or cutting on or near a fuel tank or other flammable material is prohibited. If fuel tank repairs, requiring cutting or welding, are required, the tank(s) shall be removed from the project before repairs are attempted.
- Do not use gasoline or other volatile or flammable liquids as a cleaning agent on or around a drill rig.
- Replace all caps, filler plugs, protective guards or panels, high pressure hose clamps and safety chains or cables that have been removed for maintenance before returning the drill rig to service.
- Personnel shall remain clear of all rotating equipment.
- All exposed drive shafts, drive chains and sprockets, drive belts, and similar power transmitting components shall have guards installed, as per OSHA and equipment manufacturer standards, during drilling operations.
- All exposed exhaust pipe(s) and/or systems shall be guarded or insulated adequately to protect personnel from burns and prevent fire hazards.
- All air and fluid circulation hose connections shall be secured with safety chains or clamped to prevent whipping in the event of a break or failure.
- Each crew member shall promptly report any worn, defective, or unsafe items which are observed to the driller or on-site subcontractor supervisor.
- Pipelines, tanks, and other storage facilities (for fuel, oil, gas, mud, foamers, etc.) shall be inspected frequently and kept from leaking. Any spills or leaks will be cleaned up immediately.
- A spill-containment plan shall be addressed in the subcontractor's written safety program for

the project.

6.0 Safe Use of Hand Tools

- When a hand tool becomes damaged, the tool shall either be repaired before further usage or removed and tagged out of service.
- Hand tools shall be used only for the express purpose for which they were designed.
- Keep all tools cleaned and stored in an orderly, safe manner when not in use.
- Never use pipe wrenches as substitute for a rod holding device.
- Replace pipe wrench hook and heel jaws when they become visibly worn.
- When breaking tool joints manually on a hard surface or on a drilling platform, position hands so that fingers will not be injured between the wrench handle and the hard surface or the platform, should the wrench slip or the joint suddenly release.

7.0 Clearing the Work Area

- Prior to drilling, adequate site clearing and leveling shall be performed to accommodate the drill rig, ancillary equipment, and supplies and provide a safe working area. Drilling shall not be commenced when tree limbs, dry vegetation, unstable ground or site obstructions may cause unsafe tool handling or potential fire hazards.

8.0 Start Up

- All drill rig personnel and visitors shall be instructed to stand clear of the drill rig or auxiliary equipment immediately prior to and during starting of an engine.
- Make sure all gear boxes are in neutral, all drawworks clutches and hoist levers are disengaged or in the neutral position, all hydraulic levers are in the correct non-actuating positions, and the cathead rope is not on the cathead spool before starting a drill rig engine or engaging the power train.

9.0 Safety During Drilling Operations

- No personnel, other than the assigned rig crew, shall be allowed on or under an operating rig deck for any reason. No personnel shall attempt to make any type of inspection of the subcontractor's equipment unless a subcontractor representative is present during the inspection.
- The drill rig shall not be moved from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick), always check for overhead wires and obstructions. An observer shall be posted at a strategic location to ensure adequate clearance is maintained (see section 2.3.9).
- The mast shall not be raised or lowered during wind speeds that exceed the rig manufacturer's maximum wind load design or when visibility is restricted.
- Before raising or lowering the mast (derrick), the area shall be inspected for potential safety hazards. All unnecessary drill rig personnel and visitors shall be cleared from the areas immediately to the rear, front and the sides of the mast. Once the mast is raised into position, the mast or derrick locks will be secured. The rig shall not be operated unless mast locks are functional and are locked. Prior to lowering, mast hydraulic system(s) will be

checked for proper operation.

- Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig must be first leveled and stabilized with leveling jacks and/or solid cribbing. The drill rig shall be releveled immediately if settling occurs after the initial set-up.
- The operator of a drill rig shall operate a drill rig only from the driller's control station. **The operator shall remain at the control station at all times when the rig is in operation.**
- Throwing or intentional dropping of tools shall not be permitted.
- If it is necessary to drill within an enclosed area, make certain that exhaust gases are conducted out of the area and sufficient ventilation is provided.
- All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, site visitors, or animals from stepping or falling into the hole. All open boreholes shall be covered, protected or backfilled adequately and according to local or state regulations on completion of the drilling project.
- When using a mast or derrick ladder, face the ladder and grasp either the side rails or the rungs with both hands while ascending or descending. The three-point system of 2 hands and 1 foot or two feet and 1 hand being in contact while climbing is mandatory. Always ensure that shoe soles are clean and dry before attempting climbing or descending the mast.
- When climbing to a mast or derrick platform that is higher than 20 feet (6 m), an approved safety climbing device shall be used. Anyone working on a derrick board, platform, or mast shall wear an approved safety belt or harness securely fastened by an approved safety lanyard.
- When working on a mast or derrick platform, do not guide drill rods or pipe into racks or other supports by taking hold of a moving hoisting line, traveling block, or other moving hoisting equipment. Rack only one pipe stand at a time. Always stay clear of moving hoisting line, traveling block, elevators, or hoisting plugs.
- Loose tools and similar items shall not be left on the derrick platform or on structural members of the derrick.
- Any working platform over 4 feet (1.2 m) above ground surface shall have 4-inch toe boards, a mid railing, and top safety railing 42 inches high installed that will withstand 200 lbs. lateral force.
- Before manually lifting any object, personnel shall ensure sure that the load is within their personal lifting capacity.
- Personnel shall not ride the hoisting line, catline, traveling block, the traveling block hook, the elevators, or any suspended equipment as a means of ascending or descending to or from the derrick.
- Assure that equipment furnished for use on the site is maintained in safe operating condition and operated only by qualified personnel. Cranes, pressure vessels, and large earth moving equipment shall have valid certificates and logs of inspection and maintenance.
- The location of the nearest phone or radio to contact emergency services shall be prominently posted. Site-specific emergency preparedness actions will be recognized and communicated to rig personnel by the subcontractor supervisor.
- **Daily** safety meetings shall be held to inform employees and other subcontractors of progress of work, changes, hazards anticipated and inspection deficiencies or good examples of employee protection. A daily "toolbox meeting" will be used to assure that good communications are maintained. A record must be kept of the subject(s) discussed and any suggestions made. Attendance will be recorded of those participants at the meeting.
- Horseplay, practical jokes, and scuffling are strictly forbidden on the drill site at all times.
- All rig steps, ladders, stairways, platforms, and walkways shall be keep free of mud, snow, ice, tools, and other materials that may cause slipping.

10.0 Overhead and Buried Utilities

- Overhead and buried utilities shall be located, noted, and emphasized on all boring location plans and boring assignment sheets. **INTERA uses a "double barrier" system for surveying underground utilities. No borehole will be drilled until the exact location to be drilled is surveyed by an independent utility locator service and their findings verified by a INTERA Utility Line Locator.**
- When overhead electrical power lines exist at or near a drilling site or project, personnel shall consider all wires to be energized and dangerous.
- Visually inspect the drill site for sagging power lines before entering the site. Do not lift power lines to gain entrance or exit. Call the responsible utility and ask them to lift or raise the lines or de-energize (turn off) the power.
- An observer or "spotter" shall be posted at a sufficient distance from the rig to adequately monitor for safe clearance (minimum of 20 feet) during the raising and lowering of the rig mast when operating in the vicinity of overhead power lines or other overhead obstructions.
- Before raising the drill rig mast (derrick) in the vicinity of power lines, walk completely around the drill rig. Determine what the minimum distance from any point on the drill rig to the nearest power line will be when the mast is raised and/or lowered. Do not raise the mast or operate the drill rig if this distance is less than 20 feet (6 m). INTERA policy for operating boomed or drilling equipment with mast, tower, or derrick in proximity of overhead power lines requires that a minimum clearance of 20 feet be maintained. The INTERA 20-foot minimum clearance requirement may only be reduced to the OSHA minimum powerline clearance requirement with approval of the INTERA technical monitor or designee. Any such approval will be granted only after a thorough inspection, which must determine that no safety hazard will be created or will exist by the application of the OSHA requirement. **UNDER NO CIRCUMSTANCES WILL MINIMUM OSHA POWERLINE CLEARANCE REQUIREMENTS BE VIOLATED UNLESS THE LINES ARE DE-ENERGIZED, GROUNDED, AND TAGGED OUT BY THE RESPONSIBLE UTILITY COMPANY OR THEIR DESIGNEE.** Any such variance will be fully documented by the grantor. In addition, a INTERA SAFE WORK PERMIT must be issued before any work is performed under the variance.

11.0 Safe Use of Electricity

- All wiring shall be installed in accordance with the National Electrical Code using high quality connections, fixtures and wire, insulated and protected with consideration of the drilling environment. Makeshift wiring and equipment shall not be permitted.
- All portable electrical equipment used by personnel shall have GFCI (ground fault circuit interrupt) protection.
- **Only qualified electricians will attempt repairs on electrical lines or installation of complex electrical devices.**
- All lights positioned above working areas shall be enclosed in cages or similar enclosures to prevent loose or detached lamps or vapor-tight enclosures from falling on workers. All light bulbs shall be heavy-duty, outdoor type, and shatterproof type.
- Electrical cables shall be guarded and located so as to prevent damage by drilling operations or by the movement of personnel, tools or supplies.
- All plug receptacles shall be the three-prong, U-blade, grounded type and have adequate current carrying capacity for the electrical tools that may be used and shall be GFCI

protected.

- All electric tools shall have three-prong, U-blade, ground wire plugs and cords.
- Do not use electrical tools with lock-on devices.
- All electrical welders, generators, control panels and similar devices will be adequately grounded.
- Electrical control panels, fuse boxes, transformers and similar equipment shall have a secure, protective enclosure. Only weatherproof boxes and fittings shall be used for exterior application. Panels, fuses, and breakers shall be labeled to indicate their function.
- Poles used to hold wiring and lights shall not be used for any other purpose.
- Power shall be turned off and locked out before changing fuses or light bulbs.

12.0 Safe Use of Wire Line Hoists, Wire Rope and Hoisting Hardware

- Any required hoisting operations which are not performed with the drill rig equipment, e.g., crane operations, shall be conducted in accordance with applicable OSHA requirements.
- All wire ropes and fittings shall be visually inspected in accordance with the manufacturer's recommendations and applicable OSHA requirements during use and thoroughly inspected at least once a week for: abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper reeving, jamming, crushing, bird caging, kinking, core protrusion, or damage to lifting hardware. Any discrepancies shall be corrected before operations continue.
- All manufactured cable-end fittings and connections shall be installed according to the manufacturer's instructions and loaded according to the manufacturer's specifications. This includes cable clamps and thimbles. All cable ends shall be wired or taped down.
- If a ball-bearing type hoisting plug is used to hoist drill rods, drill pipe, or casing, the bearings shall be inspected and lubricated daily to assure that the hoisting plug rotates freely under load.
- Wire rope size shall be properly matched to sheave groove size. Non-rotating wire rope is suggested for light rig application.
- Minimize shock and side loading of wire rope. Apply loads smoothly and steadily.
- Avoid sudden loading in cold weather.
- Never use frozen catline ropes. Keep ropes protected from adverse weather.
- Protect wire rope from sharp corners or edges. Avoid *pile-up* or uneven spooling of wire rope.
- Replace faulty guides and rollers.
- Replace worn sheaves and sheave bearings with parts equal to or exceeding original manufacturer specification(s).
- Replace damaged safety latches on safety hooks before using.
- Know the safe load capacity of the hoisting equipment being used. Never exceed this limit.
- Know and do not exceed the rated capacity of hooks, rings, links, swivels, hoisting plugs, elevators, shackles and other lifting aids. Never exceed the manufacturer's rated load capacity for any reason.
- Do not guide wire rope on hoist drums with hands or feet.
- Keep hands and other extremities away from hoists, wire rope, hoisting hooks, sheaves and pinch points as slack is being taken up and when the load is being hoisted.
- Following the installation of new wire rope, lift a light load first to allow the wire rope to adjust.

- Never leave a load suspended when the hoist is unattended.
- Never hoist the load over the head, body, or feet of any personnel.
- Inspect daily, or at the start of each shift, all rotating cable attachments, e.g. safety hooks, deadman anchors, and hoisting apparatus, for freedom of movement.

13.0 Safe Use of Catheads and Rope Hoists

- Keep the cathead spool clean and free of rust and oil and grease.
- Check the cathead periodically, with the engine not running, for rope wear grooves.
- Never wrap the rope from the cathead (or any other rope, wire rope or cable on the drill rig) around a hand, wrist, arm, foot, ankle, leg, or any other part of the body.
- Do not use a rope that is any longer than necessary. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.
- Do not use more rope wraps than are required to hoist a load, or than can be safely released.
- Do not leave a cathead unattended with the rope wrapped on the cathead spool when cathead power is engaged.
- Position all other hoist lines to prevent contact with the operating cathead rope.
- The cathead operator must be able to operate the cathead standing on a level surface with firm footing and without distraction or disturbance.

14.0 Safe Use of Augers

The following general procedures shall be used when starting a boring with continuous flight or hollow-stem augers:

- Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear, and the engine running at low RPM.
- Apply an adequate amount of downward pressure prior to rotation to seat the auger head below the ground surface.
- Observe the auger head while slowly engaging the clutch or rotation control. Stay clear of the auger.
- Slowly rotate the auger and auger head while continuing to apply down pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated one foot or more below ground surface.
- If the auger head slides out of alignment, disengage the clutch or hydraulic rotation control and repeat the hole starting process.
- An auger guide can facilitate the starting of a straight hole through hard ground or pavement.
- Use only the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with hands, feet, wrenches or any tools during rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of an auger section in the ground or other hard surfaces such as the drill rig platform.
- Never place feet under the auger section that is being hoisted.
- When rotating augers, stay clear of the auger and other rotating components of the drill rig. **Never reach behind or around a rotating auger for any reason whatever. A minimum of 18 inches clearance shall be maintained between personnel, clothing, footwear and**

other personal apparel and the rotating augers, kellys, heads, drillrod or other rotating components of the drill rig.

- Use a long-handled shovel to move auger cuttings away from the auger, ensuring that the shovel blade does not come in contact with the rotating auger. Never use hands or feet to move cuttings away from the auger.
- Never attempt to remove cuttings from rotating augers. Augers should be cleaned only when the auger drive is in neutral and rotation of the augers has ceased.
- Auger speed shall be only that speed necessary for penetration and cuttings removal. High-speed auger rotation shall not be used for penetration or cuttings removal unless approved by the on-site INTERA field supervisor. In such cases, all unnecessary personnel will be removed from the rig operating area.
- Free-standing auger(s) shall be secured to prevent accidental falling.

15.0 Safety During Rotary and Core Drilling Operations

- Water swivels, Chiksan joints, and hoisting plugs shall be lubricated and checked for *frozen* bearings before use. A swivel guide cable and anchor chain shall be used to prevent swivel hose whip in case of swivel failure.
- Pressure relief valves shall be installed and operable on all circulation systems. Protective covers shall be installed on shear-type relief valves.
- Direct-reading pressure gauges shall be installed on all air and drilling fluid delivery lines. Gauges shall be operable at all times and must represent the true pressure of the medium being transported in the line(s). This shall include all ancillary equipment, e.g., grout mixers, auxiliary circulation pumps, and other such equipment.
- Drill rod chuck jaws shall be checked periodically and replaced when necessary.
- Drill rod movement shall not be braked or retarded by using the drill rod chuck jaws.
- Drill rods or drill pipe shall not be held or lowered into the hole with pipe wrenches. Use slips, clamps, spiders, or other suitable holding devices.
- In the event of a plugged bit or other circulation (fluid or air) blockage, the pressure in the piping and hose(s) between the pump, or air compressor, and the obstruction shall be relieved or bled down before breaking the first tool joint. Line pressure shall be relieved prior to breaking any tool joint connection.
- When drill rods or drill pipe are hoisted from the borehole, they shall be cleaned for safe handling with a rubber pipe wiper or other suitable apparatus. Do not use hands to clean or strip drilling fluids from downhole tools as they are being hoisted.
- If work must progress over a portable drilling mud pit, do not attempt to stand on narrow sides or cross members. The mud pit shall be equipped with rough surfaced, fitted cover panels of adequate strength to support the combined weight of drill rig personnel.
- Drill rods and drill pipe shall not be lifted and leaned unsecured against the mast. A suitable method shall be provided for securing the upper ends of the drill rod or drill pipe sections for safe vertical storage or the tools must be laid down.
- Only personnel necessary to perform hoisting or tripping operations shall be on the rig during these operations.
- Remain well clear of moving rotary tables, kellys, quillrods, pull-down chains, drive lines, drive chains, and other rotating components at all times.
- When air rotary or air coring operations are in progress, all discharges, e.g., dust, cuttings, and fluids shall be contained. All shrouds, curtains, diverter head(s), cyclone separator(s), blooie line(s), and other necessary containment equipment will be used at all times. Any variance from these requirements must be approved in writing by INTERA before any such

variance is implemented.

- All rig air-delivery systems used in environmental drilling applications will be equipped with oil-separating, 10 micron in-line filter(s) to remove oil that might be discharged into the air stream by the compressor(s). These filters shall be inspected daily and serviced as applicable.

16.0 Off-Road Movement of Drilling Equipment and/or Components

- Before off-road movement of a drill rig, visually survey the route of travel, inspecting the proposed route for unstable road bed(s) and bridges, depressions, stumps, gullies, ruts, and similar obstacles which might impede safe movement of the equipment.
- The braking system of the drill rig carrier shall always be tested for adequate operation before movement.
- Inspect the complete drive-train, including drive shafts, U-joints, carrier bearings, flanges, etc. of the rig truck or carrier at least weekly.
- Use caution when traversing slopes. Conservatively evaluate side hill capability of drill rigs, as the arbitrary addition of drilling tools may raise the center of gravity. When possible, travel directly uphill or downhill. Increase tire pressures before traveling in hilly terrain (however, do not exceed rated tire pressure).
- Properly secure all drilling equipment and tools, including drill rod, drill pipe, casing, and other tubular material before transport.
- Use only those routes that have been designated for rig travel and movement.

17.0 Hazardous Materials and Waste

- The subcontractor shall provide material safety data sheets (MSDS) for all hazardous materials used in the drilling operation(s) as per 29CFR1910.1200. Personnel must be trained in accordance with 29 CFR 1910.120 for handling any such hazardous materials as well as any site-specific requirements pertinent to the particular task being undertaken.
- Chemicals, corrosives, and etc. shall be properly labeled, placarded, and stored.
- Any waste generated by drilling operations shall be handled as per site-specific project requirements.
- All cuttings, dust, fluids, and other waste generated by drilling activities must be contained and disposed of as per site-specific project requirements. In no case where drilling is being performed in a posted radiological and hazardous waste area shall dust, cuttings, fluids, or other subsurface waste be discharged to the atmosphere, unless engineering controls are used to separate particulate matter from the discharged air. Engineering controls may include, but are not solely limited to, the use of cyclone separator(s), HEPA (high efficiency particulate air) filters, or other suitable, approved controls.
- All spills and leaks, including but not solely limited to, oils, fuels, grease, motor coolants, drilling additives, or other potentially hazardous wastes, will be cleaned up immediately and properly disposed of. The cause of such spills or leaks shall be determined and appropriate corrective action taken before drilling is resumed. Such events will be reported by the subcontractor to INTERA as per direction of the applicable Health and Safety Plan and/or Statement of Work governing the project tasks.
- A subcontractor shall not perform any work identified in the site-specific project Health and Safety Plan or Project Statement of Work (SOW) requiring a SAFE WORK PERMIT (SWP) or RADIATION WORK PERMIT (RWP), until such permit is issued by INTERA. This

includes, but is not solely limited to, such tasks as welding, working in a confined space area, cutting, grinding, or other related activities where heat, open flame, and/or sparks may be generated. All provisions of the issued permit(s) shall be adhered to while working on the project.

18.0 Statement of Understanding

All personnel, including INTERA and subcontractor, are required to read and fully understand the provisions of these minimum requirements. The INTERA field supervisor shall document that all INTERA personnel working on the drilling project have read and understand the requirements. The subcontractor and each subcontractor employee working on the project shall sign the attached STATEMENT OF UNDERSTANDING before commencing any work on the project.

**ATTACHMENT A
STATEMENT OF UNDERSTANDING
DRILLING HEALTH AND SAFETY REQUIREMENTS
FOR DRILLING OPERATIONS**

I, the undersigned, as an employee of the Subcontractor doing business as _____, have received and have read the INTERA Health and Safety Requirements for Drilling Operations. Further, I understand all provisions of these requirements.

Name (please print)	Signature	Date	Position
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
12. _____	_____	_____	_____
13. _____	_____	_____	_____
14. _____	_____	_____	_____
15. _____	_____	_____	_____

**ATTACHMENT B
EQUIPMENT SAFETY INSPECTION CHECKLIST
FOR SMALL AUGER, ROTARY, AND CORE RIGS**

Contractor: _____ Rig Type: _____ Rig no. _____ Date: __/__/__
 Safety Inspector: _____ Project: _____

<p>I. Rig Carrier</p> <input type="checkbox"/> Overall Appearance <input type="checkbox"/> Oil Leaks <input type="checkbox"/> Fuel Leaks <input type="checkbox"/> Fire Extinguisher <input type="checkbox"/> Back-up Alarm <input type="checkbox"/> Exhaust System <input type="checkbox"/> Wheel Chocks <input type="checkbox"/> Outrigger Jacks <input type="checkbox"/> Fuel Tank Placard(s) <input type="checkbox"/> Portable fuel containers <input type="checkbox"/> Other: _____	<p>IV. Power Train/Drill Unit</p> <input type="checkbox"/> Chain/belt Guards <input type="checkbox"/> Fluid Leaks <input type="checkbox"/> Driveline Guards <input type="checkbox"/> Hydraulic Hoses <input type="checkbox"/> Safety Chains/lanyards <input type="checkbox"/> Gauges <input type="checkbox"/> Loose Bolts <input type="checkbox"/> Rotary Table <input type="checkbox"/> Drive Head <input type="checkbox"/> Auger Drive <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____	<p>VIII. Hoisting Equipment</p> <input type="checkbox"/> Hoisting Plug(s) <input type="checkbox"/> Lifting Iron(s) <input type="checkbox"/> Elevators <input type="checkbox"/> Weight Indicator <input type="checkbox"/> Safety Hook(s) <input type="checkbox"/> Spider(s) <input type="checkbox"/> Slips <input type="checkbox"/> Foot Clamps <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____
<p>II. Mast</p> <input type="checkbox"/> Crown Block <input type="checkbox"/> Hinge Pins <input type="checkbox"/> Lock Pins/Devices <input type="checkbox"/> Lights/Wiring <input type="checkbox"/> Safety Climbing Device <input type="checkbox"/> Safety Belts/Harness <input type="checkbox"/> Racking Board <input type="checkbox"/> Ladders <input type="checkbox"/> Deadman Anchors <input type="checkbox"/> Standpipe <input type="checkbox"/> Swivel Hose <input type="checkbox"/> Safety Chains/Clamps <input type="checkbox"/> Mast Rams/Cylinders <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____	<p>V. Pump(s)/Compressor(s)</p> <input type="checkbox"/> Sheaf Relief Valve Cover(s) <input type="checkbox"/> Pressure Relief Valve(s) <input type="checkbox"/> Flowline Safety Clamps/chains <input type="checkbox"/> Belt/Chain Guards <input type="checkbox"/> Vibrator Line Anchor <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____	<p>IX. Downhole Equipment</p> <input type="checkbox"/> Drillpipe <input type="checkbox"/> Drillcollars <input type="checkbox"/> Core Rod <input type="checkbox"/> Core Barrel(s) <input type="checkbox"/> Augers <input type="checkbox"/> Samplers <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____
<p>III. Rig Engine(s)</p> <input type="checkbox"/> Fuel Tank(s) <input type="checkbox"/> Exhaust System <input type="checkbox"/> Electrical System <input type="checkbox"/> Belt/Drive Line Guards <input type="checkbox"/> Emergency Shut-down System(s) <input type="checkbox"/> Heat Shields <input type="checkbox"/> Fluid Leaks <input type="checkbox"/> Gauges <input type="checkbox"/> Clutches <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____	<p>VI. Hoists/Catheads</p> <input type="checkbox"/> Chain Guard(s) <input type="checkbox"/> Spool/Drum wear-cracks <input type="checkbox"/> Safety Devices\Spool Divider <input type="checkbox"/> Clutch(es) <input type="checkbox"/> Brake(s) <input type="checkbox"/> Hydraulics <input type="checkbox"/> Wireline Drum-coring <input type="checkbox"/> Drive Hammer(s) <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____	<p>X. Safety Equipment</p> <input type="checkbox"/> Placards/Warning Signs <input type="checkbox"/> Applicable OSHA Postings <input type="checkbox"/> First Aid Kit(s) <input type="checkbox"/> Applicable Regulation Posting <input type="checkbox"/> Emergency Medical Posting(s) <input type="checkbox"/> Emergency Procedures <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____
<p>VII. Wireline/Catline</p> <input type="checkbox"/> Wear/broken strands <input type="checkbox"/> Spooling <input type="checkbox"/> Cable Clamps and Thimbles <input type="checkbox"/> Cable Ends <input type="checkbox"/> Catline Rope Condition <input type="checkbox"/> Other: _____	<p>XI. Personal Protective Equipment</p> <input type="checkbox"/> Hard Hats <input type="checkbox"/> Safety Glasses <input type="checkbox"/> Safety boots/shoes <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____	<p>XII. Other Items</p> <input type="checkbox"/> _____ <input type="checkbox"/> _____

COMMENTS: _____

Attachment E

Health and Safety Requirements for Heavy and Light Equipment

HEALTH AND SAFETY REQUIREMENTS FOR HEAVY AND LIGHT EQUIPMENT

General

1. Ensure operators have demonstrated skills and/or have attended training on the safe operation of heavy/light equipment.
2. Operate equipment according to Department of Transportation (DOT) regulations.
3. Meet manufacturer's minimum requirements for safe operation of equipment.
4. Daily inspect heavy/light equipment before use. Identify defective equipment, remove it from service, and do not use it until repaired.
5. Before operating heavy/light equipment, inspect work areas, and provide safeguards for identified hazards.
6. Ensure operator's manual is accessible for all heavy/light equipment.
7. Before operating heavy/light equipment greater than 20 horsepower with an operator's seat (excluding trucks), ensure it is equipped with approved roll over protection safety (ROPS), if required.
8. Ensure heavy/light equipment with an operator's seat and equipped with roll over protection safety (ROPS) is equipped with a seat belt.
9. When operating heavy/light equipment, wear a seat belt where provided.
10. Before exiting operator's seat from all heavy/light equipment, lower attachments to the ground and apply parking brake.
11. When riding on heavy/light equipment, ride only on designated positions.
12. Do not use heavy/light equipment as a lifting device unless the equipment and rigging have been load-tested.
13. Ensure all equipment operated during poor visibility or inclement weather is equipped with proper lighting and appropriate safety devices (e.g., windshield wipers, defroster).
14. If it created a hazard to persons in the immediate work area, do not operate equipment.
15. Operate all heavy/light equipment within manufacturer's recommended operating parameters.
16. When digging, drilling, driving objects, or trenching close to energized circuits, locate underground utilities (e.g., electrical lines, telephone, water, natural gas, and other piping systems) and take measures to prevent damage.
17. Be careful when using ladders, handrails, steps, etc., to climb on or off heavy/light equipment.
18. Chock all vehicles with dual wheels. Chock medium-and heavy-duty vehicles (one ton or greater) and, on extremely hilly and mountainous terrain, chock smaller vehicles (1/2 ton pickups and 3/4 ton service vehicles).
19. Wear footwear appropriate for the environment and for the equipment being used.

Operation of Light Equipment (Mowers, Tractors, chain Saws, Tamps, Etc.)

1. For manual opening of tailgates on dump trucks, install and use handgrips.
2. Ensure farm tractors used with bush hogs are equipped with heavy-metal mesh guards for personal protection.
3. When engaged in a winching operation with light equipment, be positioned safely (e.g., behind the door).
4. When working in the bucket of an aerial lift, wear a fall protection harness.
5. When operating a chain saw, wear eye and face protection and, except when working from a bucket truck or wood pole, wear chaps.
6. When operating a weedeater with a blade (brushsaw), wear leggings or chaps and eye and face protection.
7. When operating a tamp (except for pole tamps), wear foot protection including toe and metatarsal guards.
8. Use the following required personal protective equipment:
 - a. Hard hats
 - b. Hearing protection
 - c. Safety glasses
 - d. Work gloves

Operation of Heavy Equipment (Bulldozers, Motor Graders, Packers, Core Drills, Etc.)

1. When engaged in a winching operation, use heavy equipment equipped with heavy-metal mesh guards for protection.
2. Ensure all heavy equipment is equipped with back-up alarms and warning devices.
3. Ensure all heavy equipment is equipped with a fire extinguisher.
4. When clearing wooded areas, use heavy equipment equipped with closed clearing cab.
5. Safety glasses and heard hat are not required in the enclosed cab of bulldozers.
6. Use the following required personal protective equipment:
 - a. Hard hats
 - b. Hearing protection
 - c. Safety glasses

ATTACHMENT A EQUIPMENT SAFETY INSPECTION CHECKLIST FOR LIGHT EQUIPMENT

Safety Inspector: _____ Site/Project: _____ Date: __/__/__
 License Plate: _____ Make/Model/Color: _____

Insert a check mark if ok, or an if there is an item deficiency.

Date							
Tire inflation							
Lug nuts							
Exhaust System							
Brakes							
Parking brake							
Engine lubricants							
Engine Coolants							
Steering							
Windshield							
Windshield Wipers							
Heater / Defroster							
Head / tail lights							
Turn indicators							
Instrument gauges							
<i>Initials of Operator</i>							

DESCRIPTION OF DEFICIENCIES: _____

REMEDY FOR DEFICIENCIES: _____

COMMENTS: _____

ATTACHMENT B EQUIPMENT SAFETY INSPECTION CHECKLIST FOR HEAVY EQUIPMENT

Safety Inspector: _____ Site/Project: _____ Date: __/__/__
 Equipment Type: _____ Equipment Number: _____

Insert a check mark ✓ if ok, an ✗ if there is an item deficiency, or "NA" if the item does not apply.

FROM THE GROUND

Bucket or Blade	Excessive Wear or Damage, Cracks	
Bucket or Blade Cylinder & Linkage	Excessive Wear, Damage, Leaks, Lubricate	
Stick, Cylinder	Wear, Damage, Leaks, Lubricate	
Boom, Cylinders	Wear, Damage, Leaks, Lubricate	
Underneath Machine	Final Drive Leaks, Swing Drive Leaks, Damage	
Track Sag	Tightness, Wear	
Pivot Shafts	Oil Leaks	
Carbody	Cracks, Damage	
Undercarriage	Wear, Damage, Tension	
Steps and Handholds	Condition and Cleanliness	
Batteries & Hold Downs	Cleanliness, Loose Bolts & Nuts	
Windshield Wipers & Washers	Wear, Damage, Fluid Level	
Fire Extinguisher	Charge, Damage	
Engine Coolant	Fluid Level	
Primary/Secondary Fuel Filters	Leaks, Drain Water Separator	
Air Filter	Restriction Indicator	
Hydraulic Oil Tank	Fluid Level, Damage, Leaks	
Hydraulic Oil	Filter Leaks	
Radiator	Fin Blockage, Leaks	
Hydraulic Oil Cooler	Fin Blockage, Leaks	
AC Condenser	Fin Blockage, Leaks	
Lights and Mirrors	Damage	
Engine Oil Filter	Filter Leaks	
Hydraulic Oil Filter	Filter Leaks	
Overall Machine	Loose/Missing Nuts, Bolts, Guards, Cleanliness	

ENGINE COMPARTMENT

Engine Oil	Fluid Level	
Gear Oil	Fluid Level, Leaks	
Fuel Tank	Fuel Level, Damage, Leaks	
All Hoses	Cracks, Wear Spots, Leaks	
All Belts	Tightness, Wear, Cracks	
Overall Engine Compartment	Trash or Dirt Buildup, Leaks	

INSIDE THE CAB

Seat	Adjustment	
Seat belt & Mounting	Damage, Wear, Adjustment, Age	
Horn, Travel Alarm, Lights	Proper Function	
Indicators	Proper Function	
Monitor Panel	Proper Function	
Switches	Proper Function	
Travel Controls	Correct Operation	
Mirrors Adjustment	Adjustment, Cracks/Broken	
Heating and Cooling System	Proper Function	
Overall Cab Interior	Overall Cab Interior Cleanliness	

COMMENTS: _____

Attachment F

HazCom Program Description

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LIST OF ATTACHMENTS

Attachment A: Labeling Systems

Attachment B: 29 CFR 1910.119 Appendix A – Threshold Quantities for Highly Hazardous Chemicals

1.0 PURPOSE

This Hazard Communication Program (HazCom Program) supplements the INTERA Corporate Health and Safety Program (CHSP) and is included as **Appendix 7** to the CHSP. The HazCom Program identifies the procedures that are used to protect the health of employees while performing the services provided by INTERA. This Program cannot be considered as encompassing of all potential hazards or of all safe practices and conditions that should be followed and maintained, but as a general guidance document providing direction for situations involving hazardous substances in the workplace. This Program is an integral piece of the overall INTERA Corporate Health and Safety Program (CHSP).

2.0 POLICY

INTERA does not routinely conduct activities that expose employees to significant chemical, mechanical, electrical or physical hazards. However, infrequent activities may occasionally result in the potential for exposure. The HazCom Program has been implemented to inform INTERA employees about hazardous substances in the workplace, the potential harmful effects of these substances and the appropriate control measures. The management of INTERA has developed the HazCom Program to provide a safe workplace for its employees and subcontractors. This HazCom Program applies to INTERA employees and subcontractors, and follows all the elements of the OSHA HAZCOM regulations found in 29 CFR 1910.1200. The expense associated with training and recordkeeping will be borne by the company.

3.0 RESPONSIBILITY

The Corporate Health and Safety Officer (Amy Andrews) is designated as the Program Administrator and, as such, is responsible for the HazCom Program and has the authority to make the necessary decisions regarding hiring personnel and purchasing of equipment necessary to implement and operate the HazCom Program. Branch Health and Safety Coordinators are designated representatives of the Corporate Health and Safety Officer, and are responsible for implementation and operation of this Program in each branch office. The Program Administrator will review the Program annually and will amend these instructions as necessary.

The Corporate Health and Safety Officer or Branch Health and Safety Coordinators will be responsible for ensuring that employees are trained in the provisions of the HazCom Program. Details regarding employee training are provided in Section 7.0 of this document.

All INTERA personnel have the authority to stop an activity if it is being performed in a hazardous manner. If an employee believes that he or she is being asked to perform work in an unsafe environment, that employee is authorized to decline the request. Employees are encouraged to communicate their health and safety concerns to the Corporate Health and Safety Officer, Branch Health and Safety Coordinators, Project Managers and/or Site Safety Officers to implement changes to work procedures where needed to reduce injury and illness exposures in the workplace. Additionally, the Corporate Health and Safety Officer, Branch Health and Safety Coordinators, Project Managers and/or Site Safety Officers have the authority to halt operations because of non-compliance with the provisions of this Program. It will be the responsibility of the Site Safety Officer to inspect field project areas for compliance with this HazCom Program.

4.0 TERMS AND DEFINITIONS

The following terms and definitions are applicable to the INTERA HazCom Program:

Exposure: any situation arising from work operations where an employee may ingest, inhale, absorb through the skin or eyes, or otherwise come into contact with a hazardous substance.

Field Activities: activities that require employees to be "outdoors" or out of the office environment.

Hazardous Substances: any substance that can be defined as a toxic substance or as a hazardous chemical. Toxic substances are any of the substances listed in the latest printed edition of the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances or has yielded positive evidence of acute or chronic health hazard in human, animal or other biological testing. Hazardous chemicals refer to any element, chemical compound or mixture of elements and/or compounds whose presence or use is a physical hazard or health hazard, as defined by 29 CFR Section 1910.1200(c).

Health Hazard: a substance for which there is significant evidence, based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. Substances identified as a health hazard include those that have been shown to have carcinogenic effects and those that have toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system and agents which may damage the lungs, skin, eyes, or mucus membranes.

Physical Hazard: a substance for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

Safety Data Sheet (SDS): a detailed information bulletin prepared by the manufacturer or importer of a chemical that describes the physical and chemical properties, physical and health hazards, routes of exposure, precautions for safe handling and use, emergency and first-aid procedures, and control measures.

Multi-employer Worksites: worksites where there are two or more different employers working in close proximity on the same site. These sites require the exchange of hazard information, including SDS's among the employers, as well as exchanging hazard information with the Host employer.

Office Activities: activities performed while employees are in the offices of the corporation, or its clients, subcontractors, or vendors.

5.0 HAZCOM PROGRAM ELEMENTS

5.1 CHEMICAL PURCHASE REQUIREMENTS

Hazardous chemicals/substances purchased by INTERA shall be accompanied with a vendor furnished Safety Data Sheet (SDS). SDSs will be kept in designated 3-ring binders as follows: one binder will contain SDSs relating to hazardous chemicals present in the office setting and one binder will have SDSs relating to hazardous chemicals present at off-site field projects. One set of binders will be kept in each office, as appropriate. The office-setting SDS binder will be stored in the main copy room/supply room in each office, and the field project SDS binder will be stored in the field supply room or in the office of the Branch Health and Safety Coordinator, whichever is most convenient. The field project SDS binder will serve as the source of SDSs for inclusion in Site-Specific Health and Safety Plans (SSHASPs), as necessary for specific field projects. SDSs must be kept for **30 years** per OSHA 1910.1020(c)(5).

INTERA employees who purchase hazardous chemicals must determine whether a current SDS is either already included in the appropriate SDS binder or is received with the shipment. For new hazardous chemicals, an SDS should be obtained and submitted to the Corporate Health and Safety Officer or to the Branch Health and Safety Coordinator within ten (10) working days of the purchase.

The HazCom Program **does not** apply to consumer products such as Windex and printer toner and ink cartridges where the employer can show that the product is used in the workplace for the purpose intended by the chemical manufacturer or importer of the product and the use results in a duration and frequency of

exposure which is not greater than the range of exposures that could reasonably be experience by consumers when used for the intended purpose (29 CFR 1910.1200(a)(6)(ix)).

5.2 CHEMICAL LABELING REQUIREMENTS

The INTERA employee responsible for purchasing a specific hazardous or toxic chemical will also be responsible for ensuring that all containers of the hazardous or toxic chemical entering the workplace are properly labeled. The manufacturer's original label shall include the following according to the Globally Harmonized System of Classification and Labeling of Chemicals (GHS):

1. Product identifier;
2. Signal word (either "Warning" or "Danger");
3. Standardized Hazard Statement corresponding to health, physical, and environmental hazard classes;
4. Hazard pictogram(s);
5. Precautionary statement(s), and
6. Name, address, and telephone number of chemical manufacturer, importer, or other responsible party.

Unlabeled containers are not acceptable and will not be used. Original labels shall not be defaced or removed. All labels will be legible, in English, and prominently displayed on the container. If the hazardous chemical is to be transferred to a separate container, the new container shall be properly labeled in accordance with the original label. Additional details regarding proper labeling of containers is provided in **Attachment A** to this HazCom Program including information on labeling systems used prior to conversion to GHS.

5.3 REQUIREMENTS FOR SAFETY DATA SHEETS

Filing System:

SDSs shall be stored in loose-leaf binders that are available to employees as described above in Section 3.1. Each binder shall include a Hazardous Chemical List (HCL), which is an index that lists hazardous chemicals in alphabetical order by product name. For hazardous chemicals stored and used in the office, the SDS binders are kept in the main copy room/supply room in each office, and field project SDS binders will be stored in the field supply room or in the office of the Branch Office Health and Safety Coordinator, whichever is most convenient. SDS binders are available to employees during normal business. Site-specific SDSs shall also be kept in each field vehicle or field office that contains chemicals for use in the field and must be included as an attachment to the SSHASP.

The Program Administrator will be responsible for maintaining the overall SDS system with support from Branch Office Health and Safety Coordinators, as delegated, and will review incoming data sheets for new and significant health and safety information and will make sure that the new information is provided to the affected employees. The Site Safety Officer is responsible for maintaining SDS data for individual field projects.

SDS Binders:

Each SDS Binder shall include:

- An HCL that lists hazardous chemicals in alphabetical order by product name for all SDS's in the office or for all SDSs used in field projects, as applicable, and
- A current SDS for each hazardous chemical used in the office or in the field.

NOTE: SDSs must be kept for 30 years.

SDS Contents:

According to GHS, each SDS shall include:

- Section 1. Identification;
- Section 2. Hazard(s) identification;
- Section 3. Composition/information on ingredients;
- Section 4. First-aid measures;
- Section 5. Fire-fighting measures;
- Section 6. Accidental release measures;
- Section 7. Handling and storage;
- Section 8. Exposure controls/personal protection;
- Section 9. Physical and chemical properties;
- Section 10. Stability and reactivity;
- Section 11. Toxicological information;
- Section 12. Ecological information;
- Section 13. Disposal considerations;
- Section 14. Transport information;
- Section 15. Regulatory information; and
- Section 16. Other information, including date of preparation or last revision.

5.4 NON-ROUTINE TASKS

The Project Manager, the Site Safety Officer and/or the employee are responsible for identifying non-routine project tasks. Before any non-routine task is performed, employees shall be advised of any special precautions that may be required. In the event such tasks are required, the Site Safety Officer will provide the following information about the task as it relates to the specific chemicals and hazards expected to be encountered:

- Specific chemicals and hazards;
- Personal protective equipment (PPE) required;
- Safety measures to be taken;
- Measures that have been taken to minimize the hazards including ventilation and respirator use;
- Presence of other employees, and
- Emergency procedures.

5.5 HAZARDOUS CHEMICAL LIST

The Hazardous Chemical List or HCL is essentially an index of SDSs for all on-site hazardous chemicals, either in the office or in the field. The HCLs for each branch office are available from the respective Branch Office Health and Safety Coordinator as well as from the front of their office-specific SDS binders, kept in the main copy/supply room of each office. Similarly, HCLs related to field projects can be found at the front of field project SDS binders that are maintained at each office, as appropriate, and inside the SSHASP for that project.

5.6 CLIENT AND MULTI-EMPLOYER SITES

In some cases, INTERA personnel may bring hazardous chemicals to a Host/Client's facility or location where INTERA is one of several employers. In these cases, INTERA shall:

- inform the Host/Client/other employers of the hazardous chemicals INTERA is bringing on site;
- provide access to the INTERA HazCom Program, appropriate SDSs and HCLs, and labeling information on the hazardous chemicals INTERA is bringing on site, and
- provide information on the precautionary measures that INTERA employees must take when working with the hazardous chemicals.

When working at a Host/Client's facility or on a multi-employer site, INTERA employees have the right to view SDSs of hazardous chemicals to which they may be exposed. The INTERA Site Safety Officer on multi-employer sites will request copies of hazard information from other employers and/or the Host/Client employer to make available as an attachment to the SSHASP.

INTERA may also opt to rely on the Host/Client's Hazard Communication Program to meet the requirements of OSHA's Hazard Communication standard. In these cases, the responsibility for hazard communication will be specified through contractual or other means.

5.7 PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS

Process safety management of highly hazardous chemicals is required to prevent or minimize the consequences of catastrophic releases of toxic, reactive, flammable or explosive chemicals as defined by 29 CFR 1910.119. Process safety management of highly hazardous chemicals applies to the following:

- A process which involves a chemical at or above the specified threshold quantities listed in Appendix A of 29 CFR 1910.119 (Appendix A is provided as **Attachment B** at the end of this Program);
- A process which involves a Category 1 flammable gas (as defined in 1910.1200(c)) or a flammable liquid with a flashpoint below 100 °F (37.8 °C) on site in one location, in a quantity of 10,000 pounds (4535.9 kg) or more except for:
 - Hydrocarbon fuels used solely for workplace consumption as a fuel (e.g., propane used for comfort heating, gasoline for vehicle refueling), if such fuels are not a part of a process containing another highly hazardous chemical covered by this standard; or,
 - Flammable liquids with a flashpoint below 100 °F (37.8 °C) stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration.

For sites where highly hazardous chemicals are present, a written plan of action will be developed and included in the SSHASP. The written plan of action will include all elements as required by 29 CFR 1910.119(c), (d), (e) and (f). Employees involved in processes related to the highly hazardous chemical will be trained according to 29 CFR 1910.119(g). Training will be documented, as appropriate, and will be kept on file in designated health and safety file cabinets in the corporate office and/or each branch office.

6.0 RESPONSIBILITIES

Program Administrator

The Program Administrator is responsible for administering the Hazard Communication Program. Duties of the program administrator include:

- Coordinating with Site Safety Officers or Branch Health and Safety Coordinators to keep the following up to date:
 - Container labels,
 - SDS availability, and
 - Workplace chemical lists;
- Arranging for and/or conducting training;
- Coordinating the transfer of HAZCOM information between INTERA and contractor/client;
- Maintaining records required by the HazCom Program;
- Evaluating the HazCom Program;
- Updating the HazCom Program, as needed; and
- Halting any operation in the company where there is danger of serious personal injury.

The Program Administrator for INTERA is the Corporate Health and Safety Officer. Certain administrative activities that are the responsibility of the Program Administrator, such as providing copies of the CHSP and the HazCom Program to new employees, may be delegated to INTERA administrative staff and/or Branch Office Health and Safety Coordinators, as appropriate.

Administrative Staff

INTERA administrative staff are responsible for providing new employees with copies of the CHSP, which includes the Hazard Communication Program as **Appendix 7**. The administrative staff may also be responsible for other administrative activities as delegated by the Program Administrator.

Project Managers

Project Managers are responsible for ensuring that the HazCom Program is implemented on their particular projects. In addition to being knowledgeable about the particular hazards associated with their project, Project Managers must also confirm that those working on the project understand the hazards. Duties of the Project Manager include:

- Identifying and evaluating potential hazards for the project, including those associated with non-routine tasks;
- Ensuring that employees working on their project have received appropriate hazard communication training;
- Being aware of hazards and corresponding protective measures associated with the project;
- Monitoring work areas and operations to identify new or changed hazards;
- Coordinating with the Program Administrator on how to address any issues which arise regarding the HazCom Program, and
- Halting any operation in the company where there is danger of serious personal injury.

Site Safety Officer

Duties of the Site Safety Officer include:

- Identifying and evaluating potential hazards for the project, including those associated with non-routine tasks;
- Identifying special precautions related to non-routine tasks and communicating to affected employees;
- Inspecting field project areas for compliance with the HazCom Program;
- Maintaining SDS data for individual field projects;
- Requesting copies of hazard information from other employers and/or the Host/Client employer on multi-employer sites and making the hazard information available as an attachment to the SSHASP; and
- Halting any operation in the company where there is danger of serious personal injury.

Employees

Each employee has the responsibility to notify his/her Manager when he/she is unsure of the hazards associated with a particular project. Employees must also:

- Know the location of SDS's and have a copy of the written HazCom Program;
- Be able to identify the Program Administrator;
- Before entering a work area, the employee will ascertain what hazards they may be exposed to and then take appropriate action to protect themselves;
- Inform their Project Manager if the actual hazards encountered are significantly different from those identified in the training and instruction received;
- Inform the Project Manager or Program Administrator of hazardous products received without labels, damaged labels, or without SDS support documentation;
- Send appropriate SDS copies to the Site Safety Officer and Program Administrator, and
- Inform the Project Manager or the Program Administrator of any hazards that they feel are not adequately addressed in the workplace or of any other concerns that they have regarding the HazCom Program.

Subcontractors

The Project Manager will provide the following information to all subcontractors:

- List of hazardous chemicals to which they may be exposed while in the workplace;
- Measures to minimize the possibility of exposure;
- Location of SDSs and labeling requirements for hazardous chemicals, and
- Procedures to follow if they are exposed.

The Project Manager will expect and collect from subcontractors:

- SDS, labeling, and hazard information on all hazardous chemicals brought on site, and
- Copies of subcontractor written policies and procedures for hazard communication, when appropriate.

7.0 TRAINING

Initial Training

The Program Administrator will provide training to all employees on the elements of the HazCom Program, their responsibilities under the HazCom Program, and on the applicable regulatory requirements. Initial training to the HazCom Program is accomplished through reading and acknowledgement of this Program. Each employee will receive a copy of the CHSP at commencement of employment. The HazCom Program is included in the CHSP as **Appendix 7**, and each employee is required to sign the Acknowledgment page at the front of this HazCom Program confirming that they have read, understood, are familiar with, and will comply with the standards that have been established in the HazCom Program. Signing of an Acknowledgment page is also required in response to revisions to the HazCom Program. Signed acknowledgement pages will be kept with a master copy of the Corporate Health and Safety Program on file in designated health and safety file cabinets at each branch office and a copy will be kept in the designated corporate health and safety files.

Elements of the Training

Specific elements of HazCom Program training shall include:

- Information on any operations in the work area where hazardous chemicals are present;
- The location and availability of the written hazard communication program (**Appendix 7** of the CHSP, issued to all employees on commencement of work);
- The location and availability of the HCL (located at the front of each SDS binder);
- The location of the safety data sheets (SDS binders in offices or field truck/field office, as appropriate);
- Methods and observation techniques used to determine the presence or release of hazardous chemicals in the work area such as monitoring, visual appearance or odor of hazardous chemical when being released;
- The physical and health hazards of the hazardous chemicals in the work area;
- How to decrease or prevent exposure to these chemicals through the use of control/work practices and PPE;
- Emergency procedures to follow if exposed to hazardous chemicals;
- Proper labeling requirements for containers; and
- Explanation on how to read and interpret labels and SDSs.

Training beyond initial training to the HazCom Program as described above is not required for employees that are not involved in projects where hazardous chemicals are present and who work in offices where hazardous chemicals are not present.

Site-specific HazCom information will be included in SSHASPs. Additional training is required whenever a new health hazard is introduced into the work area. Employees expected to come in contact with the new health hazard (hazardous chemical) will be informed of its presence, will be instructed on its safe use, and will be trained on the hazards associated with the new hazardous chemical. Site-specific HazCom training will be documented using the **Safety Meeting Attendance Form** at the beginning of each project and whenever a new health hazard is introduced into the work area. The **Safety Meeting Attendance Form** is provided in **Appendix 9** of the CHSP.

Additional chemical-specific training will be provided, as appropriate, for specific hazardous chemicals such as hydrogen sulfide (refer to **Appendix 26** – Hydrogen Sulfide Awareness Plan).

Additional training with regard to the content and use of safety data sheets is also provided to employees who conduct field activities at sites that may contain hazardous chemicals as part of their OSHA 40-hour HAZWOPER training and annual 8-hour refreshers in accordance with OSHA regulation 29 CFR 1910.120 for general site workers (refer to **Appendix 11** – Hazardous Waste Operations and Emergency Response Plan).

HazCom training will be documented, as appropriate, and will be kept on file in designated corporate health and safety file cabinets and/or each branch office, as appropriate.

8.0 HAZCOM PROGRAM EVALUATION

The Program Administrator will conduct periodic evaluations of the workplace to ensure that the provisions of this HazCom Program are being implemented. Evaluations will include consultations with employees and their managers, site inspections, and a review of records.

Evaluation of the HazCom Program will be documented, as appropriate, and addressed by the Program Administrator. Documentation will include problems identified, if any, along with steps to be taken to correct deficiencies in the HazCom Program and target dates for the implementation of those corrections.

9.0 DOCUMENTATION AND RECORDKEEPING

A written copy of this HazCom Program and the applicable OSHA standard is provided to all employees as **Appendix 7** of the CHSP, which is provided to employees upon commencement of employment and after each revision. A replacement copy of the CHSP or of the HazCom Program will be supplied to any employee upon request.

Training records (signed acknowledgement pages) will be kept with a master copy of the CHSP on file in designated health and safety file cabinets at each branch office and a copy will be kept in the designated corporate health and safety files. These records will be updated as new employees are trained and as existing employees receive additional training.

10.0 MISCELLANEOUS

Non-English Speaking Employees

Care must be taken to make sure that hazard information is communicated to employees who may have difficulty with hazard information written in English. INTERA does not have this issue with the current work force, but should this situation arise in the future, the anticipated remedy will be to either provide these employees with a bi-lingual manager to translate the English hazard information, or if possible, to obtain hazard information in an alternate language.

LABELING SYSTEMS

Containers of hazardous chemicals shall be properly labeled. Labels or other forms of warning must be legible, in English, and prominently displayed on the container. A proper label is one that contains the name of the product (as it appears on the Safety Data Sheet [SDS]), as well as any physical and health hazards, including target organs (e.g., lung irritant).

The manufacturer's name and address shall also be included on the label. Most INTERA operations will rely on the manufacturer's label to meet regulatory requirements. Therefore, labels that have been placed on a container by the product's manufacturer shall not be removed, defaced, or covered. If the manufacturer's label is missing, illegible, or damaged, a label providing the required information shall be affixed.

As described below, there are currently five types of labels used in industry today. The final label described, the Global Harmonization System label, should ultimately be the only label in use.

1. **American National Standard Institute (ANSI):** Uses mostly words to describe the hazard along with some graphics, colors and geometric shapes. The hazard level is printed in the top of the label:

DANGER = serious hazard

WARNING = less hazardous but still severe

CAUTION = moderate hazard but still of concern



2. **Department of Transportation (DOT):** Prints the class or division of hazard on the label. The color of the label denotes a different hazard (e.g., flammable gas or liquids are red, explosives are orange, etc.). The DOT Hazard Class list is presented below:

Class 1: Explosives

Class 2: Gases

Class 3: Flammable Liquids

Class 4: Flammable Solids

Class 5: Oxidizers and Organic Peroxides

Class 6: Toxic Materials and Infectious Substances

Class 7: Radioactive Materials

Class 8: Corrosive Materials

Class 9: Miscellaneous



3. **National Fire Protection Agency (NFPA):** Uses four color-coded diamonds. Each color signifies a particular hazard and a number or letter within each color diamond denotes the level of hazard. The NFPA ratings are typically skewed in favor of fire safety meaning they assign a greater risk to flammable materials and immediate risks than to long term risks.

Blue – This diamond contains the Health hazard associated with a chemical. A number ranging from 0 to 4 denotes the level of hazard associated with the chemical, as detailed below.

0-Normal material

1-Slightly hazardous

2-Hazardous

3-Extreme danger

4-Deadly

Red – This diamond contains the Fire hazard associated with the chemical. A number ranging from 0 to 4 denotes the flash point of the chemical, as detailed below. This is an indicator of how readily a material will burn, so the lower the flash point of a material, the easier it will burn.

- 0-Will not burn
- 1-Above 200 °F
- 2-Between 200 °F and 100 °F
- 3-Below 100 °F
- 4-Below 73 °F

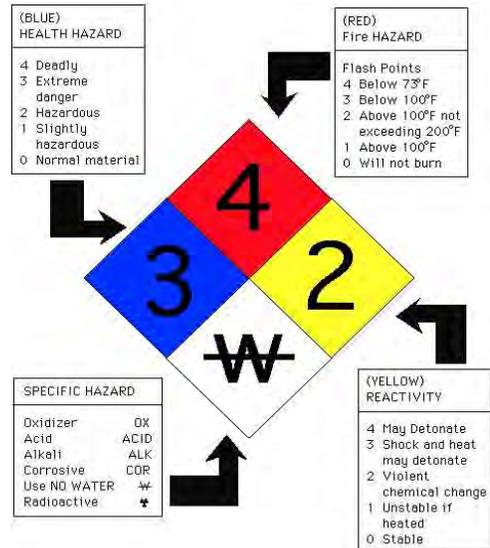
Yellow – This diamond contains the Reactivity hazard associated with the chemical. A number ranging from 0 to 4 denotes the reactivity of the chemical, as detailed below.

- 0-Stable
- 1-Unstable if heated
- 2-Violent chemical change
- 3-Shock or heat may detonate
- 4-May detonate

White – This diamond contains specific additional information about the chemical. The information may provide insight into the way a fire-fighting team approaches the chemical or how the material should be handled. A few examples of specific hazards are listed below.

- OXY Oxidizer
- ACID Acid
- ALK Alkali
- COR Corrosive
- Radioactive
- Use NO WATER

The NFPA classification is illustrated in this diagram:



4. **Hazardous Materials Identification System (HMIS):**

This system uses a color and numbering system similar to the NFPA, but as shown in the figure below, uses a table instead of a diamond. This system also provides a section with a personal protection code in order to assist personnel with choosing the correct level of protective gear.



5. **Global Harmonization System (GHS):** GHS labels include: a product identifier; a signal word (either Category 1 “Warning” or Category 2 “Danger”); standardized hazard statements corresponding to health, physical, and environmental hazard classes; hazard symbols/hazard pictograms; precautionary statements, and the name, address, and telephone number of the chemical manufacturer, importer, or other responsible party. The GHS hazard pictograms, along with their names and associated hazards are indicated below. Pictograms are on a white background with a red diamond.

 Explosion hazard symbol	<p>Usage</p> <ul style="list-style-type: none"> • Unstable explosives • Self-reactive substances and mixtures • Organic peroxides
 Flame	<p>Usage</p> <ul style="list-style-type: none"> • Flammable gases • Flammable aerosols • Flammable liquids • Flammable solids • Self-reactive substances and mixtures • Pyrophoric liquids, category 1 • Pyrophoric solids, category 1 • Self-heating substances and mixtures • Substances and mixtures, which in contact with water, emit flammable gases • Organic peroxides
 Flame over circle	<p>Usage</p> <ul style="list-style-type: none"> • Oxidizing gases • Oxidizing liquids • Oxidizing solids
 Gas cylinder	<p>Usage</p> <ul style="list-style-type: none"> • Compressed gases • Liquefied gases • Refrigerated liquefied gases • Dissolved gases
 Corrosion	<p>Usage</p> <ul style="list-style-type: none"> • Corrosive to metal • Skin corrosion • Serious Eye Damage

 Skull and crossbones	<p>Usage</p> <ul style="list-style-type: none"> • Acute toxicity (severe)
 Exclamation mark	<p>Usage</p> <ul style="list-style-type: none"> • Acute toxicity (harmful) • Skin irritation • Eye irritation • Skin sensitization • Respiratory tract irritation • Narcotic effects
 Health hazard	<p>Usage</p> <ul style="list-style-type: none"> • Respiratory sensitization • Mutagen • Carcinogen • Reproductive toxicity • Target organ toxicity • Aspiration hazard
 Environment	<p>Usage</p> <ul style="list-style-type: none"> • Acute hazards to the aquatic environment • Chronic hazards to the aquatic environment

29 CFR 1910.119 APPENDIX A

This Appendix contains a listing of toxic and reactive highly hazardous chemicals which present a potential for a catastrophic event at or above the threshold quantity.

CHEMICALNAME	CAS*	TQ**
Acetaldehyde	75-07-0	2500
Acrolein (2-Popenal)	107-02-8	150
Acrylyl Chlorde	814-68-6	250
Allyl Chlorid	107-05-1	1000
Allylamine	107-11-9	1000
Alkylaluminum	Varies	5000
Ammonia, Anhydrous	7664-41-7	10000
Ammonia solutions (greater than 44% ammonia by weight)	7664-41-7	15000
AmmoniumP erchlorate	7790-98-9	7500
Ammonium Permanganate	7787-36-2	7500
Arsine (also called Arsenic Hydride)	7784-42-1	100
Bis (Chloromethyl) Ether	542-88-1	100
Boron Trichloride	10294-34-5	2500
Boron Trifluoride	7637-07-2	250
Bromine	7726-95-6	1500
Bromine Chloride	13863-41-7	1500
Bromine Pentafluoride	7789-30-2	2500
Bromine Trifluoride	7787-71-5	15000
3-Bromopropyne (also called Propargyl Bromide)	106-96-7	100
Butyl Hydroperoxide (Tertiary)	75-91-2	5000
Butyl Perbenzoate (Tertiary)	614-45-9	7500
Carbonyl Chloride (see Phosgene)	75-44-5	100
Carbonyl Fluoride	353-50-4	2500
Cellulose Nitrate (concentration greater than 12.6% nitrogen)	9004-70-0	2500
Chlorine	7782-50-5	1500
Chlorine Dioxide	10049-04-4	1000
Chlorine Pentrafluoride	13637-63-3	1000
Chlorine Trifluoride	7790-91-2	1000
Chlorodiethylaluminum (also called Diethylaluminum Chloride)	96-10-6	5000
1-Chloro-2, 4-Dinitrobenzene	97-00-7	5000
Chloromethyl Methyl Ether	107-30-2	500
Chloropicrin	76-06-2	500
Chloropicrin and Methyl Bromide mixture	None	1500
Chloropicrin and Methyl Chloride mixture	None	1500
Cumene Hydroperoxide	80-15-9	5000
Cyanogen	460-19-5	2500
Cyanogen Chloride	506-77-4	500
Cyanuric Fluoride	675-14-9	100
Diacetyl Peroxide (concentration greater than 70%)	110-22-5	5000
Diazomethane	334-88-3	500
Dibenzoyl Peroxide	94-36-0	7500
Diborane	19287-45-7	100
Dibutyl Peroxide (Tertiary)	110-05-4	5000
Dichloro Acetylene	7572-29-4	250
Dichlorosilane	4109-96-0	2500
Diethylzinc	557-20-0	10000

**Corporate Health and Safety Program: Appendix 7
Hazard Communication Program
Attachment B: 29 CFR 1910.119 Appendix A –
Threshold Quantities for Highly Hazardous Chemicals**

CHEMICALNAME	CAS*	TQ**
Diisopropyl Peroxydicarbonate	105-64-6	7500
Dilauroyl Peroxide	105-74-8	7500
Dimethyldichlorosilane	75-78-5	1000
Dimethylhydrazine,1,1-	57-14-7	1000
Dimethylamine, Anhydrous	124-40-3	2500
2,4-Dinitroaniline	97-02-9	5000
Ethyl Methyl Ketone Peroxide (also Methyl Ethyl Ketone Peroxide; concentration greater than 60%)	1338-23-4	5000
Ethyl Nitrite	109-95-5	5000
Ethylamine	75-04-7	7500
Ethylene Fluorohydrin	371-62-0	100
Ethylene Oxide	75-21-8	5000
Ethyleneimine	151-56-4	1000
Fluorine	7782-41-4	1000
Formaldehyde (Formalin)	50-00-0	1000
Furan	110-00-9	500
Hexafluoroacetone	684-16-2	5000
HydrochloricAcid, Anhydrous	7647-01-0	5000
HydrofluoricAcid, Anhydrous	7664-39-3	1000
Hydrogen Bromide	10035-10-6	5000
Hydrogen Chloride	7647-01-0	5000
Hydrogen Cyanide, Anhydrous	74-90-8	1000
Hydrogen Fluoride	7664-39-3	1000
Hydrogen Peroxide (52% by weight or greater)	7722-84-1	7500
Hydrogen Selenide	7783-07-5	150
Hydrogen Sulfide	7783-06-4	1500
Hydroxylamine	7803-49-8	2500
Iron, Pentacarbonyl	13463-40-6	250
Isopropylamine	75-31-0	5000
Ketene	463-51-4	100
Methacrylaldehyde	78-85-3	1000
Methacryloyl Chloride	920-46-7	150
Methacryloyloxyethyl Isocyanate	30674-80-7	100
Methyl Acrylonitrile	126-98-7	250
Methylamine, Anhydrous	74-89-5	1000
Methyl Bromide	74-83-9	2500
Methyl Chloride	74-87-3	15000
Methyl Chloroformate	79-22-1	500
Methyl Ethyl Ketone Peroxide (concentration greater than 60%)	1338-23-4	5000
Methyl Fluoroacetate	453-18-9	100
Methyl Fluorosulfate	421-20-5	100
Methyl Hydrazine	60-34-4	100
Methyl Iodide	74-88-4	7500
Methyl Isocyanate	624-83-9	250
Methyl Mercaptan	74-93-1	5000
Methyl Vinyl Ketone	79-84-4	100
Methyltrichlorosilane	75-79-6	500
Nickel Carbonyl (Nickel Tetracarbonyl)	13463-39-3	150
Nitric Acid (94.5% by weight or greater)	7697-37-2	500

**Corporate Health and Safety Program: Appendix 7
Hazard Communication Program
Attachment B: 29 CFR 1910.119 Appendix A –
Threshold Quantities for Highly Hazardous Chemicals**

CHEMICALNAME	CAS*	TQ**
Nitric Oxide	10102-43-9	250
Nitroaniline (para Nitroaniline)	100-01-6	5000
Nitromethane	75-52-5	2500
Nitrogen Dioxide	10102-44-0	250
Nitrogen Oxides (NO; NO(2); N2O4; N2O3)	10102-44-0	250
Nitrogen Tetroxide (also called Nitrogen Peroxide)	10544-72-6	250
Nitrogen Trifluoride	7783-54-2	5000
Nitrogen Trioxide	10544-73-7	250
Oleum (65% to 80% by weight; also called Fuming Sulfuric Acid)	8014-95-7	1000
Osmium Tetroxide	20816-12-0	100
Oxygen Difluoride (Fluorine Monoxide)	7783-41-7	100
Ozone	10028-15-6	100
Pentaborane	19624-22-7	100
Peracetic Acid (concentration greater 60% Acetic Acid; also called Peroxyacetic Acid)	79-21-0	1000
Perchloric Acid (concentration greater than 60% by weight)	7601-90-3	5000
Perchloromethyl Mercaptan	594-42-3	150
Perchloryl Fluoride	7616-94-6	5000
Peroxyacetic Acid (concentration greater than 60% Acetic Acid; also called Peracetic Acid)	79-21-0	1000
Phosgene (also called Carbonyl Chloride)	75-44-5	100
Phosphine (Hydrogen Phosphide)	7803-51-2	100
Phosphorus Oxychloride (also called Phosphoryl Chloride)	10025-87-3	1000
Phosphorus Trichloride	7719-12-2	1000
Phosphoryl Chloride (also called Phosphorus Oxychloride)	10025-87-3	1000
Propargyl Bromide	106-96-7	100
Propyl Nitrate	627-3-4	2500
Sarin	107-44-8	100
Selenium Hexafluoride	7783-79-1	1000
Stibine (Antimony Hydride)	7803-52-3	500
Sulfur Dioxide (liquid)	7446-09-5	1000
Sulfur Pentafluoride	5714-22-7	250
Sulfur Tetrafluoride	7783-60-0	250
Sulfur Trioxide (also called Sulfuric Anhydride)	7446-11-9	1000
Sulfuric Anhydride (also called Sulfur Trioxide)	7446-11-9	1000
Tellurium Hexafluoride	7783-80-4	250
Tetrafluoroethylene	116-14-3	5000
Tetrafluorohydrazine	10036-47-2	5000
Tetramethyl Lead	75-74-1	1000
Thionyl Chloride	7719-09-7	250
Trichloro (chloromethyl) Silane	1558-25-4	100
Trichloro (dichlorophenyl) Silane	27137-85-5	2500
Trichlorosilane	10025-78-2	5000
Trifluorochloroethylene	79-38-9	10000
Trimethoxyasilane	2487-90-3	1500

Footnote* Chemical Abstract Service Number

Footnote** Threshold Quantity in Pounds (Amount necessary to be covered by this standard.)

Attachment G

Respiratory Protection Program

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LIST OF ATTACHMENTS

- Attachment A: NIOSH Air Purifying Respirator Selection Flow Chart
- Attachment B: Respiratory Medical Evaluation Questionnaire
- Attachment C: Respirator Inspection Checklist

1.0 PURPOSE

The purpose of this Respiratory Protection Program is to provide for the protection of employees from respiratory hazards through proper use of respirators. Respirators are to be used only where engineering control of respiratory hazards is not feasible, while engineering controls are being installed or in emergency situations. This Program is an integral piece of the overall INTERA Corporate Health and Safety Program (CHSP).

2.0 RESPONSIBILITY

The Corporate Health and Safety Officer (Amy Andrews) is designated as the Respiratory Program Administrator and, as such, is responsible for this Program and has full authority to make the decisions necessary for the success of this Program. This authority includes hiring personnel and purchasing the equipment necessary to implement and operate the Program. Branch Health and Safety Coordinators are the designated representative of the Corporate Health and Safety Officer, and are responsible for implementation and operation of this Program in each branch office. This written Program was developed in accordance with the requirements of 29 CFR 1910.134 and covers each of the basic elements in the regulations. The Corporate Health and Safety Officer will review the Program annually and will amend these instructions as necessary.

The Corporate Health and Safety Officer or Branch Health and Safety Coordinators, in conjunction with Project Managers and Site Safety Officers, will review employee job descriptions and determine which, if any, employees may be required to wear respiratory protection as part of their job responsibilities. INTERA employees whose work includes wearing respiratory protection will be trained to this Program. The Corporate Health and Safety Officer or Branch Health and Safety Coordinator will be responsible for ensuring that these employees are trained in the provisions of this Program.

All INTERA personnel have the authority to stop an activity if it is being performed in a hazardous manner. This authority includes halting operations because of respiratory hazards. If an employee believes that he or she is being asked to perform work in an unsafe environment, that employee is authorized to decline the request. Employees are encouraged to communicate their health and safety concerns to the Corporate Health and Safety Officer, Branch Health and Safety Coordinators, Project Managers and/or Site Safety Officers to implement changes to work procedures where needed to reduce injury and illness exposures in the workplace. Additionally, the Corporate Health and Safety Officer, Branch Health and Safety Coordinators, Project Managers and/or Site Safety Officers have the authority to halt operations because of non-compliance with the provisions of this Program. It is the responsibility of the Site Safety Officer to inspect field project areas for compliance with the Program.

3.0 PROCEDURES FOR SELECTING RESPIRATORS FOR USE IN THE WORKPLACE

Selection of respirators can be broken into two broad categories based on atmosphere characterization, i.e. is the atmosphere immediately dangerous to life or health (IDLH) or not. The Corporate Health and Safety Officer in conjunction with the Project Manager and the Site Safety Officer will determine whether the workplace atmosphere is IDLH or not. This determination will be based on field measurements of air quality using calibrated instruments that are operated by qualified personnel. The measurements will include oxygen levels, combustibles (as measured by combustible gas indicators), and toxics. If any oxygen levels and/or toxics fall into ranges that are considered IDLH, only NIOSH-approved positive pressure, pressure demand, supplied air equipment will be utilized.

There are two general types of positive pressure, pressure demand respirators: open circuit self-contained breathing apparatuses (SCBAs) where the breathing air source is designed to be carried by the user and supplied air respirators (SARs) where the breathing air is supplied through an airline. For SAR/airline units, an auxiliary self-contained air supply (express bottle) will also be required. Positive pressure, pressure demand, supplied air respirators will only be used by personnel properly trained in accordance with Section 10.0 of this Program and will use air that has been tested according to Section 8.0 of this Program. In general, INTERA does not perform field work at sites that contain hazard levels that are IDLH, or where Level A or Level B PPE is required. **In the event that site conditions require the use of Level A or Level B PPE, the Corporate Health and Safety Officer will be notified immediately to verify that proper training and procedures are in place prior to conduct of fieldwork.**

NOTE: Work will **not** occur at a site where the atmosphere is explosive, including atmospheres where oxygen levels exceed 23.5%.

For non-IDLH atmospheres where air contaminants exceed published exposure limits, air-purifying respirators (APRs) may be worn. The NIOSH Respirator Decision Logic tree in **Attachment A** will be used to determine if an APR can be used, to select the proper respirator configuration if an APR is appropriate and to determine the proper concentration range of contaminants. A combination of input from the Host/Client Site Safety Officer, from NIOSH Pocket Guide recommendations and from manufacturer specifications will be used to determine cartridge selection. Only NIOSH-approved air purifying respirators and cartridges will be used. NIOSH Pocket Guides may be obtained from the Corporate Health and Safety Officer.

There are three types of air-purifying respirators: particulate filters, cartridges and canisters. Cartridges and canisters contain sorbent medium. Combination devices are also available which contain layers of sorbent materials and filters, but these have not been tested for effectiveness against simultaneous exposure to more than one agent. The different types of APRs are color coded as follows:

- Magenta – high efficiency particulate filter – good for particulates such as dust, fumes, mist, asbestos, etc.;
- Black – organic vapor;
- White – acid gas;
- Yellow – combination organic vapor/acid gas; and
- Green – ammonia and organic vapor.

Chemical sorbent cartridges and canisters may have an expiration date. Once opened, humidity and other factors shorten their useful life and the canister/cartridge should be used immediately. After use, the canister/cartridge will be discarded.

4.0 MEDICAL EVALUATIONS

An employee will not be assigned to a task requiring the use of a respirator unless it has been determined that the employee is physically able to perform the work while using the equipment. Respiratory Medical Evaluations will be provided at no cost to the employee and will be done according to the **Respiratory Medical Evaluation Questionnaire** provided in **Attachment B**. A company-approved physician/medical provider will determine what health and physical conditions are pertinent. Respiratory Medical Evaluations will be done before an employee is fit tested and/or required to use a respirator.

Additional medical evaluations, using the **Respiratory Medical Evaluation Questionnaire** as provided in **Attachment B** or a questionnaire provided by the medical provider that obtains the same information as the questionnaire in **Attachment B**, will be provided in response to any of the following:

- An employee reports medical signs or symptoms that are related to ability to use a respirator;
- A physician/medical provider, manager, or the respirator program administrator informs the employer that an employee needs to be reevaluated;
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation; or
- A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

The medical status of each employee that uses a respirator will also be reviewed annually during routine medical surveillance. Medical records will be kept in accordance with the OSHA requirements in 29 CFR 1910.1020(c)(6)(i). Respiratory Medical Evaluation Questionnaires, results of medical exams, and Physician's Written Opinions will be kept on file in designated corporate health and safety file cabinets and copies of relevant records will be kept at each branch office, as appropriate. Confidential records will be kept in locked file cabinets that can be accessed only by the Corporate Health and Safety Officer, Branch Office Health and Safety Coordinators, or Corporate Human Resources personnel (as appropriate), for the employee's term of employment plus 30 years.

5.0 FIT TEST PROCEDURES FOR TIGHT FITTING RESPIRATORS

There are two types of fit test procedures: qualitative fit testing and quantitative fit testing. Both of these fit-test protocols are described in 29 CFR 1910.134, Appendix A. Qualitative fit tests may be conducted at the direction of the Corporate Health and Safety Officer, Branch Health and Safety Coordinator, the Project Manager or the Site Safety Officer. Quantitative fit test will be done at an approved respirator fit test contractor's facility, and successful fit tests will be verified by the Project Manager prior to use at a specific job site. Fit tests performed by the selected fit test contractor will conform to the protocols in 29 CFR 1910.134, Appendix A

Qualitative fit testing may be performed for air purifying respirators during initial and refresher Hazardous Waste Operations and Emergency Response (HAZWOPER) training or during the annual physical by a certified individual, or at other times, as needed. The respirator fit test will be repeated annually for employees who regularly use respirators. For those employees who seldom or infrequently use respirators, it is possible that more than one year may elapse between respirator uses. In those cases, fit tests will be performed prior to any re-use of respirators. Quantitative fit testing for supplied air respirators will be done on an as needed basis prior to work requiring their use. . Fit test records, both qualitative and quantitative, will be kept for term of employment in designated corporate health and safety file cabinets and/or each branch office, as appropriate.

Anyone needing prescription eyewear, that is also required to wear a respirator, will be provided with a spectacle kit designed to fit the specific facepiece that the employee must wear. Employees will also be trained on the importance of maintaining the face-to-facepiece seal. No facial hair will be allowed anywhere on the sealing surface.

6.0 PROCEDURES FOR PROPER USE OF RESPIRATORS IN EMERGENCY SITUATIONS

The normal procedure for INTERA employees during an emergency is to evacuate the work area when alarms are sounded and to remain outside the effected area until the "all clear" is sounded. Therefore, there no additional procedures are provided for emergency situations.

7.0 PROCEDURES FOR CLEANING, STORING, INSPECTING, REPAIRING AND DISCARDING RESPIRATORS

Supplied air respiratory equipment will be rented from vendors who will provide the equipment and the necessary documentation of periodic inspections of the air packs, air line masks, regulators, hoses and alarms. The equipment will be stored on-site in the cases provided by the rental company. For projects where this equipment will be used for more than one day, the Project Manager will have a representative from the supplied air equipment vendor to clean, disinfect, recharge and/or repair the equipment at a frequency that will have the equipment ready for use prior to the next day the equipment will be worn. At a minimum, supplied air equipment will be inspected once per month while on site. Respirator face-pieces will be periodically washed by the wearer of the device and checked by the Site Safety Officer during the course of the day, as necessary, to prevent eye or skin irritation associated by respirator use. Documentation of inspections by equipment vendors will be kept on file in designated health and safety file cabinets in the corporate office and each branch office, as appropriate.

For air-purifying respirators, the Site-Specific Health and Safety Plan (SSHASP) will specify whether full-face or half-face respirators will be required. Full and half-face respirators will be thoroughly cleaned and disinfected using the procedure outlined in **Attachment C** according to the following schedule:

- Respirators issued for the exclusive use of an employee shall be cleaned and disinfected as often as necessary to be maintained in a sanitary condition;
- Respirators issued to more than one employee shall be cleaned and disinfected before being worn by different individuals, and
- Respirators used in fit testing and training shall be cleaned and disinfected after each use.

Once cleaned and disinfected, respirators shall be store in a way that protects them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture and damaging chemicals. Respirators will be stored in bags/cases provided by the manufacturer or in a zip-lock-type sealable bag in a manner that prevents deformation of the facepiece and exhalation valve.

Respirators used in routine situations by INTERA personnel shall be inspected BEFORE each use and during cleaning. Respirator inspections will be documented using the Respirator Inspection Checklist provided in **Attachment C** by the employee to whom the respirator has been issued. Completed Respirator Inspection Checklists will be kept on file in designated health and safety file cabinets in the corporate office and each branch office, as appropriate. Inspections will include a check of respirator function including tightness of connections and the condition of various parts and a check of elastomeric parts for pliability and signs of deterioration.

Respirators that fail inspection will be removed from service until the respirator can be repaired, or if the respirator cannot be repaired, it will be removed from service permanently and replaced with a new respirator. Any repairs to respirators must be performed by the respirator manufacturer or by a competent respirator repair facility. Completed repairs will be documented on the appropriate Respirator Inspection Checklist.

8.0 PROCEDURES FOR ENSURING ADEQUATE AIR QUALITY AND ADEQUATE FLOW OF AIR FOR SUPPLIED AIR RESPIRATORS

Before using any supplied air respiratory equipment from a vendor, the Project Manager or Site Safety Officer will receive and review the Quality Assurance Report on the OSHA Grade D parameters for the air and the test report on the flow volume on the masks. If it is a supplied air job, a qualified "bottle-watch" will be assigned the responsibility of ensuring adequate air flow to the users on air-line respirators. The "bottle-watch" will do this by maintaining pressure on the low pressure side of the regulator in the range of 60 -

120 psig and by asking the users about the adequacy of air flow when they come out of the area each break time. **Never use Oxygen as a substitute for breathing air.**

9.0 TRAINING OF EMPLOYEES IN THE RESPIRATORY HAZARDS WHICH THEY ARE POTENTIALLY EXPOSED

The only employees that will be allowed to wear respirators at INTERA are those who must also receive HAZWOPER training (29 CFR 1910.120). Therefore, the hazard awareness, air monitoring and health hazard aspects of potential workplace air are adequately covered by that training, and these concepts are also reviewed during the annual HAZWOPER refresher. The records of the training content and employee performance in that training are kept on file in designated corporate health and safety file cabinets and each branch office, as appropriate.

10.0 TRAINING IN THE PROPER USE OF RESPIRATORS

INTERA employees, whose job responsibilities include the use of respirators, will be trained in the contents of this Program. Initial training to the Respiratory Protection Program is accomplished through reading and acknowledgement of this Program. Each employee will receive a copy of the Respiratory Protection Program (**Appendix 14** of the CHSP) at commencement of employment and after each revision, and employees identified as having the need (or potential need) to wear a respirator are required to sign the Acknowledgment page at the front of this Respiratory Protection Program confirming that they have read, understood, are familiar with, and will comply with the standards that have been established in the Respiratory Protection Program. Signing of an Acknowledgment page is also required in response to revisions to the Respiratory Protection Program. Signed acknowledgement pages will be kept with a master copy of the CHSP on file in designated health and safety file cabinets at each branch office and a copy will be kept in the designated corporate health and safety files.

Additional training in the use of respirators is provided by the training contractor providing HAZWOPER training and is documented on training class certificates and through completion of fit test forms. The training gives the employee the opportunity to:

- Handle the respirator;
- Inspect valves, straps, and face piece;
- Have it fitted properly;
- Learn negative and positive pressure checks;
- Practice donning and doffing procedures; and
- Learn cleaning, storing and disinfecting procedures.

This training, along with annual HAZWOPER refreshers, also reviews the proper application of air purifying respirators according to the APR Selection Flow Chart provided in Section 3.0 and reminds employees of the limitations of both air purifying and supplied air respirators.

11.0 PERIODIC EVALUATIONS

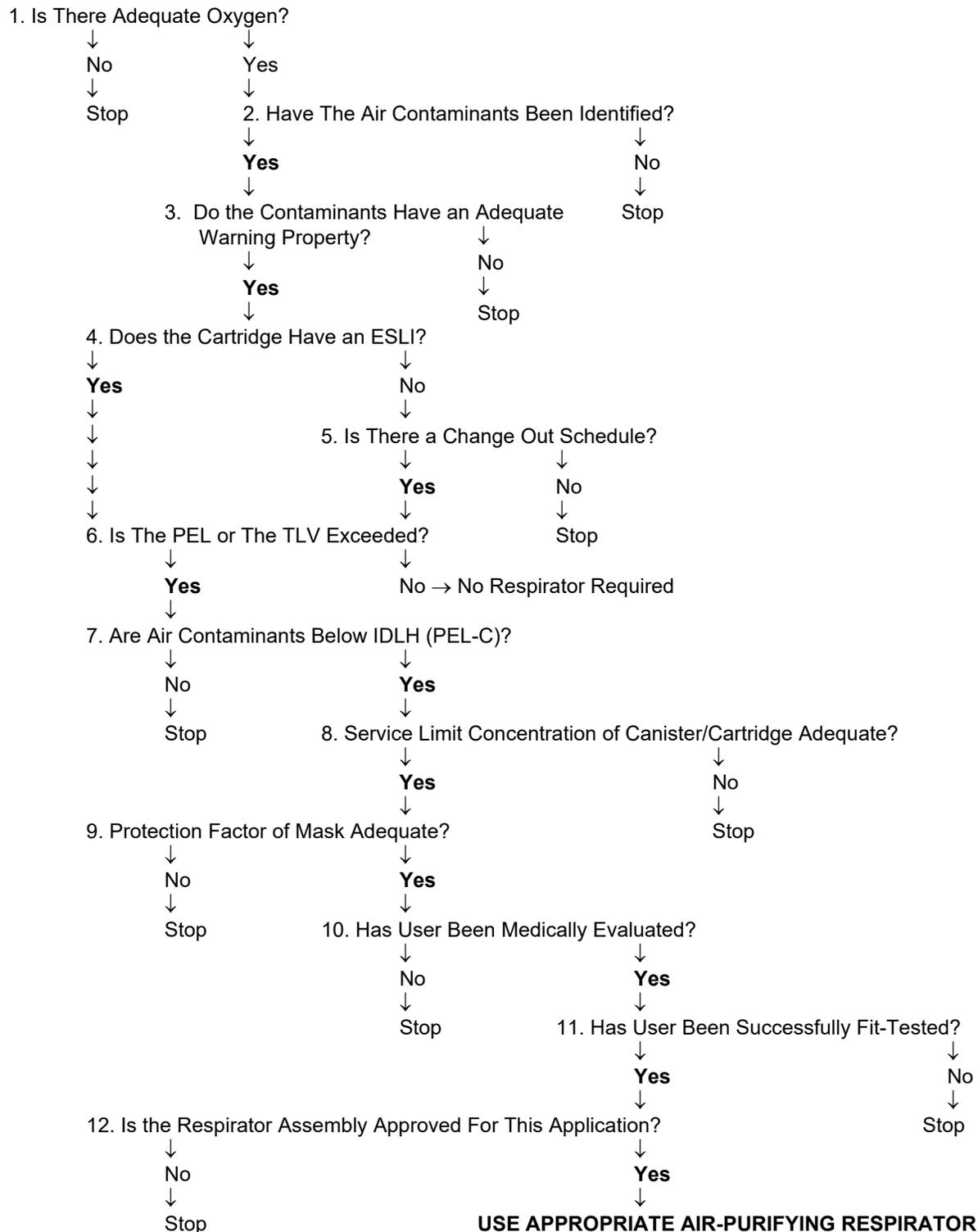
The Corporate Health and Safety Officer will review this written Program annually to ensure its effectiveness and make changes where appropriate. The Corporate Health and Safety Officer and/or the Project Manager will perform periodic inspections of work areas where respirators are used to ensure compliance with the written Program. The Corporate Health and Safety Officer, Branch Health and Safety Coordinator and/or the Project Manager will also consult regularly with employees to assess employee's views on program effectiveness and to identify and address any problems, as appropriate. Workplace inspections and employee consultations will be done in accordance with 29 CFR 1910.134(l)(1) and (2) and will be

documented and kept on file in designated corporate health and safety file cabinets and/or each branch office, as appropriate.

12.0 VOLUNTARY RESPIRATOR USE

Employees who voluntarily use a respirator to avoid exposures to hazards even if the amount of hazardous substances does not exceed the limits set by OSHA standards must be provided with a copy of 29 CFR 1910.134, Appendix D. Employees must read and adhere to 29 CFR 1910.134, Appendix D to make sure that the respirator is used properly and is kept clean so that the respirator itself does not become a hazard.

NIOSH APR SELECTION FLOW CHART (Can An Air-Purifying Respirator Be Used?)



29 CFR 1910.134 APPENDIX C: OSHA RESPIRATOR MEDICAL EVALUATION QUESTIONNAIRE
(Mandatory, but other forms that ask the same questions are acceptable)

To the employer: Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

To the employee:

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

Part A. Section 1. (Mandatory) The following information must be provided by every employee who has been selected to use any type of respirator (please print).

1. Today's date: _____
2. Your name: _____
3. Your age (to nearest year): _____
4. Sex (circle one): Male/Female
5. Your height: _____ ft. _____ in.
6. Your weight: _____ lbs.
7. Your job title: _____
8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code): _____
9. The best time to phone you at this number: _____
10. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one):
Yes/No
11. Check the type of respirator you will use (you can check more than one category):
 - a. _____ N, R, or P disposable respirator (filter-mask, non-cartridge type only).
 - b. _____ Other type (for example, half- or full-facepiece type, powered-air purifying, supplied-air, self-contained breathing apparatus).
12. Have you worn a respirator (circle one): Yes/No
If "yes," what type(s): _____

Part A. Section 2. (Mandatory) Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator (please circle "yes" or "no").

1. Do you *currently* smoke tobacco, or have you smoked tobacco in the last month: Yes/No
2. Have you *ever had* any of the following conditions?
 - a. Seizures: Yes/No
 - b. Diabetes (sugar disease): Yes/No
 - c. Allergic reactions that interfere with your breathing: Yes/No
 - d. Claustrophobia (fear of closed-in places): Yes/No
 - e. Trouble smelling odors: Yes/No
3. Have you *ever had* any of the following pulmonary or lung problems?
 - a. Asbestosis: Yes/No
 - b. Asthma: Yes/No
 - c. Chronic bronchitis: Yes/No
 - d. Emphysema: Yes/No
 - e. Pneumonia: Yes/No
 - f. Tuberculosis: Yes/No
 - g. Silicosis: Yes/No
 - h. Pneumothorax (collapsed lung): Yes/No
 - i. Lung cancer: Yes/No
 - j. Broken ribs: Yes/No
 - k. Any chest injuries or surgeries: Yes/No
 - l. Any other lung problem that you've been told about: Yes/No
4. Do you *currently* have any of the following symptoms of pulmonary or lung illness?
 - a. Shortness of breath: Yes/No
 - b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes/No

- c. Shortness of breath when walking with other people at an ordinary pace on level ground: Yes/No
 - d. Have to stop for breath when walking at your own pace on level ground: Yes/No
 - e. Shortness of breath when washing or dressing yourself: Yes/No
 - f. Shortness of breath that interferes with your job: Yes/No
 - g. Coughing that produces phlegm (thick sputum): Yes/No
 - h. Coughing that wakes you early in the morning: Yes/No
 - i. Coughing that occurs mostly when you are lying down: Yes/No
 - j. Coughing up blood in the last month: Yes/No
 - k. Wheezing: Yes/No
 - l. Wheezing that interferes with your job: Yes/No
 - m. Chest pain when you breathe deeply: Yes/No
 - n. Any other symptoms that you think may be related to lung problems: Yes/No
5. Have you *ever had* any of the following cardiovascular or heart problems?
- a. Heart attack: Yes/No
 - b. Stroke: Yes/No
 - c. Angina: Yes/No
 - d. Heart failure: Yes/No
 - e. Swelling in your legs or feet (not caused by walking): Yes/No
 - f. Heart arrhythmia (heart beating irregularly): Yes/No
 - g. High blood pressure: Yes/No
 - h. Any other heart problem that you've been told about: Yes/No
6. Have you *ever had* any of the following cardiovascular or heart symptoms?
- a. Frequent pain or tightness in your chest: Yes/No
 - b. Pain or tightness in your chest during physical activity: Yes/No
 - c. Pain or tightness in your chest that interferes with your job: Yes/No
 - d. In the past two years, have you noticed your heart skipping or missing a beat: Yes/No
 - e. Heartburn or indigestion that is not related to eating: Yes/No
 - d. Any other symptoms that you think may be related to heart or circulation problems: Yes/No
7. Do you *currently* take medication for any of the following problems?
- a. Breathing or lung problems: Yes/No
 - b. Heart trouble: Yes/No
 - c. Blood pressure: Yes/No
 - d. Seizures: Yes/No
8. If you've used a respirator, have you *ever had* any of the following problems? (If you've never used a respirator, check the following space and go to question 9:)
- a. Eye irritation: Yes/No
 - b. Skin allergies or rashes: Yes/No
 - c. Anxiety: Yes/No
 - d. General weakness or fatigue: Yes/No
 - e. Any other problem that interferes with your use of a respirator: Yes/No
9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Yes/No
- Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.
10. Have you *ever lost* vision in either eye (temporarily or permanently): Yes/No
11. Do you *currently* have any of the following vision problems?
- a. Wear contact lenses: Yes/No
 - b. Wear glasses: Yes/No
 - c. Color blind: Yes/No
 - d. Any other eye or vision problem: Yes/No
12. Have you *ever had* an injury to your ears, including a broken ear drum: Yes/No
13. Do you *currently* have any of the following hearing problems?
- a. Difficulty hearing: Yes/No

- b. Wear a hearing aid: Yes/No
- c. Any other hearing or ear problem: Yes/No
- 14. Have you *ever had* a back injury: Yes/No
- 15. Do you *currently* have any of the following musculoskeletal problems?
 - a. Weakness in any of your arms, hands, legs, or feet: Yes/No
 - b. Back pain: Yes/No
 - c. Difficulty fully moving your arms and legs: Yes/No
 - d. Pain or stiffness when you lean forward or backward at the waist: Yes/No
 - e. Difficulty fully moving your head up or down: Yes/No
 - f. Difficulty fully moving your head side to side: Yes/No
 - g. Difficulty bending at your knees: Yes/No
 - h. Difficulty squatting to the ground: Yes/No
 - i. Climbing a flight of stairs or a ladder carrying more than 25 lbs: Yes/No
 - j. Any other muscle or skeletal problem that interferes with using a respirator: Yes/No

Part B Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire.

- 1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen: Yes/No
 - If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions: Yes/No
- 2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: Yes/No
 - If "yes," name the chemicals if you know them: _____

- 3. Have you ever worked with any of the materials, or under any of the conditions, listed below:
 - a. Asbestos: Yes/No
 - b. Silica (e.g., in sandblasting): Yes/No
 - c. Tungsten/cobalt (e.g., grinding or welding this material): Yes/No
 - d. Beryllium: Yes/No
 - e. Aluminum: Yes/No
 - f. Coal (for example, mining): Yes/No
 - g. Iron: Yes/No
 - h. Tin: Yes/No
 - i. Dusty environments: Yes/No
 - j. Any other hazardous exposures: Yes/No
 - If "yes," describe these exposures: _____

- 4. List any second jobs or side businesses you have: _____

- 5. List your previous occupations: _____

- 6. List your current and previous hobbies: _____

- 7. Have you been in the military services? Yes/No
 - If "yes," were you exposed to biological or chemical agents (either in training or combat): Yes/No
- 8. Have you ever worked on a HAZMAT team? Yes/No
- 9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes/No
 - If "yes," name the medications if you know them: _____
- 10. Will you be using any of the following items with your respirator(s)?
 - a. HEPA Filters: Yes/No
 - b. Canisters (for example, gas masks): Yes/No
 - c. Cartridges: Yes/No

11. How often are you expected to use the respirator(s) (circle "yes" or "no" for all answers that apply to you)?:
- a. Escape only (no rescue): Yes/No
 - b. Emergency rescue only: Yes/No
 - c. Less than 5 hours *per week*: Yes/No
 - d. Less than 2 hours *per day*: Yes/No
 - e. 2 to 4 hours per day: Yes/No
 - f. Over 4 hours per day: Yes/No
12. During the period you are using the respirator(s), is your work effort:
- a. *Light* (less than 200 kcal per hour): Yes/No
If "yes," how long does this period last during the average shift: _____ hrs. _____ mins.
Examples of a light work effort are *sitting* while writing, typing, drafting, or performing light assembly work; or *standing* while operating a drill press (1-3 lbs.) or controlling machines.
 - b. *Moderate* (200 to 350 kcal per hour): Yes/No
If "yes," how long does this period last during the average shift: _____ hrs. _____ mins.
Examples of moderate work effort are *sitting* while nailing or filing; *driving* a truck or bus in urban traffic; *standing* while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; *walking* on a level surface about 2 mph or down a 5-degree grade about 3 mph; or *pushing* a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.
 - c. *Heavy* (above 350 kcal per hour): Yes/No
If "yes," how long does this period last during the average shift: _____ hrs. _____ mins.
Examples of heavy work are *lifting* a heavy load (about 50 lbs.) from the floor to your waist or shoulder; working on a loading dock; *shoveling*; *standing* while bricklaying or chipping castings; *walking* up an 8-degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs.).
13. Will you be wearing protective clothing and/or equipment (other than the respirator) when you're using your respirator: Yes/No
If "yes," describe this protective clothing and/or equipment: _____

14. Will you be working under hot conditions (temperature exceeding 77 deg. F): Yes/No
15. Will you be working under humid conditions: Yes/No
16. Describe the work you'll be doing while you're using your respirator(s):

17. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for example, confined spaces, life-threatening gases):

18. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when you're using your respirator(s):
- Name of the first toxic substance: _____
 - Estimated maximum exposure level per shift: _____
 - Duration of exposure per shift: _____
 - Name of the second toxic substance: _____
 - Estimated maximum exposure level per shift: _____
 - Duration of exposure per shift: _____
 - Name of the third toxic substance: _____
 - Estimated maximum exposure level per shift: _____
 - Duration of exposure per shift: _____
 - The name of any other toxic substances that you'll be exposed to while using your respirator:

19. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and well-being of others (for example, rescue, security):

RESPIRATOR INSPECTION CHECKLIST

Name of Inspector: _____ DATE: _____

Respirator Serial Number (or other identifying mark): _____

	<u>OK</u>	<u>NEEDS REPAIR</u>	<u>DATE REPAIRED</u>
1. Inhalation Valve	_____	_____	_____
2. Exhalation Valve(s)	_____	_____	_____
3. Cartridge to Cartridge Holder Gasket	_____	_____	_____
4. Other Gaskets/Canisters/Filters	_____	_____	_____
5. Face Piece Lens	_____	_____	_____
6. Straps	_____	_____	_____
7. Connecting Tube	_____	_____	_____
8. Face Sealing Surface Pliable and Intact	_____	_____	_____
9. General Cleanliness	_____	_____	_____

Other Comments:

Respirator Cleaning and Disinfecting Procedure

To clean the respirator:

1. Remove filters, cartridges or canisters and disassemble the facepiece according to the manufacturer's instructions.
2. Discard or repair any defective parts.
3. Thoroughly wash all components and surfaces in warm water with a mild detergent or with a cleaner recommended by the manufacturer. A soft bristle (not wire) brush may be used to facilitate the removal of dirt.
4. Rinse components thoroughly in clean, warm, preferably running water. Drain.
5. If the cleaner does not include a disinfecting agent, respirator components should be immersed for two minutes in a hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of warm water (43°F).
6. Rinse components thoroughly in clean, warm, preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized to prevent dermatitis or deterioration of respirator.
7. Components should be hand-dried with a clean lint-free cloth or air-dried.
8. Reassemble facepiece, replacing filter, cartridges, and canisters where necessary.
9. Test the respirator to ensure that all components work properly.

Attachment H

Confined Space Program

TABLE OF CONTENTS

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LIST OF FORMS

Form 1: Confined Space Entry Permit and Confined Space Entry Planning Worksheet

LIST OF ATTACHMENTS

Attachment A: Confined Spaces Glossary

1.0 POLICY

INTERA employees, who are required to perform Confined Space Entry work as defined by OSHA in 29 CFR 1910.146, will be trained in the contents and requirements of this Program. They will also be trained on the personnel protective equipment (PPE), ventilation equipment and rescue and retrieval equipment that are required for each particular Confined Space Entry. A written program for confined space entry will be established in the Site-Specific Health and Safety Plan (SSHASP), and a copy of the Confined Spaces Program will be included as an attachment to the SSHASP. This Program is an integral piece of the overall INTERA Corporate Health and Safety Program (CHSP).

2.0 RESPONSIBILITY

The Corporate Health and Safety Officer (Amy Andrews) is designated as the Confined Spaces Program Administrator and, as such, is responsible for this Program and has the authority to make necessary decisions regarding hiring personnel and purchasing the equipment necessary to implement and operate the Program. Branch Health and Safety Coordinators are the designated representative of the Corporate Health and Safety Officer, and are responsible for implementation and operation of this Program in each branch office. This written Program has been developed in accordance with the requirements of 29 CFR 1910.146 and covers each of the basic elements in the regulations. The Corporate Health and Safety Officer will review the Program annually and will amend these instructions as necessary.

The Corporate Health and Safety Officer or the Branch Health and Safety Coordinator and the Project Manager will review any project that involves Confined Space Entry work and will determine whether the Host Employer/Client or the INTERA Confined Spaces Program will apply. The Corporate Health and Safety Officer or the Branch Health and Safety Coordinator and the Project Manager will review employee job descriptions and determine which, if any, employees have job responsibilities that include Confined Space Entry work and those employees will be trained to this Program. The Corporate Health and Safety Officer or the Branch Health and Safety Coordinator will be responsible for ensuring that employees are trained in the provisions of this Program.

All INTERA personnel have the authority to stop an activity if it is being performed in a hazardous manner. If an employee believes that he or she is being asked to perform work in an unsafe environment, that employee is authorized to decline the request. Employees are encouraged to communicate their health and safety concerns to the Corporate Health and Safety Officer, Branch Health and Safety Coordinators, Project Managers and/or Site Safety Officers to implement changes to work procedures where needed to reduce injury and illness exposures in the workplace. Additionally, the Corporate Health and Safety Officer, Branch Health and Safety Coordinators, Project Managers and/or Site Safety Officers have the authority to halt operations because of non-compliance with the provisions of this Program.

3.0 DEFINITIONS

Confined Space

Confined spaces are characterized by the following conditions:

- It is not meant to be continuously occupied by workers;
- It has limited or restricted openings for entry and exit;
- It has poor natural ventilation; and
- Its size, shape or use may injure workers entering or working in it.

Permit-Required Confined Space (Permit-Space)

A permit-required confined space is a confined space that requires a permit before the space can be entered because it has or has the potential for one or more of the following characteristics:

- Atmosphere can become immediately dangerous to life or health (IDLH) due to toxic, flammable or asphyxiating characteristics;
- Potential for engulfment;
- Size or shape can trap or asphyxiate; or
- Any other recognized serious hazard.

Additional terms are defined in the Glossary provided as **Attachment A** to this Program.

4.0 INSPECTION AND EVALUATION

Work areas for field projects will be inspected and evaluated to determine if they require a confined space entry permit. The inspection is the responsibility of the Site Safety Officer. Hazards will be determined and evaluated. Conditions that prohibit entry to a permit-space will be evaluated and listed on the confined space entry permit and kept with the SSHASP.

5.0 PERMITS

Entry to a permit-space is restricted to those employees listed on the permits and only permit-listed tasks will be performed. Permits must be available to all employees that are required to enter a permitted confined space. The permit is valid only for the duration of the task. Permits must be retained by the employer whose Program was followed. Permits for any Confined Space Entry that is performed following the INTERA Program will be kept with the SSHASP in the project files for a minimum of one year. Copies of permits will be forwarded to the Corporate Health and Safety Officer. The Corporate Health and Safety Officer will conduct an annual review of any entries performed following the INTERA Program and will make changes to the Confined Spaces Program, as necessary.

Confined Space Entry Permits must be posted at the point of entry throughout the duration of the entry and must include the following:

- Identification of the space;
- Purpose of entry;
- Date and duration of permit;
- List of authorized entrants;
- Names of current attendants and entry supervisor;
- List of hazards in the permit space;
- List of measures to isolate the permit space and eliminate or control hazards;
- The acceptable entry conditions;
- Results of tests initialed by the persons performing tests;
- Rescue and emergency services and means to summon;
- Communication procedures for attendants and entrants;
- Required equipment (respirators, communication devices, alarm, etc.);
- Any other necessary information; and

- Any additional permits (such as for hot work under a Hot Work Permit).

A blank **Confined Space Entry Permit** is provided as **Form 1** to this Program. This form should be used for any Confined Space Entry done under the INTERA Confined Spaces Program. **Form 1** also includes the **Confined Space Entry Planning Worksheet** which should be used in planning for the entry and in filling out the **Confined Space Entry Permit**.

6.0 CONFINED SPACE NOTICE

The Site Safety Officer will inform employees through signs, or other equally effective means, of confined spaces that require a permit to enter. Normal work for INTERA does not require confined space entry work. As such, no confined spaces are routinely entered and employees are not typically trained. However, employees will be trained prior to confined spaces work, should the need arise.

Personnel Authorized to Issue Entry Permits – Entry Supervisors

Entry supervisors are authorized to issue entry permits and must know and understand the hazards associated with confined spaces. Before signing the permit, entry supervisors must complete the permit and verify the following:

- That proper air monitoring and testing has been conducted;
- That proper equipment and work procedures are in place for conduct of the work authorized in the confined space;
- That the space is prepared and isolated;
- That a trained rescue team is available; that the means for summoning them are operable and that the procedures in place will provide for a timely response; and
- That all entrants have been given the opportunity to witness the air monitoring.

Entry supervisors may terminate entry and cancel permits. They must remove unauthorized individuals who enter a confined space. They also must determine that conditions are acceptable as specified in the permit.

Personnel Authorized to Enter Confined Spaces - Entrants

An employee who is authorized by the employer to enter into a permit-required confined space is referred to as the entrant. Personnel identified as entrants on permits must know the hazards they may face, be trained to recognize signs or symptoms of exposure, and understand the consequences of exposure to hazards.

Entrants must know how to use any needed equipment, communicate with attendants, alert attendants when a warning symptom or other hazardous condition exists and exit as quickly as possible whenever ordered or alerted (by alarm, warning sign or prohibited condition) to do so. Entrants will be provided an opportunity to witness any air quality testing prior to their entering a permit-required confined space.

Attendants

Attendants must know the hazards of the confined space and be aware of potential exposures. Attendants must perform the following duties:

- check permits to confirm list of authorized entrants
- prevent entry to those without a permit;
- maintain a continuous count of those in a confined space;
- monitor activity in the confined space; and

- remain outside the confined space until relieved.

If necessary, an attendant will:

- order everyone to exit a confined space;
- contact rescuers by radio provided by the Host Site, or by cell phone; and
- perform non-entry rescues.

Attendants may not perform any duty that will interfere with the duties listed above. INTERA attendants will not monitor more than one permit-required confined space at a time.

Authorized Personnel Training in the use of Gas Monitor Devices

INTERA will provide the necessary oxygen, combustible gas and toxic gas monitoring equipment. Equipment will be calibrated and only properly trained personnel will be allowed to use the sampling equipment to determine safe entry parameters. In some cases, the air monitoring of confined spaces will be performed by trained safety personnel provided by the Host Employer/Client. Entrants or their representatives will be given the opportunity to witness the air monitoring measurements and review the results. Entrants will also be allowed to request additional air monitoring measurements whenever they believe conditions may have changed.

Authorized On-Site Rescue Team Members

On-site rescue teams will consist of Host Employer/Client personnel whenever possible. However, in the event that a project involving confined spaces is undertaken by INTERA at a site where Host Employer/Client rescue personnel are not available, INTERA will provide a properly-trained rescue team.

On-site rescue teams should use employee retrieval systems whenever possible. On-site teams must be properly equipped. They must practice simulated rescues at least once every twelve (12) months. Rescue teams will receive the same training as authorized entrants and additional training on the use of PPE, use of rescue equipment and first aid, including CPR.

Outside Rescue Services

Rescue team services will be provided by the Host Employer/Client whenever possible, and they will be responsible for contracting with outside rescue services. In the event that a project involving permit-spaces is undertaken by INTERA at a site where Host Employer/Client support is not available, INTERA will contract with outside rescue services.

Outside rescue services will be called in the event of any emergency involving confined spaces. Outside rescue services must be made aware of hazards and have access to permit-spaces in order to develop rescue plans and practice rescues. Employers must provide hospitals or treatment facilities with any Safety Data Sheets (SDSs) or other information about known hazards in a permit-space, if the information can aid in treatment of rescued employees.

Preventing Unauthorized Entry

Barricades and signs will be posted around permit-required confined spaces to notify individuals that only trained employees will be allowed beyond the barricades. The attendant and supervisor will allow no unauthorized persons to enter the space.

Informing Other Contractors

INTERA will require any other contractor who intends to put employees in the confined space to provide proof of training at the required level. There will be a pre-entry meeting to review the permit form, the specific project hazards and required protective clothing. Other contractors will also be required to provide their own attendant and have their supervisor co-sign the permit.

Permit Issuing and Cancellation

Only properly trained and certified supervisors may issue a confined-space permit after the Host Employer/Client or INTERA safety personnel have verified the space has been properly prepared, the air quality has been checked, and that procedures have been followed according to the applicable Confined Spaces Program.

The permit can be cancelled by the supervisor, the attendant, or the entrant should any conditions develop that violate the permit entry conditions. This cancellation will be communicated by the attendant using the evacuation alarm specified on the permit to remove entrants from the space. The situation will be evaluated to determine the steps needed to re-issue a permit after the cancellation, but the initial permit will note the time of cancellation along with supervisor and attendant signatures. This cancelled permit is no longer valid, and a new permit will be issued prior to re-entering the space.

In addition, any Host Employer/Client site audible alarms will cancel any confined space permit using the same procedures listed above, and a new permit will be required to re-enter the space.

7.0 CONFINED SPACES TRAINING

INTERA employees who are required to perform work in permit-required confined spaces will be trained in the contents of this Program. Training to the Confined Spaces Program is accomplished through reading and acknowledgement. Employees receive a copy of the Confined Spaces Program (**Appendix 19** of the CHSP) at commencement of employment, and employees identified as having the need to work in permit-required confined spaces are required to sign the Acknowledgment page at the front of the Confined Spaces Program confirming that they have read, understood, are familiar with, and will comply with the standards that have been established in the Program. Signing of an Acknowledgement page is also required upon receipt of revisions to the Program. Signed acknowledgement pages will be kept with a master copy of the CHSP on file in designated health and safety file cabinets at each branch office and a copy will be kept in the designated corporate health and safety files.

Additional training in a classroom setting is required to provide employees with the understanding, skills and knowledge to do their job safely. Training will be provided on the specific duties required for Entrants, Attendants, Supervisors and the Rescue Team. Training must include both initial and refresher courses. Refresher training is necessary when duties change, when hazards change, or whenever an evaluation determines inadequacies in an employee's knowledge. Certification of training must include the employee's name, signature or initials of trainer and date of training. Original certificates indicating completion of training are to be kept by the employee. A copy will be kept on file in designated corporate health and safety file cabinets as well as at the branch office of the respective employee. Training records are kept for the term of employment of the employee.

**INTERA CONFINED SPACE ENTRY
PERMIT**

Permit Number _____ Date _____

Location & Description of Confined Space:

Purpose of Entry:

Scheduled Start _____ a.m. _____ p.m. Day / Date / Time	Scheduled Finish _____ a.m. _____ p.m. Day / Date / Time
--	---

Entrants:

Attendants:

{Check those items below which are applicable to your confined space permit.}

TYPES OF HAZARDS

- | | | |
|--|---|---|
| <input type="checkbox"/> Oxygen-Deficient Atmosphere | <input type="checkbox"/> Engulfment | <input type="checkbox"/> Energized Electrical Equipment |
| <input type="checkbox"/> Oxygen-Enriched Atmosphere | <input type="checkbox"/> Toxic Atmosphere | <input type="checkbox"/> Entrapment |
| <input type="checkbox"/> Welding/Cutting | <input type="checkbox"/> Flammable Atmosphere | <input type="checkbox"/> Hazardous Chemical |

Note: If welding/cutting operations are to be performed, attach hot work permit to entry form.

ISOLATION PROCEDURES

- | | |
|---|---|
| <input type="checkbox"/> Equipment depressurized, drained, free of toxic/flammable material | <input type="checkbox"/> SDS/MSDSs reviewed |
| <input type="checkbox"/> Control valves locked/tagged | <input type="checkbox"/> Other Lock Out/Tag Out, as necessary |
| | <input type="checkbox"/> Energy sources de-energized |

SAFETY PRECAUTIONS

- | | | |
|--|---|--|
| <input type="checkbox"/> Protective Gloves/Other PPE | <input type="checkbox"/> Barricade Job Area | <input type="checkbox"/> Lifelines |
| <input type="checkbox"/> Entry and Caution Signs Posted | <input type="checkbox"/> Respirators (note type in Remarks below) | <input type="checkbox"/> Current H&S Certifications |
| <input type="checkbox"/> Fire-Retardant Clothing | <input type="checkbox"/> Lockout/Tagout | <input type="checkbox"/> Lighting |
| <input type="checkbox"/> Ventilation (e.g. mechanical power vent. fan) | <input type="checkbox"/> Fire Extinguishers | <input type="checkbox"/> Ground Fault Interrupter |
| <input type="checkbox"/> Two-way Radio | <input type="checkbox"/> Alert/Air Horns | <input type="checkbox"/> Other Communication Equipment |

Remarks: _____

ENVIRONMENTAL TESTING

ACCEPTABLE ENTRY CONDITIONS	TESTED	DATE / TIME	RE-TESTING	TESTED	DATE / TIME
Oxygen: 19.5% - 23.5%	_____ %	_____ a/p	Oxygen: _____ %	_____ %	_____ a/p
Lower Explosive Limit: <10% LEL	_____ %	_____ a/p	LEL:<10% LEL _____ %	_____ %	_____ a/p
Toxic Atmosphere (Benzene): 0.5 ppm or less	_____ ppm	_____ a/p	Toxic: _____ ppm	_____ ppm	_____ a/p
Toxic Atmosphere (H2S): <5ppm	_____ ppm	_____ a/p	Toxic: _____ ppm	_____ ppm	_____ a/p
Toxic Atmosphere (CO): <10ppm	_____ ppm	_____ a/p	Toxic: _____ ppm	_____ ppm	_____ a/p
Instruments Used:			Additional testing _____		

Calibration Date: _____

Employee Conducting Safety Checks **SIGNATURE:** _____

Remark on the overall condition of the confined space.

<p align="center">ENTRY SUPERVISOR AUTHORIZATION</p> <p>All actions and/or conditions for safe entry have been performed.</p> <p>Entry Supervisor _____</p> <p align="center"><small>PLEASE SIGN AND PRINT</small></p>	<p align="center">ENTRY CANCELLATION</p> <p>Entry has been completed and all entrants have exited permit space.</p> <p>Entry Supervisor _____</p> <p align="center"><small>PLEASE SIGN AND PRINT</small></p>
---	---

CONFINED SPACE ENTRY PLANNING WORKSHEET

What is the type of the confined space? _____

Where is the confined space located? _____

Reason for entering the confined space: _____

Contents of the confined space: _____

List oxygen level _____

Describe the procedures used to test oxygen and the testing equipment used: _____

List flammable gas level _____

Describe the procedures used to test flammable gas level and the testing equipment used: _____

List toxic gas levels _____

Describe the procedures used to test toxic gas levels and the testing equipment used: _____

List all mechanical and physical hazards: _____

Describe the procedures for isolating all mechanical and physical hazards: _____

What type of ventilation will be used? Mechanical Natural

Describe procedures: _____

Will the confined space be purged? _____

If yes, list the procedures: _____

Will the confined space be cleaned? _____

If yes, list procedures: _____

List all chemicals that will be used: _____

Will warning signs or barriers be needed? _____

If yes, describe what type and where they must be placed: _____

List the names and job assignments for every individual who will be involved in the entry.

Name	Job Assignment
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

List all equipment that will be needed.

Type of Equipment	Quantity
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

CONFINED SPACES GLOSSARY

Acceptable Entry Conditions - The conditions that must exist in a permit space to allow entry and so that employees involved with a permit-required confined space entry can safely enter into and work within the space.

Attendant - An individual stationed outside one or more permit-spaces who monitors the authorized entrants and who performs attendant's duties assigned in the employer's permit-space plan.

Authorized Entrant - An employee who is authorized by the employer to enter into a permit-space.

Blanking or Blinding - The absolute closure of a pipe, line or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and is capable of withstanding the maximum pressure of the pipe, line or duct with no leakage beyond the plate.

Confined Space - A space that: (1) is large enough and so configured that an employee can bodily enter and perform assigned work and (2) has limited or restricted entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and (3) is not designed for continuous employee occupancy.

Double Block and Bleed - The closure of a line, duct or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Emergency - Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

Engulfment - The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be breathed in and can cause death by filling or plugging the respiratory system; or that can exert enough force on the body to cause death by strangulation, constriction or crushing.

Entry - The action by which a person passes through an opening into a permit-required space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry Permit - The written or printed document that is provided by the employer to allow and control entry into the permit-space and contains the information of the permit-required confined space plan.

Entry Supervisor - The person (such as the employer, project manager or safety officer) responsible for determining if acceptable entry conditions are present at a permit-space where entry is planned; for authorizing entry and overseeing entry operations; and for terminating entry as required by this plan. Note: An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this plan for each role he or she fills. Also, the duties of the entry supervisor may be passed from one individual to another during the course of an entry operation.

Hazardous Atmosphere - An atmosphere that may expose employees to the risk of death, incapacitation, impairment of the ability to self-rescue (that is escape unaided from a permit space), injury, or illness from one or more of the following causes: (1) flammable gas, vapor or mist in excess of ten (10%) percent of its lower explosive limit (LEL); (2) airborne combustible dust at a concentration that meets or exceeds its LEL; (3) atmospheric oxygen concentration below 19.5 percent or above 23.5 percent; (4) atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, *Occupational Health and Environmental Control*, or in Subpart Z, *Toxic and Hazardous Substances*, of this part and which could result in employee exposure in excess of its dose or permissible exposure limit; (5) any other atmospheric condition that is immediately dangerous to life or health.

Hot Work Permit - The employer's written authorization to perform operations (for example, riveting, welding, cutting, burning and heating) capable of providing a source of ignition.

Immediately Dangerous to Life or Health (IDLH)- Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

Inerting - The displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

Isolation - The process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Line Breaking - The intentional opening of a pipe, line or duct that is or has been carrying flammable, corrosive or toxic material, an inert gas or any fluid at a volume, pressure or temperature capable of causing injury.

Non-Permit Confined Space - A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Oxygen Deficient Atmosphere - Means an atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen-Enriched Atmosphere - An atmosphere containing more than 23.5% oxygen by volume.

Permit-Required Confined Space (Permit-Space) - A confined space that has one or more of the following characteristics: (1) contains or has a potential to contain a hazardous atmosphere; (2) contains a material that has the potential for engulfing an entrant; (3) has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section; and (4) contains any other recognized serious safety or health hazard.

Permit-Required Confined Space Plan (Permit-Space Plan) - The employer's overall plan for controlling and, where appropriate, for protecting employees from permit-space hazards or for regulating employee entry into permit-spaces.

Permit System - The employer's written procedure of preparing and issuing permits for entry and for returning the permit-space to service following termination of entry.

Prohibited Condition - Any condition in a permit-space that is not allowed by the permit during the period when entry is authorized.

Rescue Services - The personnel designated to rescue employees from permit-spaces.

Retrieval System - The equipment (including retrieval line, chest or full body harness, wristlets [if appropriate], and lifting device or anchor) used for non-entry rescue of persons from permit-spaces.

Testing - The process by which the hazards that may confront entrants of a permit-space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit-space.

HAZCOM

Hazardous Chemical List
Safety Data Sheets

LIST OF SITE CHEMICALS AND COPCS

Site COPCs

1. Benzene
2. Ethylbenzene
3. Toluene
4. total xylenes
5. total naphthalene
6. MTBE
7. EDC
8. EDB
9. unleaded gasoline
10. diesel fuel

Site Chemicals

1. motor oil
2. bentonite
3. Portland Cement
4. mercuric chloride (HgCl_2) as sample preservative
5. nitric acid (HNO_3) as sample preservative
6. sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$) as sample preservative

BENZENE**PRODUCT IDENTIFICATION****Chemical Name and Synonyms:**

Benzene; Benzol; Carbon oil; Cyclohexatriene; Phenyl hydride

Chemical Family:

Aromatic hydrocarbon

Chemical Formula:

C₆H₆

Product Use:

Laboratory solvent

Manufacturer's Name and Address:

Caledon Laboratories Ltd.
40 Armstrong Avenue
Georgetown, Ontario L7G 4R9

Telephone No:

(905) 877-0101

Fax No:

(905) 877-6666

Emergency Telephone No:

CANUTEC (613) 996-6666

HAZARDOUS INGREDIENTS OF MATERIALS

Ingredients	%	TLV Units	CAS No.
Benzene	99	0.5 ppm	71-43-2

STEL 2.5 ppm

PHYSICAL DATA**Physical State:**

Liquid

Odour and Appearance:

Clear, colourless to light yellow with an aromatic odour

Odour Threshold (ppm):

61 ppm (detection); 97 ppm (recognition) Poor warning qualities, threshold is above TLV.

Vapour Pressure (mm Hg):

75 mm Hg at 20°C

Vapour Density (Air = 1):

2.7

Evaporation Rate:

2.8 (diethyl ether = 1)

Boiling Point (°C):

80°C

Freezing Point (°C):

5.5°C

pH:

Not applicable

Specific Gravity:

0.877 @ 20°C

Coefficient of Water/Oil distribution:

LogP(oct) 1.18-1.9

SHIPPING DESCRIPTION**UN:**

1114

T.D.G. Class:

3 (9.2)

Pkg. Group:

II

REACTIVITY DATA**Chemical Stability:**

Stable

Incompatibility with other substances:

May react violently or explosively with strong oxidizing agents, strong acids, halogens and halogenated compounds, oxygen, oxone. Can explode on contact with chromic anhydride, permanganic acid, chlorine, nitryl perchlorate. Spontaneously flammable with sodium or potassium peroxide. Metal perchlorates recrystallized from benzene, can explode spontaneously. Contact with acids liberates toxic gas. Attacks rubber and plastics. Not corrosive to metals.

Reactivity:

Avoid high temperatures, sparks, open flames, hot surfaces, all sources of ignition, all incompatible materials, generation of mist or vapour.

Hazardous Decomposition Products:

CO_x

FIRE AND EXPLOSION DATA**Flammability:**

Extremely flammable liquid and vapour. Mixtures with air are explosive. Can accumulate static charge by flow or agitation. Vapours are heavier than air and may travel considerable distance to source of ignition and flash back. Liquid can float on water and may spread fire.

Extinguishing Media:

Dry chemical, foam, carbon dioxide. Water may be used to cool containers and disperse vapours but will be ineffective for extinguishing fire because it will not cool liquid below flash point. Fight fire from upwind, from a safe distance. Firefighters must wear protective equipment (NIOSH/ OSHA approved positive-pressure, full face-piece self-contained breathing apparatus) and encapsulating chemical splash suit to prevent any inhalation or contact with this chemical.

Flash Point (Method Used):

-11°C (TCC)

Autoignition Temperature:

498°C

Upper Flammable Limit (% by volume):

7.1%

Lower Flammable Limit (% by volume):

1.3%

Hazardous Combustion Products:

CO_x, irritating aldehydes, ketones.

Sensitivity to Impact:

Not expected to be sensitive

Sensitivity to Static discharge:

Liquid can accumulate static charge by flow or agitation. Vapour in the flammable range can be ignited by a electrostatic discharge of sufficient energy.

TOXICOLOGICAL PROPERTIES AND HEALTH DATA**Toxicological Data:****LD₅₀:**

(oral rat) 930 mg/kg, 1 mL/kg; (dermal, guinea pig) 9,400 µL/kg

LC₅₀:

(rat) 34mL/kg/2h; 6.5 mL/kg/4h

Effects of Acute Exposure to Product:**Inhaled:**

Toxic. Irritating to upper respiratory tract. Exposure to 50-150 ppm causes central nervous system depression with drowsiness, dizziness, headache, nausea. Exposure to 20,000 ppm for a 5-10 minutes can cause death. High concentrations

BENZENE

cause decreased judgement, feelings of well being, loss of balance, delirium, coma with motor restlessness, cardiac arrhythmias, pulmonary edema, cardiac or respiratory failure and death. Respiratory or cardiac complications may occur from within a few minutes to several days after exposure. May cause liver or kidney damage, and damage to blood and immune systems. If the exposure is not fatal, symptoms, such as unsteady gait, cardiac distress, internal bleeding, secondary infections, may persist for several weeks.

In contact with skin:

Based on animal studies, moderately irritating to skin, causing burning sensation, blistering and swelling. May be absorbed through skin, increasing systemic effects in "Inhaled".

In contact with eyes:

No human information. Based on animal studies, vapour is moderately irritating to eyes; liquid can cause burning sensation and transient corneal injury but not permanent damage.

Ingested:

Toxic. Causes burning sensation in mouth and throat. Readily absorbed, causing systemic intoxication with symptoms as in "Inhaled". Aspiration may cause immediate pulmonary edema and hemorrhage. The usual lethal dose in humans is 10-15 mL, but smaller amounts have been reported to cause death. If ingestion is not fatal, it may produce longterm effects that persist for up to a year.

Effects of Chronic Exposure to Product:

Studies have proved conclusively that prolonged or repeated exposure causes severe effects on the blood system, damage to bone marrow, and all types of blood cells, harmful changes to the immune system, including reduced lymphocyte counts.

Carcinogenicity:

Confirmed human carcinogen (designation A1). Causes cancer of white blood cells; aplastic anaemia; leukemia

Teratogenicity:

Crosses placental barrier, may cause teratogenic effects. Animal testing shows benzene fetotoxic, causing reduced birth weight and minor skeletal variations at levels that produce mild maternal toxicity.

Reproductive Effects:

Effects at doses which caused other significant signs of toxicity.

Mutagenicity:

Causes chromosomal aberrations in virtually all studies on animals and workers.

Synergistic Products:

Alcohols react synergistically. The use of alcoholic beverages may increase the toxic effects. The use of epinephrine may cause cardiac arrhythmias. Interactions with other medications have been reported.

PREVENTIVE MEASURES

Engineering Controls:

Non-sparking, grounded, separate, exhaust ventilation required.

Respiratory Protection:

At any concentration above the TLV, at any detectable concentration, or for fire or spill conditions where the concentration is unknown, NIOSH/OSHA approved positive-pressure, full face-piece self-contained breathing apparatus or positive-pressure, full face-piece supplied-air respirator with an auxiliary positive-pressure, self-contained breathing apparatus. IDLH (Immediately Dangerous to Life or Health) for benzene is 500 ppm; carcinogenic effects were not considered in establishing this value.

Eye Protection:

Chemical safety goggles and face shield.

Skin Protection:

Polyvinyl alcohol, Viton™/butyl rubber, Barrier (PE/PA/PE), Silver Shield/4H™ (polyethylene/ethylene vinyl alcohol), Responder™, Tychem™ BR/LV, Tychem™ TK gloves. Other impervious clothing, coveralls, boots, etc. as required to prevent contact.

Other Personal Protective Equipment:

Safety shower and eye-wash fountain available in work area.

Leak and Spill Procedure:

Eliminate all sources of ignition. Evacuate area. Cleanup personnel must be thoroughly trained in the hazards of this chemical and must wear protective equipment and clothing sufficient to prevent inhalation of vapours or mists and contact with skin and eyes. Do not touch spilled product. Stop or reduce discharge if safe to do so. Contain spill with activated carbon adsorbent or other inert material (sand, earth). Prevent from entering sewers or waterways, or confined spaces. Collect material into sealed, labelled containers for collection by disposal company. Contaminated absorbent may pose the same hazards as the spilled product; handle with the same caution. Ventilate area of spill, and flush with copious amounts of running water.

Waste Disposal:

Follow all federal, provincial and local regulations for disposal.

Handling Procedures and Equipment:

FLAMMABLE, TOXIC, CARCINOGEN, TERATOGEN, MUTAGEN. Workers must be thoroughly trained in the handling of hazardous materials and in the particular hazards of this material and its safe use, and must wear appropriate protective equipment and clothing. Ensure that engineering controls are operating effectively. Eliminate all ignition sources. Post "No Smoking" signs. Ground and bond equipment and containers to prevent a static charge buildup. Use spark-resistant tools and avoid "splash filling" of containers. Keep storage and work areas free of combustible or incompatible materials. Use the smallest amount possible for the purpose in a designated, well ventilated area. Avoid generating mists or vapours. AVOID ALL CONTACT AND INHALATION. Empty containers may contain hazardous residues; treat with caution.

Storage Requirements:

Store in suitable, labelled containers, in a cool, dry, well-ventilated area, out of direct sunlight and away from all sources of ignition and incompatible or combustible materials. Keep containers tightly closed. Storage facilities should be made of fire-resistant materials. Provide raised sills and trenches to drain to a safe area. Do not expose sealed containers to elevated temperatures. Protect from damage, and inspect frequently for signs of leaking. Treat empty containers with caution, as they may contain hazardous residues. Post "NO SMOKING" signs. Have appropriate fire extinguishers and spill cleanup equipment near the storage area.

FIRST AID MEASURES

Specific Measures:

Eyes:

IMMEDIATELY flush eyes with gently running water for at least thirty (30) minutes, holding eyelids open while flushing. Wear gloves to avoid contact. Take care not to flush contaminated water into unaffected eye. Get MEDICAL ATTENTION immediately.

Skin:

Under running water, remove contaminated clothing (including

BENZENE

rings, watches, belts and shoes). Wear gloves to avoid contact. IMMEDIATELY flush exposed area with large amounts of warm running water for at least thirty (30) minutes or until chemical is removed. Get medical attention. Discard contaminated clothing.

Inhalation:

IMMEDIATELY remove to fresh air (caution must be used by rescuers to avoid exposure to contaminating fumes). Remove any sources of ignition. Give oxygen and get medical attention for any breathing difficulty. If breathing has stopped give artificial respiration (use a mouth guard to prevent contact with chemical). If breathing and pulse are absent give CPR.

IMMEDIATELY OBTAIN MEDICAL ATTENTION. Stay with casualty until medical assistance is reached.

Ingestion:

DO NOT INDUCE VOMITING. DANGER OF ASPIRATION WITH VOMITING. If casualty is alert and not convulsing, rinse out mouth with water, and give 1 to 2 glasses of water or milk to drink to dilute material. GET MEDICAL ATTENTION IMMEDIATELY. If spontaneous vomiting occurs, have casualty lean forward with head down to avoid breathing in of vomitus. Rinse mouth and give more water to drink.

REFERENCES USED

CCINFO disc: Cheminfo

Royal Society of Chemistry: Chemical Safety Data Sheets, Vol. 1, 1992

Sax, Lewis: Hawley's Condensed Chemical Dictionary, 11th ed., 1987

Suppliers' Material Safety Data Sheets

ADDITIONAL INFORMATION

Date Issued:

November 1, 1988

Revision:

February 2012

MSDS:

1600-1, 1600-3, 1600-4, 1601-2

Proposed WHMIS Designation:

B2; D2A; D2B

Prepared by: Caledon Laboratories Ltd. (905)

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%P#C% R%/%

Q/R%/%

! #?%%

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Consult local authorities for acceptable exposure limits.

Section 9. Physical and Chemical Properties

Physical State and Appearance	J*c? *J6ÅTD? *JF
Color	N # &#%+ +C#JÅL*(ÅJ*+!*!*"S%Å"&)"*Å J &
Odor	2L%ÅD"&) " !*FÅJ &6
Molecular Weight	W !Å"ll#""Q#%6
Molecular Formula	N:> eBN>ÅN>H
Boiling/Condensation Point	=H:fNÅDA;fF
Melting/Freezing Point	BGefNÅEHGfF
Critical Temperature	H<<fNÅD:e=fF
Specific Gravity	C6E;ÅD"!%&ÅÅ=F
Vapor Pressure	=CÅ)) Å Å0ÅM ÅAe6:ÅF
Vapor Density	H6::ÅB* & ÅiÅF
Volatility	=CCgÅDSF6
Evaporation Rate	G<Å!*%>+Å+# L%Å) !"&%JÅÅO!(F#%!(%&
VOC	=CCÅDgF
LogK _{ow}	Ä(%Ål& J?!"Å+Å)"&%Å+ #?Q#Å *#dÅ# 0D"!#&ÅH6=
Solubility in Water	W%0#Q#%

Section 10. Stability and Reactivity

Stability and Reactivity	Ä(%Ål& J?!"Å+Å)"Q#%6
Conditions of Instability	3S *JÅ(%!"Å!"&X+4ÅÅ+!"!*"Å%#%!"&*B P
Incompatibility with Various Substances	-%!"*S%ÅL*(Å 9J*R/0Å"0%l+6
Hazardous Decomposition Products	1/J% &Å&) "#Å' /J*!+ /Å .Å+! &"0%ÅJÅ?+%4ÅR "&J ?+ÅJ%') +* !* / Ål& J?!"Å+ (?#JÅ/ lÅ Q%Ål& J?!"Å+Å"&ÅR" &J ?+ÅJ%') +* !* / Ål& J?!"Å+ "PÅQÅJ?%"J4Å*/#J*/0ÅÅ&Q /Å) / 9 *J%Å&Q /ÅJ* 9 *J%Å /+%Å+)X%ÅJÅS"&* ?+Å(B& ""&Q /+ 6

Hazardous Polymerization

1/J% &A&) "#A' /J!* /+A .A+! &"0%AJA?+%4AR " &J ?+AI #P) %&*R' /AL* ##/ !A "?&6

Section 11. Toxicological Information

Table with 5 columns: Toxicity to Animals, 5#4GR1!!\$, -9#"G\$, -A- 0", 8"6R%!, &S"1\$"6), 46", +TS46R#"
Rows include chemical structures like ZeC, NeC, and NeC with various symbols and numbers.

Chronic Effects on Humans

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Other Toxic Effects on Humans

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Section 12. Ecological Information

Table with 4 columns: Ecotoxicity, Product/ingredient name, Result, Species, Exposure
Rows include data for NeC and NeC with various symbols and numbers.

Section 13. Disposal Considerations

Table with 2 columns: Waste Information, Waste Stream
Rows include disposal instructions and stream descriptions with various symbols and numbers.

Consult your local or regional authorities.

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State Regulations

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Section 16. Other Information

Label requirements

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Y3_A8OA>3-Y\ 1JA5A82 7-8OZ AA>-71T>A2 5W6
Y3_A8OA>3-Y\ 1JA5Aa 3JJ7a OZ6AN3WOWAOAJ1WT2A3WZAN312 OAZ3Y3TO6
Y3_A8OA>3-Y\ 1JA5AW>3JOZ6
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AA

Hazardous Material Information System (U.S.A.)

Table with 2 columns: Hazard Category and Value. Categories include D" %I*, ?#AD.#G, 8" 1!\$US!(, 5"#64-%A#4!"1\$4-

National Fire Protection Association (U.S.A.)



References

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Validated on 1/1/2014.

Printed 1/1/2014.

Chemtrec:

(800) 424-9300

Total Petrochemicals & Refining USA, Inc.:

(800) 322-3462

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SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form	: Substance
Substance name	: Toluene
CAS No	: 108-88-3
Product code	: LC26170
Formula	: C7H8
Synonyms	: benzyl hydride / methylbenzene / phenylmethane / toluol / toluol oil / toluole
BIG no	: 10046

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Solvent

1.3. Details of the supplier of the safety data sheet

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US classification

Flam. Liq. 2 H225
Skin Irrit. 2 H315
Repr. 2 H361
STOT SE 3 H336
STOT RE 2 H373
Asp. Tox. 1 H304

2.2. Label elements

GHS-US labelling

Hazard pictograms (GHS-US) :



GHS02

GHS07

GHS08

Signal word (GHS-US) :

Danger

Hazard statements (GHS-US) :

H225 - Highly flammable liquid and vapour
H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H336 - May cause drowsiness or dizziness
H361 - Suspected of damaging fertility or the unborn child
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements (GHS-US) :

P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, sparks, open flames, hot surfaces. - No smoking
P233 - Keep container tightly closed
P240 - Ground/bond container and receiving equipment
P241 - Use explosion-proof electrical, ventilating, lighting equipment
P242 - Use only non-sparking tools
P243 - Take precautionary measures against static discharge
P260 - Do not breathe mist, vapours, spray
P264 - Wash exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves, protective clothing, eye protection, face protection

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P301+P310 - IF SWALLOWED: immediately call a POISON CENTER or doctor/physician
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - IF INHALED: remove victim to fresh air and keep at rest in a position comfortable for breathing
P308+P313 - IF exposed or concerned: Get medical advice/attention
P331 - If swallowed, do NOT induce vomiting
P332+P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P370+P378 - In case of fire: Use carbon dioxide (CO₂), powder, alcohol-resistant foam for extinction
P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/container to comply with local, state and federal regulations
P235 - Keep cool

2.3. Other hazards

Other hazards not contributing to the classification : None under normal conditions.

2.4. Unknown acute toxicity (GHS-US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Toluene (Main constituent)	(CAS No) 108-88-3	100	Flam. Liq. 2, H225 Skin Irrit. 2, H315 Repr. 2, H361 STOT SE 3, H336 STOT RE 2, H373 Asp. Tox. 1, H304

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital. Never give alcohol to drink.

First-aid measures after inhalation : Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

First-aid measures after skin contact : Wash immediately with lots of water. Soap may be used. Do not apply (chemical) neutralizing agents. Remove clothing before washing. Take victim to a doctor if irritation persists.

First-aid measures after eye contact : Rinse immediately with plenty of water. Do not apply neutralizing agents. Take victim to an ophthalmologist if irritation persists.

First-aid measures after ingestion : Rinse mouth with water. Immediately after ingestion: give lots of water to drink. Do not give milk/oil to drink. Do not induce vomiting. Give activated charcoal. Call Poison Information Centre (www.big.be/antigif.htm). Consult a doctor/medical service if you feel unwell. Ingestion of large quantities: immediately to hospital.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : EXPOSURE TO HIGH CONCENTRATIONS: Headache. Nausea. Feeling of weakness. Dizziness. Central nervous system depression. Narcosis. Mental confusion. Drunkenness. Coordination disorders. Disturbed motor response. Disturbances of consciousness.

Symptoms/injuries after skin contact : Tingling/irritation of the skin.

Symptoms/injuries after eye contact : Irritation of the eye tissue.

Symptoms/injuries after ingestion : Risk of aspiration pneumonia. Nausea. Abdominal pain. Symptoms similar to those listed under inhalation.

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Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Dry skin. Skin rash/inflammation. Impairment of the nervous system. Tremor. Impaired memory. Impaired concentration. Brain affection. Disturbances of heart rate. Change in the haemogramme/blood composition.

4.3. Indication of any immediate medical attention and special treatment needed

Obtain medical assistance.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Preferably: alcohol resistant foam. Water spray. BC powder. Polyvalent foam. AFFF foam. Carbon dioxide.

Unsuitable extinguishing media : Container may slop over if solid jet (water/foam) is applied.

5.2. Special hazards arising from the substance or mixture

Fire hazard : DIRECT FIRE HAZARD. Highly flammable. Gas/vapour flammable with air within explosion limits. INDIRECT FIRE HAZARD. May build up electrostatic charges: risk of ignition. May be ignited by sparks. Gas/vapour spreads at floor level: ignition hazard. Reactions involving a fire hazard: see "Reactivity Hazard".

Explosion hazard : DIRECT EXPLOSION HAZARD. Gas/vapour explosive with air within explosion limits. INDIRECT EXPLOSION HAZARD. may be ignited by sparks. Reactions with explosion hazards: see "Reactivity Hazard".

Reactivity : Upon combustion: CO and CO₂ are formed. Reacts violently with (some) halogens. Reacts violently with (strong) oxidizers: (increased) risk of fire/explosion. Violent to explosive reaction with (some) acids.

5.3. Advice for firefighters

Firefighting instructions : Cool tanks/drums with water spray/remove them into safety. Do not move the load if exposed to heat.

Protection during firefighting : Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment : Gloves. Protective goggles. Head/neck protection. Protective clothing. Large spills/in enclosed spaces: compressed air apparatus. Large spills/in enclosed spaces: gas-tight suit.

Emergency procedures : Keep upwind. Mark the danger area. Consider evacuation. Seal off low-lying areas. Close doors and windows of adjacent premises. Stop engines and no smoking. No naked flames or sparks. Spark- and explosionproof appliances and lighting equipment. Keep containers closed. Wash contaminated clothes.

6.1.2. For emergency responders

Protective equipment : Do not breathe gas, fumes, vapour or spray. Equip cleanup crew with proper protection.

Emergency procedures : Stop leak if safe to do so. Ventilate area. If a major spill occurs, all personnel should be immediately evacuated and the area ventilated.

6.2. Environmental precautions

Prevent soil and water pollution.

6.3. Methods and material for containment and cleaning up

For containment : Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Try to reduce evaporation. Measure the concentration of the explosive gas-air mixture. Dilute/disperse combustible gas/vapour with water curtain. Provide equipment/receptacles with earthing. Do not use compressed air for pumping over spills.

Methods for cleaning up : Liquid spill: cover with foam. Take up liquid spill into inert absorbent material, e.g.: sand, earth, vermiculite. Scoop absorbed substance into closing containers. See "Material-handling" for suitable container materials. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. Do not use compressed air for pumping over spills. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

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SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Precautions for safe handling : Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Handle uncleaned empty containers as full ones. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Do not use compressed air for pumping over. Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks. Observe strict hygiene. Keep container tightly closed. Measure the concentration in the air regularly. Work under local exhaust/ventilation.
- Hygiene measures : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

- Incompatible products : Strong oxidizers.
- Incompatible materials : Direct sunlight. Heat sources. Sources of ignition.
- Heat and ignition sources : KEEP SUBSTANCE AWAY FROM: heat sources. ignition sources.
- Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: oxidizing agents. (strong) acids. halogens.
- Storage area : Store at ambient temperature. Ventilation at floor level. Fireproof storeroom. Provide for a tub to collect spills. Provide the tank with earthing. Under a shelter/in the open. Store only in a limited quantity. May be stored under nitrogen. Meet the legal requirements. Keep out of direct sunlight.
- Special rules on packaging : SPECIAL REQUIREMENTS: closing. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.
- Packaging materials : SUITABLE MATERIAL: metal. stainless steel. carbon steel. aluminium. nickel. polypropylene. glass. tin. MATERIAL TO AVOID: polyethylene.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Toluene (108-88-3)		
USA ACGIH	ACGIH TWA (ppm)	20 ppm
USA ACGIH	ACGIH STEL (ppm)	20 ppm
USA OSHA	OSHA PEL (TWA) (ppm)	200 ppm
USA OSHA	OSHA PEL (STEL) (ppm)	500 ppm 10-min peak per 8 hour shift
USA OSHA	OSHA PEL (Ceiling) (ppm)	300 ppm

8.2. Exposure controls

- Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation.
- Materials for protective clothing : GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: tetrafluoroethylene. viton. PVA. GIVE LESS RESISTANCE: butyl rubber. natural rubber. neoprene. nitrile rubber. polyethylene. neoprene/natural rubber. nitrile rubber/PVC. GIVE POOR RESISTANCE: chloroprene rubber.
- Hand protection : Gloves.
- Eye protection : Safety glasses.
- Skin and body protection : Head/neck protection. Protective clothing.
- Respiratory protection : Wear gas mask with filter type A if conc. in air > exposure limit.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- Physical state : Liquid
- Appearance : Liquid.
- Molecular mass : 92.14 g/mol
- Colour : Colourless.
- Odour : Aromatic odour.
- Odour threshold : 0.2 - 69 ppm
0.8 - 276 mg/m³
- pH : No data available

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Relative evaporation rate (butylacetate=1)	: 2.24
Melting point	: -95 °C
Freezing point	: No data available
Boiling point	: 111 °C
Flash point	: 4 °C
Critical temperature	: 321 °C
Self ignition temperature	: 480 °C
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapour pressure	: 29 hPa
Vapour pressure at 50 °C	: 109 hPa
Critical pressure	: 41077 hPa
Relative vapour density at 20 °C	: 3.2
Relative density	: 0.87
Relative density of saturated gas/air mixture	: 1.6
Density	: 870 kg/m ³
Solubility	: Insoluble in water. Soluble in ethanol. Soluble in ether. Soluble in acetone. Soluble in chloroform. Soluble in carbon disulfide. Soluble in acetic acid. Soluble in ethylacetate. Soluble in petroleum spirit. Water: 0.05 g/100ml Ethanol: Complete Ether: Complete Acetone: > 10 g/100ml
Log Pow	: 2.73 (Experimental value; Other; 20 °C, Experimental value; Other; 20 °C, Experimental value; Other; 20 °C)
Log Kow	: No data available
Viscosity, kinematic	: 0.690 mm ² /s (20 °C)
Viscosity, dynamic	: 0.0006 Pa.s (20 °C)
Explosive properties	: No data available
Oxidising properties	: No data available
Explosive limits	: 1.3 - 7 vol % 46 - 270 g/m ³

9.2. Other information

Minimum ignition energy	: 0.3 mJ
Specific conductivity	: 1.0 pS/m
Saturation concentration	: 110 g/m ³
VOC content	: 100 %
Other properties	: Gas/vapour heavier than air at 20°C. Clear. Volatile. Substance has neutral reaction. May generate electrostatic charges.

SECTION 10: Stability and reactivity

10.1. Reactivity

Upon combustion: CO and CO₂ are formed. Reacts violently with (some) halogens. Reacts violently with (strong) oxidizers: (increased) risk of fire/explosion. Violent to explosive reaction with (some) acids.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Heat. Direct sunlight. Sparks. Open flame.

10.5. Incompatible materials

Strong oxidizers.

10.6. Hazardous decomposition products

Carbon dioxide. Carbon monoxide.

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SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Toluene (1f)108-88-3	
LD50 oral rat	> 2000 mg/kg (5580 mg/kg bodyweight; Rat; Rat; Experimental value)
LD50 dermal rabbit	12223 mg/kg (>5000 mg/kg bodyweight; Rabbit; Rabbit; Experimental value; Other,>5000 mg/kg bodyweight; Rabbit; Rabbit; Experimental value; Other)
LC50 inhalation rat (mg/l)	> 20 mg/l/4h (Rat)

Skin corrosion/irritation : Causes skin irritation.

Serious eye damage/irritation : Not classified

Respiratory or skin sensitisation : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Toluene (108-88-3)	
IARC group	3 - Not classifiable

Reproductive toxicity : Suspected of damaging fertility or the unborn child.

Specific target organ toxicity (single exposure) : May cause drowsiness or dizziness.

Specific target organ toxicity (repeated exposure) : May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard : May be fatal if swallowed and enters airways.

Symptoms/injuries after inhalation : EXPOSURE TO HIGH CONCENTRATIONS: Headache. Nausea. Feeling of weakness. Dizziness. Central nervous system depression. Narcosis. Mental confusion. Drunkenness. Coordination disorders. Disturbed motor response. Disturbances of consciousness.

Symptoms/injuries after skin contact : Tingling/irritation of the skin.

Symptoms/injuries after eye contact : Irritation of the eye tissue.

Symptoms/injuries after ingestion : Risk of aspiration pneumonia. Nausea. Abdominal pain. Symptoms similar to those listed under inhalation.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Dry skin. Skin rash/inflammation. Impairment of the nervous system. Tremor. Impaired memory. Impaired concentration. Brain affection. Disturbances of heart rate. Change in the haemogramme/blood composition.

Likely routes of exposure : Inhalation;Skin and eye contact

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Classification concerning the environment: not applicable.

Ecology - air : TA-Luft Klasse 5.2.5/l.

Ecology - water : Fouling to shoreline. Ground water pollutant. Toxic to fishes. Toxic to invertebrates. Harmful to algae. Inhibits photosynthesis of algae. Harmful to bacteria. Taste alteration in fishes/aquatic organisms.

Toluene (108-88-3)	
LC50 fishes 1	24 mg/l 96 h; Salmo gairdneri (Oncorhynchus mykiss)
EC50 Daphnia 1	84 mg/l (24 h; Daphnia magna; Locomotor effect)
LC50 fish 2	13 mg/l (96 h; Lepomis macrochirus)
EC50 Daphnia 2	11.5 - 19.6 mg/l (48 h; Daphnia magna)
Threshold limit algae 1	> 400 mg/l (168 h; Scenedesmus quadricauda; Toxicity test)
Threshold limit algae 2	105 mg/l (192 h; Microcystis aeruginosa)

12.2. Persistence and degradability

Toluene (108-88-3)	
Persistence and degradability	Readily biodegradable in water. Biodegradable in the soil. Low potential for adsorption in soil.
Biochemical oxygen demand (BOD)	2.15 g O ² /g substance
Chemical oxygen demand (COD)	2.52 g O ² /g substance
ThOD	3.13 g O ² /g substance
BOD (% of ThOD)	0.69 % ThOD

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12.3. Bioaccumulative potential

Toluene (108-88-3)	
BCF fish 1	13.2 (Anguilla japonica)
BCF fish 2	90 (72 h; Leuciscus idus)
BCF other aquatic organisms 1	380 (24 h; Chlorella sp.; Fresh weight)
BCF other aquatic organisms 2	4.2 (Mytilus edulis; Fresh weight)
Log Pow	2.73 (Experimental value; Other; 20 °C, Experimental value; Other; 20 °C, Experimental value; Other; 20 °C)
Bioaccumulative potential	Low potential for bioaccumulation (BCF < 500).

12.4. Mobility in soil

Toluene (108-88-3)	
Surface tension	0.03 N/m (20 °C)

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle by distillation. Do not landfill. Remove to an authorized waste incinerator for solvents with energy recovery. Do not discharge into drains or the environment. May be discharged to company wastewater treatment plant.

Additional information : LWCA (the Netherlands): KGA category 03. Hazardous waste according to Directive 2008/98/EC.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN1294 Toluene, 3, II
UN-No.(DOT) : 1294
DOT NA no. : UN1294
DOT Proper Shipping Name : Toluene
Department of Transportation (DOT) Hazard Classes : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120
Hazard labels (DOT) : 3 - Flammable liquid



Packing group (DOT) : II - Medium Danger
DOT Special Provisions (49 CFR 172.102) : IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized.
T4 - 2.65 178.274(d)(2) Normal..... 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = $97 / (1 + a (tr - tf))$ Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.
DOT Packaging Exceptions (49 CFR 173.xxx) : 150
DOT Packaging Non Bulk (49 CFR 173.xxx) : 202
DOT Packaging Bulk (49 CFR 173.xxx) : 242
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 5 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 60 L

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DOT Vessel Stowage Location : B - (i) The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) "On deck only" on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.

Additional information

Other information : No supplementary information available.
State during transport (ADR-RID) : as liquid.

ADR

Transport document description : UN 1294 Toluene, 3, II, (D/E)
Packing group (ADR) : II
Class (ADR) : 3 - Flammable liquids
Hazard identification number (Kemler No.) : 33
Classification code (ADR) : F1
Danger labels (ADR) : 3 - Flammable liquids



Orange plates : 

Tunnel restriction code : D/E

Transport by sea

UN-No. (IMDG) : 1294
Class (IMDG) : 3 - Flammable liquids
EmS-No. (1) : F-E
EmS-No. (2) : S-D

Air transport

UN-No.(IATA) : 1294
Class (IATA) : 3 - Flammable Liquids
Packing group (IATA) : II - Medium Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Toluene (108-88-3)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings)	
RQ (Reportable quantity, section 304 of EPA's List of Lists) :	1000 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Fire hazard

15.2. International regulations

CANADA

Toluene (108-88-3)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
WHMIS Classification	Class B Division 2 - Flammable Liquid Class D Division 2 Subdivision B - Toxic material causing other toxic effects Class D Division 2 Subdivision A - Very toxic material causing other toxic effects

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EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Flam. Liq. 2 H225
Repr. 2 H361d
Asp. Tox. 1 H304
STOT RE 2 H373
Skin Irrit. 2 H315
STOT SE 3 H336

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC or 1999/45/EC

F; R11
Repr.Cat.3; R63
Xn; R65
Xn; R48/20
Xi; R38
R67

Full text of R-phrases: see section 16

15.2.2. National regulations

Toluene (108-88-3)

Listed on the Canadian Ingredient Disclosure List

15.3. US State regulations

Toluene(108-88-3)

U.S. - California - Proposition 65 - Developmental Toxicity	Yes
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	Yes
No significance risk level (NSRL)	7000 µg/day

SECTION 16: Other information

Full text of H-phrases: see section 16:

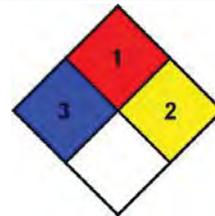
Asp. Tox. 1	Aspiration hazard, Category 1
Flam. Liq. 2	Flammable liquids, Category 2
Repr. 2	Reproductive toxicity, Category 2
Skin Irrit. 2	Skin corrosion/irritation, Category 2
STOT RE 2	Specific target organ toxicity — Repeated exposure, Category 2
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3, Narcosis
H225	Highly flammable liquid and vapour
H304	May be fatal if swallowed and enters airways
H315	Causes skin irritation
H336	May cause drowsiness or dizziness
H361	Suspected of damaging fertility or the unborn child
H373	May cause damage to organs through prolonged or repeated exposure

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- NFPA health hazard : 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.
- NFPA fire hazard : 1 - Must be preheated before ignition can occur.
- NFPA reactivity : 2 - Normally unstable and readily undergo violent decomposition but do not detonate. Also: may react violently with water or may form potentially explosive mixtures with water.



HMIS III Rating

- Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
- Flammability : 1 Slight Hazard
- Physical : 2 Moderate Hazard
- Personal Protection : H

SDS US (GHS HazCom 2012)

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

1. Identification

Product identifier	Residual Solvent Class II - Xylenes	
Other means of identification		
Catalog number	1601849	
Recommended use	Specified quality tests and assay use only.	
Recommended restrictions	Not for use as a drug. Not for administration to humans or animals.	
Manufacturer/Importer/Supplier/Distributor information		
Company name	U. S. Pharmacopeia	
Address	12601 Twinbrook Parkway Rockville MD 20852-1790 US	
Telephone	RS Technical Services	301-816-8129
Website	www.usp.org	
E-mail	RSTECH@usp.org	
Emergency phone number	CHEMTREC within US & Canada	1-800-424-9300
	CHEMTREC outside US & Canada	+1 703-527-3887

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 2
Health hazards	Serious eye damage/eye irritation	Category 2B
	Carcinogenicity	Category 2
OSHA hazard(s)	Not classified.	
Label elements		



Signal word	Danger
Hazard statement	Highly flammable liquid and vapor. Causes eye irritation. Suspected of causing cancer.
Precautionary statement	
Prevention	Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves/protective clothing/eye protection/face protection. Wash thoroughly after handling. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood.
Response	If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. In case of fire: Use appropriate media for extinction. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. If exposed or concerned: Get medical advice/attention.
Storage	Store in a well-ventilated place. Keep cool. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	Not classified.

3. Composition/information on ingredients

Mixture

Hazardous components

Chemical name	Common name and synonyms	CAS number	%
Dimethyl Sulfoxide		67-68-5	98.915
Xylene		1330-20-7	0.90055
Ethylbenzene		100-41-4	0.18445

4. First-aid measures

Inhalation	If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Call a physician if symptoms develop or persist.
Skin contact	Rinse skin with water/shower. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. If ingestion of a large amount does occur, call a poison control center immediately.
Most important symptoms/effects, acute and delayed	Irritation of eyes and mucous membranes.
Indication of immediate medical attention and special treatment needed	Treatment of overdose may include the following: Because of the risk of CNS depression and pulmonary aspiration, do not induce vomiting. Activated charcoal may induce vomiting and pulmonary aspiration. Routine use is not recommended. Support respiratory and cardiovascular function. Monitor for respiratory distress. Delayed pulmonary edema may not develop for 24 to 72 hours. If symptomatic, obtain chest x-ray; if severe, monitor arterial blood gases or pulse oximetry. PEEP or CPAP may be necessary. If CNS depression, noncardiogenic pulmonary edema, or ARDS develop, endotracheal intubation, assisted ventilation, and supplemental oxygen may be required. Monitor cardiac function. Epinephrine and other sympathomimetics should be used with caution. Xylene may decrease the myocardial threshold to the arrhythmogenic effects of such drugs, increasing the risk of arrhythmias. Monitor fluid and electrolyte status. Correct hypokalemia and acidemia with intravenous potassium and sodium bicarbonate. Hypocalcemia may ensue following fluid and electrolyte replenishment. This should be corrected with intravenous calcium. [Meditext 2003]
General information	Remove from exposure. Remove contaminated clothing. For treatment advice, seek guidance from an occupational health physician or other licensed health-care provider familiar with workplace chemical exposures. In the United States, the national poison control center phone number is 1-800-222-1222. If person is not breathing, give artificial respiration. If breathing is difficult, give oxygen if available. Persons developing serious hypersensitivity (anaphylactic) reactions must receive immediate medical attention.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO ₂).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	By heating and fire, harmful vapors/gases may be formed.
Special protective equipment and precautions for firefighters	Wear suitable protective equipment. Use protective equipment appropriate for surrounding materials.
Fire-fighting equipment/instructions	In the event of fire, cool tanks with water spray. As with all fires, evacuate personnel to a safe area. Firefighters should use self-contained breathing equipment and protective clothing.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unnecessary personnel away. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Avoid inhalation of vapors. Wear appropriate personal protective equipment.
Methods and materials for containment and cleaning up	Remove sources of ignition. Absorb spillage with suitable absorbent material. For waste disposal, see section 13 of the SDS. Clean surface thoroughly to remove residual contamination. Keep combustibles (wood, paper, oil, etc.) away from spilled material.

7. Handling and storage

Precautions for safe handling	As a general rule, when handling USP Reference Standards, avoid all contact and inhalation of dust, mists, and/or vapors associated with the material. Clean equipment and work surfaces with suitable detergent or solvent after use. After removing gloves, wash hands and other exposed skin thoroughly.
Conditions for safe storage, including any incompatibilities	Store in tight container as defined in the USP-NF. This material should be handled and stored per label instructions to ensure product integrity.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Ethylbenzene (CAS 100-41-4)	PEL	435 mg/m3 100 ppm
Xylene (CAS 1330-20-7)	PEL	435 mg/m3 100 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Ethylbenzene (CAS 100-41-4)	REL	435 mg/m3 100 ppm
	STEL	545 mg/m3 125 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
Ethylbenzene (CAS 100-41-4)	STEL	125 ppm
	TWA	100 ppm
Xylene (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

US. Workplace Environmental Exposure Level (WEEL) Guides

Components	Type	Value
Dimethyl Sulfoxide (CAS 67-68-5)	TWA	250 ppm

Biological limit values

US. ACGIH. BEIs. Biological Exposure Indices

Components	Value	Determinant	Sampling Time
Ethylbenzene (CAS 100-41-4)	0.7 g/g	Sum of mandelic acid and phenyl glyoxylic acid	*
Xylene (CAS 1330-20-7)	1.5 g/g	Methylhippuric acids	*

Appropriate engineering controls

Airborne exposure should be controlled primarily by engineering controls such as general dilution ventilation, local exhaust ventilation, or process enclosure. Local exhaust ventilation is generally preferred to general exhaust because it can control the contaminant at its source, preventing dispersion into the work area. An industrial hygiene survey involving air monitoring may be used to determine the effectiveness of engineering controls. Effectiveness of engineering controls intended for use with highly potent materials should be assessed by use of nontoxic surrogate materials. Local exhaust ventilation such as a laboratory fume hood or other vented enclosure is recommended, particularly for aerosol-generating procedures.

Individual protection measures, such as personal protective equipment

Eye/face protection

Safety glasses with sideshields are recommended. Face shields or goggles may be required if splash potential exists or if corrosive materials are present. Approved eye protection (e.g., bearing the ANSI Z87 or CSA stamp) is preferred. Maintain eyewash facilities in the work area.

Skin protection

Hand protection

Chemically compatible gloves. For handling solutions, ensure that the glove material is protective against the solvent being used. Use handling practices that minimize direct hand contact. Employees who are sensitive to natural rubber (latex) should use nitrile or other synthetic nonlatex gloves. Use of powdered latex gloves should be avoided due to the risk of latex allergy.

Other

For handling of laboratory scale quantities, a cloth lab coat is recommended. Where significant quantities are handled, work clothing may be necessary to prevent take-home contamination.

Respiratory protection

Where respirators are deemed necessary to reduce or control occupational exposures, use NIOSH-approved respiratory protection and have an effective respirator program in place (applicable U.S. regulation OSHA 29 CFR 1910.134).

Thermal hazards

Not available.

General hygiene considerations

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance	Clear liquid.
Physical state	Liquid.
Form	Liquid.
Odor	Not available.
Odor threshold	Not available.
pH	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor density	Not available.
Relative density	Not available.
Solubility in water	Not available.
Partition coefficient (n-octanol/water)	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

10. Stability and reactivity

Reactivity	No reactivity hazards known.
Chemical stability	Risk of explosion.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Heat, flames, and sparks. Avoid temperatures exceeding the flash point.
Incompatible materials	Alkaline metals. Isocyanates.
Hazardous decomposition products	Irritating and/or toxic fumes or gases. Emits toxic fumes under fire conditions.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Based on available data, the classification criteria are not met.
Inhalation	Due to lack of data the classification is not possible.
Skin contact	Based on available data, the classification criteria are not met.
Eye contact	Causes eye irritation.
Symptoms related to the physical, chemical, and toxicological characteristics	Nausea. Vomiting. Diarrhea. Garlic-like taste or odor on breath and skin. Drowsiness. Headache. Fatigue. Dizziness. Weakness. Confusion. Incoordination. Memory loss. Vertigo. Irritability. Tremor. Skin inflammation. Chest tightness.
Delayed and immediate effects of exposure	Pulmonary edema. Respiratory depression. Respiratory failure. Convulsions. Seizures. Central nervous system depression. Arrhythmias. Ototoxicity. Coma. Death.
Medical conditions aggravated by exposure	Alcoholism. Heart disease. Liver disease. Kidney disease. Neurological disorders. Blood disorders. Impaired pulmonary function. Skin disorders.
Acute toxicity	Based on available data, the classification criteria are not met.

Components	Species	Test Results
Dimethyl Sulfoxide (CAS 67-68-5)		
Acute		
<i>Dermal</i>		
LD50	Mouse	50000 mg/kg
	Rat	40000 mg/kg
<i>Inhalation</i>		
LC50	Rat	> 2000 mg/m ³ , 40 hours
		> 1600 mg/m ³ , 4 hours
<i>Oral</i>		
LD50	Mouse	7920 mg/kg

Components	Species	Test Results
	Rat	14500 mg/kg 17.9 ml/kg
Ethylbenzene (CAS 100-41-4)		
Acute		
<i>Dermal</i>		
LD50	Rabbit	17800 mg/kg
<i>Inhalation</i>		
LC50	Rat	17.2 mg/l/4h
<i>Oral</i>		
LD50	Rat	3500 mg/kg
Xylene (CAS 1330-20-7)		
<i>Dermal</i>		
LD50	Rat	> 1700 mg/kg, 4 hours
<i>Inhalation</i>		
LC50	Rat	5000 ppm
<i>Oral</i>		
LD50	Mouse	2119 mg/kg
	Rat	4300 mg/kg
Skin corrosion/irritation	Based on available data, the classification criteria are not met.	
Serious eye damage/eye irritation	Causes eye irritation.	
Local effects		
Xylene		5 mg Irritancy test Result: Irritant. Species: Rabbit Organ: Eye. Test Duration: 24 hours Severity: Severe.
Ethylbenzene		500 mg Irritancy test Result: Irritant. Species: Rabbit Organ: Eye. Severity: Severe.
Xylene		500 mg Irritancy test Result: Irritant. Species: Rabbit Organ: Skin. Test Duration: 24 hours Severity: Moderate.
		87 mg Irritancy test Result: Irritant. Species: Rabbit Organ: Eye. Severity: Mild.
Ethylbenzene		Irritancy test Result: Irritant. Species: Human Organ: Skin.
		Irritancy test Result: Irritant. Species: Rabbit Organ: Skin. Severity: Moderate.
Dimethyl Sulfoxide		Irritancy test Result: Negative. Species: Mouse Organ: Skin. Test Duration: 30 weeks Severity: No dermal injury
		Irritancy test (Draize) Result: Negative. Species: Rabbit Organ: Eye. Test Duration: 24 hours Severity: Slight.

Local effects

Dimethyl Sulfoxide

Irritancy test (Draize)
 Result: Negative.
 Species: Rabbit
 Organ: Skin.
 Test Duration: 24 hours
 Severity: Mild.

Respiratory sensitization

Due to lack of data the classification is not possible.

Skin sensitization

Based on available data, the classification criteria are not met.

Sensitization

Dimethyl Sulfoxide

Buehler test
 Result: Negative.
 Species: Guinea pig
 Organ: Skin.
 Sensitization (patch) test
 Result: Non-sensitizing.
 Species: Human
 Organ: Skin.

Ethylbenzene

Germ cell mutagenicity

Due to lack of data the classification is not possible.

Mutagenicity

Xylene

Ames assay
 Result: Negative.
 DNA repair microsuspension assay
 Result: Negative.

Ethylbenzene

E. coli assay
 Result: Negative.

Dimethyl Sulfoxide

Gene mutation assays in yeast
 Result: Negative.
 In vitro cytogenetic assay in Chinese hamster ovary cells
 Result: Negative.
 In vitro reverse mutation studies in Salmonella
 Result: Negative.
 In vivo cytogenetic assay in rats
 Result: Positive.
 In vivo micronucleus assay in mice
 Result: Negative.
 In vivo sex-linked recessive lethal mutation assay in D. melanogaster
 Result: Negative.
 Mouse dominant lethal assay
 Result: Negative.
 Mouse lymphoma assay
 Result: Positive.
 Mouse lymphoma forward gene mutation assay
 Result: Negative.
 Rat dominant lethal assay
 Result: Negative.
 S. typhimurium Ames assay
 Result: Negative.
 Sister chromatid exchange assay in hamsters
 Result: Negative.

Xylene

Ethylbenzene

Xylene

Ethylbenzene

Carcinogenicity

Suspected of causing cancer.

Xylene

0 - 1000 mg/kg Carcinogenicity study
 Result: No evidence of organ toxicity on histopathological examination or of any treatment related increase in incidence of neoplasia.
 Species: Mouse
 0 - 500 mg/kg Carcinogenicity study
 Result: No treatment related increase in the incidence of tumors.
 Species: Rat
 Test Duration: 103 weeks
 0 - 750 ppm Carcinogenicity study
 Result: Increased incidences of alveolar/bronchiolar neoplasms in males, increased incidences of hepatocellular neoplasms in females.
 Species: Mouse
 Test Duration: 103 weeks

Ethylbenzene

Ethylbenzene

0 - 750 ppm Carcinogenicity study
Result: Increased incidences of renal tubule neoplasms and testicular adenomas in males; increased incidences of renal tube adenomas in females.

Species: Rat

Test Duration: 104 weeks

500 mg/kg/day Carcinogenicity study

Result: Significant increase in total malignant tumors.

Species: Rat

Test Duration: 104 weeks

Dimethyl Sulfoxide

9 g/kg Carcinogenicity test (oral or topical)

Result: No tumor development observed.

Species: Rhesus monkey

Test Duration: 18 months

Carcinogenicity study

Ethylbenzene

Reproductive toxicity

Due to lack of data the classification is not possible.

Reproductivity

Xylene

0 - 138 ppm Reproductivity study

Result: Maternal body weight was reduced and relative liver weights increased; increased incidence of delayed development and a minor variant (extra ribs) were reported.

Species: Rat

0 - 230 ppm Reproductivity study

Result: No effects on maternal body weight gain or fetal body weights; no teratogenic effects.

Species: Rat

0 - 772 ppm Reproductivity study

Result: Post-implantation loss was increased but there was no effect on mean litter size.

Species: Rat

Ethylbenzene

4300 mg/m3 Reproductivity test

Result: Maternal toxicity was reflected in increased liver, kidney, and spleen weights.

Species: Rat

600 - 2400 mg/m3 Reproductivity test

Result: Caused skeletal growth retardation, extra ribs, and reduced fetal growth rate at the highest concentration.

Species: Rat

Specific target organ toxicity - single exposure

Based on available data, the classification criteria are not met.

Specific target organ toxicity - repeated exposure

Based on available data, the classification criteria are not met.

Aspiration hazard

Due to lack of data the classification is not possible.

12. Ecological information

Ecotoxicity

Components	Species	Test Results
Dimethyl Sulfoxide (CAS 67-68-5)		
Aquatic		
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)
		33000 - 37000 mg/l, 96 hours
Ethylbenzene (CAS 100-41-4)		
Aquatic		
Crustacea	EC50	Water flea (Daphnia magna)
		1.37 - 4.4 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)
		4.2 mg/l, 96 hours
Xylene (CAS 1330-20-7)		
Aquatic		
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)
		2.661 - 4.093 mg/l, 96 hours

Persistence and degradability

No data is available on the degradability of this product.

Bioaccumulative potential

Not available.

Mobility in soil

Not available.

Other adverse effects

Not available.

13. Disposal considerations

Disposal instructions	Dispose in accordance with all applicable regulations. Under RCRA, it is the responsibility of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste.
Local disposal regulations	Not available.
Hazardous waste code	Not available.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN1175
UN proper shipping name	Flammable liquid, n.o.s. (Xylene/Ethylbenzene mixture)
Transport hazard class(es)	3
Subsidiary class(es)	Not available.
Packing group	II

IATA

UN number	UN1175
UN proper shipping name	Flammable liquid, n.o.s. (Xylene/Ethylbenzene mixture)
Transport hazard class(es)	3
Subsidiary class(es)	-
Packaging group	II

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code No information available.

DOT



IATA



15. Regulatory information

US federal regulations All components are on the U.S. EPA TSCA Inventory List.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - Yes Fire Hazard - Yes Pressure Hazard - No Reactivity Hazard - No
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SARA 302 Extremely hazardous substance No

SARA 311/312 Hazardous chemical No

Other federal regulations**Safe Drinking Water Act (SDWA)** Not regulated.**Food and Drug Administration (FDA)** Not regulated.**US state regulations**

WARNING: This product contains a chemical known to the State of California to cause cancer.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

16. Other information, including date of preparation or last revision**Issue date** 04-15-2014**Version #** 01**Further information** Not available.

Disclaimer USP Reference Standards are sold for chemical test and assay purposes only, and NOT for human consumption. The information contained herein is applicable solely to the chemical substance when used as a USP Reference Standard and does not necessarily relate to any other use of the substance described, (i.e. at different concentrations, in drug dosage forms, or in bulk quantities). USP Reference Standards are intended for use by persons having technical skill and at their own discretion and risk. This information has been developed by USP staff from sources considered reliable but has not been independently verified by the USP. Therefore, the USP Convention cannot guarantee the accuracy of the information in these sources nor should the statements contained herein be considered an official expression. NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE is made with respect to the information contained herein.

FLINN SCIENTIFIC, INC.

Safety Data Sheet (SDS)

SDS #: 531.00

Revision Date: March 25, 2014

SECTION 1 — CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Naphthalene

Flinn Scientific, Inc. P.O. Box 219, Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

Signal Word **DANGER**

Pictograms



SECTION 2 — HAZARDS IDENTIFICATION

Hazard class: Flammable solids (Category 1 or 2). Flammable solid (H228). Keep away from heat, sparks, open flames, and hot surfaces. No smoking (P210).

Hazard class: Acute toxicity, oral (Category 4). Harmful if swallowed (H302). Do not eat, drink or smoke when using this product (P270).

Hazard class: Serious eye damage or irritation (Category 2B). Causes eye irritation (H320).

Hazard class: Carcinogenicity (Category 2). Suspected of causing cancer (H351). Obtain special instructions before use (P201). Do not handle until all safety precautions have been read and understood (P202).

SECTION 3 — COMPOSITION, INFORMATION ON INGREDIENTS

Component Name	CAS Number	Formula	Formula Weight	Concentration
Naphthalene	91-20-3	C ₁₀ H ₈	128.17	

SECTION 4 — FIRST AID MEASURES

Call a POISON CENTER or physician if you feel unwell.

If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so. Continue rinsing (P305+P351+P338). **If eye irritation persists:** Get medical advice or attention (P337+P313).

If on skin: Wash with plenty of water.

If swallowed: Rinse mouth. Call a POISON CENTER or physician if you feel unwell (P302+P301+P312).

SECTION 5 — FIRE FIGHTING MEASURES

Class IIIA combustible solid.

Flash point: 79 °C Flammable limits: Lower: 0.9% Upper: 5.9% Autoignition Temperature: 526 °C

When heated to decomposition, may emit toxic fumes.

In case of fire: Use a tri-class dry chemical fire extinguisher (P370+P378).

NFPA CODE

H-2

F-2

R-0

SECTION 6 — ACCIDENTAL RELEASE MEASURES

Remove all ignition sources and water. Sweep up the spill, place in a sealed bag or container, and dispose. Ventilate area and wash spill site after material pickup is complete. See Sections 8 and 13 for further information.

SECTION 7 — HANDLING AND STORAGE

Flinn Suggested Chemical Storage Pattern: Organic #3. Store with hydrocarbons, oils, esters and aldehydes. Keep container tightly closed. Store in a cool, dry place within a Flinn Chem-Saf™ bag. Ground or bond container and receiving equipment (P240). Use explosion-proof electrical and ventilating equipment (P241).

SECTION 8 — EXPOSURE CONTROLS, PERSONAL PROTECTION

Wear protective gloves, protective clothing, and eye protection (P280). Wash hands thoroughly after handling (P264). Exposure guidelines: PEL/TLV 10 ppm (OSHA/ACGIH) Readily absorbed through the skin.

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

White, volatile flakes, cubes, sphere or powder. Odor of moth balls. Boiling point: 217.9 °C
Soluble: Absolute alcohol and ether. Insoluble in water. Melting point: 80.2 °C
Specific gravity: 1.0253
Vapor density: 4.4

SECTION 10 — STABILITY AND REACTIVITY

Shelf life: Volatile flakes, keep tightly closed. See Section 7 for further information.

SECTION 11 — TOXICOLOGICAL INFORMATION

Acute effects: Toxic, irritant	ORL-RAT LD ₅₀ : 490 mg/kg
Chronic effects: Possible carcinogen.	IHL-RAT LC ₅₀ : N.A.
Target organs: Eyes, blood, kidneys	SKN-RAT LD ₅₀ : >2500 mg/kg

N.A. = Not available, not all health aspects of this substance have been fully investigated.

SECTION 12 — ECOLOGICAL INFORMATION

Data not yet available.

SECTION 13 — DISPOSAL CONSIDERATIONS

Please review all federal, state and local regulations that may apply before proceeding. Flinn Suggested Disposal Method #18b is one option.

SECTION 14 — TRANSPORT INFORMATION

Shipping name: Naphthalene, refined; Hazard class: 4.1, Flammable solid; UN number: UN1334

N/A = Not applicable

SECTION 15 — REGULATORY INFORMATION

TSCA-listed, EINECS-listed (202-049-5), RCRA code U165.

SECTION 16 — OTHER INFORMATION

This Safety Data Sheet (SDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific, Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. The data should not be confused with local, state, federal or insurance mandates, regulations, or requirements and CONSTITUTE NO WARRANTY. Any use of this data and information must be determined by the science instructor to be in accordance with applicable local, state or federal laws and regulations. The conditions or methods of handling, storage, use and disposal of the product(s) described are beyond the control of Flinn Scientific, Inc. and may be beyond our knowledge. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE HANDLING, STORAGE, USE OR DISPOSAL OF THIS PRODUCT(S).

Consult your copy of the *Flinn Science Catalog/Reference Manual* for additional information about laboratory chemicals.

Revision Date: March 25, 2014



SAFETY DATA SHEET

Creation Date 28-May-2009

Revision Date 12-Sep-2014

Revision Number 4

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product Description: tert-Butyl methyl ether
Cat No. : 378720000; 378720010; 378720025; 378720100
Synonyms 2-Methyl-2-methoxy propane; MTBE; Methyl tert-butyl ether
CAS-No 1634-04-4
EC-No. 216-653-1
Molecular Formula C5 H12 O
Reach Registration Number -

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Laboratory chemicals.
Uses advised against No Information available

1.3. Details of the supplier of the safety data sheet

Company Acros Organics BVBA
Janssen Pharmaceuticaaan 3a
2440 Geel, Belgium
E-mail address begel.sdsdesk@thermofisher.com

1.4. Emergency telephone number

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99
CHEMTREC Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-527-3887

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

CLP Classification - Regulation (EC) No 1272/2008

Physical hazards

Flammable liquids Category 2

Health hazards

Skin Corrosion/irritation Category 2

Environmental hazards

Based on available data, the classification criteria are not met

Classification according to EU Directives 67/548/EEC or 1999/45/EC

Symbol(s) Xi - Irritant
F - Highly flammable
R-phrases(s) R11 - Highly flammable
R38 - Irritating to skin

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For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.

2.2. Label elements



Signal Word

Danger

Hazard Statements

H225 - Highly flammable liquid and vapor

H315 - Causes skin irritation

Precautionary Statements

P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking

P240 - Ground/Bond container and receiving equipment

P302 + P352 - IF ON SKIN: Wash with plenty of soap and water

2.3. Other hazards

No information available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Component	CAS-No	EC-No.	Weight %	CLP Classification - Regulation (EC) No 1272/2008	DSD Classification - 67/548/EEC
Methyl tert-butyl ether	1634-04-4	EEC No. 216-653-1	>95	Skin Irrit. 2 (H315) Flam. Liq. 2 (H225)	F; R11 Xi; R38

Reach Registration Number	-
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For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.
Ingestion	Do not induce vomiting. Obtain medical attention.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Get medical attention immediately if symptoms occur.
Protection of First-aiders	Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

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4.2. Most important symptoms and effects, both acute and delayed

Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting: Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically. Symptoms may be delayed.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable Extinguishing Media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

Extinguishing media which must not be used for safety reasons

Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products

Carbon monoxide (CO), Carbon dioxide (CO₂).

5.3. Advice for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Ensure adequate ventilation.

6.2. Environmental precautions

Should not be released into the environment. See Section 12 for additional ecological information.

6.3. Methods and material for containment and cleaning up

Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment. Take precautionary measures against static discharges.

6.4. Reference to other sections

Refer to protective measures listed in Sections 8 and 13.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharges. Use only under a chemical fume hood. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded.

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7.2. Conditions for safe storage, including any incompatibilities

Keep containers tightly closed in a dry, cool and well-ventilated place. Flammables area. Keep away from heat and sources of ignition. Keep container tightly closed in a dry and well-ventilated place. May form explosive peroxides on prolonged storage.

7.3. Specific end use(s)

Use in laboratories

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Exposure limits

List source(s): **EU** - Commission Directive 2006/15/EC of 7 February 2006 establishing a second list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC and amending Directives 91/322/EEC and 2000/39/EC on the protection of the health and safety of workers from the risks related to chemical agents at work. **UK** - EH40/2005 Containing the workplace exposure limits (WELs) for use with the Control of Substances Hazardous to Health Regulations (COSHH) 2002 (as amended). Updated by September 2006 official press release and October 2007 Supplement.

Component	European Union	The United Kingdom	France	Belgium	Spain
Methyl tert-butyl ether	TWA: 50 ppm 8 hr TWA: 183.5 mg/m ³ 8 hr STEL: 100 ppm 15 min STEL: 367 mg/m ³ 15 min	STEL: 100 ppm 15 min STEL: 367 mg/m ³ 15 min TWA: 50 ppm 8 hr TWA: 183.5 mg/m ³ 8 hr	TWA / VME: 50 ppm (8 heures). TWA / VME: 183.5 mg/m ³ (8 heures). STEL / VLCT: 367 mg/m ³ . STEL / VLCT: 100 ppm.	TWA: 40 ppm 8 uren TWA: 146 mg/m ³ 8 uren STEL: 100 ppm 15 minuten STEL: 367 mg/m ³ 15 minuten	STEL / VLA-EC: 100 ppm (15 minutos). STEL / VLA-EC: 367 mg/m ³ (15 minutos). TWA / VLA-ED: 50 ppm (8 horas) TWA / VLA-ED: 183.5 mg/m ³ (8 horas)

Component	Italy	Germany	Portugal	The Netherlands	Finland
Methyl tert-butyl ether		TWA: 50 ppm (8 Stunden). AGW - exposure factor 1.5 TWA: 180 mg/m ³ (8 Stunden). AGW - exposure factor 1.5 TWA: 50 ppm (8 Stunden). MAK TWA: 180 mg/m ³ (8 Stunden). MAK Höhepunkt: 75 ppm Höhepunkt: 270 mg/m ³	STEL: 100 ppm 15 minutos STEL: 367 mg/m ³ 15 minutos TWA: 50 ppm 8 horas TWA: 183.5 mg/m ³ 8 horas	STEL: 360 mg/m ³ 15 minuten TWA: 180 mg/m ³ 8 uren	TWA: 50 ppm 8 tunteina STEL: 100 ppm 15 minuutteina

Component	Austria	Denmark	Switzerland	Poland	Norway
Methyl tert-butyl ether	MAK-KZW: 100 ppm 15 Minuten MAK-KZW: 360 mg/m ³ 15 Minuten MAK-TMW: 50 ppm 8 Stunden MAK-TMW: 180 mg/m ³ 8 Stunden	TWA: 40 ppm 8 timer TWA: 144 mg/m ³ 8 timer	STEL: 75 ppm 15 Minuten STEL: 270 mg/m ³ 15 Minuten TWA: 50 ppm 8 Stunden TWA: 180 mg/m ³ 8 Stunden	STEL: 270 mg/m ³ 15 minutach TWA: 180 mg/m ³ 8 godzinach	TWA: 50 ppm 8 timer TWA: 183.5 mg/m ³ 8 timer STEL: 100 ppm 15 minutter. listed in the List of Administrative Norms STEL: 367 mg/m ³ 15 minutter. listed in the List of Administrative Norms

Component	Bulgaria	Croatia	Ireland	Cyprus	Czech Republic

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Methyl tert-butyl ether	TWA: 50 ppm TWA: 183.5 mg/m ³ STEL : 100 ppm STEL : 367 mg/m ³	TWA-GVI: 50 ppm 8 satima. TWA-GVI: 183.5 mg/m ³ 8 satima. STEL-KGVI: 100 ppm 15 minutama. STEL-KGVI: 367 mg/m ³ 15 minutama.	TWA: 50 ppm 8 hr. TWA: 183.5 mg/m ³ 8 hr. STEL: 100 ppm 15 min STEL: 367 mg/m ³ 15 min	STEL: 367 mg/m ³ STEL: 100 ppm TWA: 183.5 mg/m ³ TWA: 50 ppm	TWA: 100 mg/m ³ 8 hodinách. Ceiling: 200 mg/m ³
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Component	Estonia	Gibraltar	Greece	Hungary	Iceland
Methyl tert-butyl ether	TWA: 50 ppm 8 tundides. TWA: 180 mg/m ³ 8 tundides. STEL: 75 ppm 15 minutites. STEL: 250 mg/m ³ 15 minutites.	TWA: 183.5 mg/m ³ 8 hr TWA: 50 ppm 8 hr STEL: 367 mg/m ³ 15 min STEL: 100 ppm 15 min	STEL: 100 ppm STEL: 367 mg/m ³ TWA: 50 ppm TWA: 183.5 mg/m ³	STEL: 367 mg/m ³ 15 percekben. CK TWA: 183.5 mg/m ³ 8 órában. AK	STEL: 100 ppm STEL: 367 mg/m ³ TWA: 50 ppm 8 klukkustundum. TWA: 183.5 mg/m ³ 8 klukkustundum. Ceiling: 100 ppm Ceiling: 367 mg/m ³

Component	Latvia	Lithuania	Luxembourg	Malta	Romania
Methyl tert-butyl ether	STEL: 100 ppm STEL: 367 mg/m ³ TWA: 50 ppm TWA: 183.5 mg/m ³	TWA: 50 ppm IPRD TWA: 183.5 mg/m ³ IPRD STEL: 100 ppm STEL: 367 mg/m ³	TWA: 50 ppm 8 Stunden STEL: 367 mg/m ³ 15 Minuten STEL: 100 ppm 15 Minuten	TWA: 183.5 mg/m ³ TWA: 50 ppm STEL: 367 mg/m ³ 15 minuti STEL: 100 ppm 15 minuti	TWA: 50 ppm 8 ore TWA: 183.5 mg/m ³ 8 ore STEL: 100 ppm 15 minute STEL: 367 mg/m ³ 15 minute

Component	Russia	Slovak Republic	Slovenia	Sweden	Turkey
Methyl tert-butyl ether	TWA: 100 mg/m ³ STEL: 300 mg/m ³ vapor	Ceiling: 367 mg/m ³	TWA: 50 ppm 8 urah TWA: 183.5 mg/m ³ 8 urah STEL: 100 ppm 15 minutah STEL: 367 mg/m ³ 15 minutah	STV: 60 ppm 15 minuter STV: 220 mg/m ³ 15 minuter LLV: 30 ppm 8 timmar. LLV: 110 mg/m ³ 8 timmar.	STEL: 100 ppm 15 dakika STEL: 367 mg/m ³ 15 dakika

Biological limit values

This product, as supplied, does not contain any hazardous materials with biological limits established by the region specific regulatory bodies.

Monitoring methods

BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.

MDHS70 General methods for sampling airborne gases and vapours

MDHS 88 Volatile organic compounds in air. Laboratory method using diffusive samplers, solvent desorption and gas chromatography

MDHS 96 Volatile organic compounds in air - Laboratory method using pumped solid sorbent tubes, solvent desorption and gas chromatography

Derived No Effect Level (DNEL) No information available

<u>Route of exposure</u>	Acute effects (local)	Acute effects (systemic)	Chronic effects (local)	Chronic effects (systemic)
Oral Dermal Inhalation				

Predicted No Effect Concentration (PNEC) No information available.

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8.2. Exposure controls

Engineering Measures

Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment.

Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source

Personal protective equipment

Eye Protection

Safety glasses with side-shields (European standard - EN 166)

Hand Protection

Protective gloves

Glove material	Breakthrough time	Glove thickness	EU standard	Glove comments
Nitrile rubber	< 211 minutes	0.38 mm	Level 4	Permeation rate 1 µg/cm ² /min
Viton (R)	< 152 minutes	0.7 mm	Level 4 EN 374	Permeation rate 17 µg/cm ² /min As tested under EN374-3 Determination of Resistance to Permeation by Chemicals

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure

Inspect gloves before use.

Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information)

Ensure gloves are suitable for the task: Chemical compatibility, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.

Remove gloves with care avoiding skin contamination.

Respiratory Protection

No protective equipment is needed under normal use conditions.

Large scale/emergency use

Use a NIOSH/MSHA or European Standard EN 136 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced

Recommended Filter type: low boiling organic solvent Type AX Brown conforming to EN371

Small scale/Laboratory use

Maintain adequate ventilation Use a NIOSH/MSHA or European Standard EN 149:2001 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Recommended half mask:- Valve filtering: EN405; or; Half mask: EN140; plus filter, EN 141

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls

No information available.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance

Colorless

Physical State

Liquid

Odor

Petroleum distillates

Odor Threshold

No data available

pH

No information available

Melting Point/Range

-110 °C / -166 °F

Softening Point

No data available

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Boiling Point/Range	54 - 56 °C / 129.2 - 132.8 °F	
Flash Point	-28 °C / -18.4 °F	Method - No information available
Evaporation Rate	No data available	
Flammability (solid,gas)	Not applicable	Liquid
Explosion Limits	Lower 1.6 vol% Upper 8.4 vol%	
Vapor Pressure	268 mbar @ 20 °C	
Vapor Density	0.2	(Air = 1.0)
Specific Gravity / Density	0.740	
Bulk Density	Not applicable	Liquid
Water Solubility	51 g/L (20°C)	
Solubility in other solvents	No information available	
Partition Coefficient (n-octanol/water)		
Component	log Pow	
Methyl tert-butyl ether	1.06	
Autoignition Temperature	224 - °C / 435.2 - °F	
Decomposition temperature	No data available	
Viscosity	0.36 mPa.s at 20 °C	
Explosive Properties	No information available	Vapors may form explosive mixtures with air
Oxidizing Properties	No information available	

9.2. Other information

Molecular Formula	C5 H12 O
Molecular Weight	88.15

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

None known, based on information available

10.2. Chemical stability

Stable under normal conditions

10.3. Possibility of hazardous reactions

Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

10.4. Conditions to avoid

Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

10.5. Incompatible materials

Strong oxidizing agents.

10.6. Hazardous decomposition products

Carbon monoxide (CO). Carbon dioxide (CO₂).

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Product Information

(a) acute toxicity;

Oral	Based on available data, the classification criteria are not met
Dermal	Based on available data, the classification criteria are not met
Inhalation	Based on available data, the classification criteria are not met

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
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Methyl tert-butyl ether	2963 mg/kg (Rat)	10000 mg/kg (Rabbit)	23576 ppm (Rat) 4 h
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(b) skin corrosion/irritation; Category 2

(c) serious eye damage/irritation; No data available

(d) respiratory or skin sensitization;
Respiratory No data available
Skin No data available

(e) germ cell mutagenicity; No data available
 Mutagenic effects have occurred in experimental animals

(f) carcinogenicity; No data available
 The table below indicates whether each agency has listed any ingredient as a carcinogen
 Limited evidence of a carcinogenic effect

Component	EU	UK	Germany	IARC
Methyl tert-butyl ether			Cat. 3B	group 3

(g) reproductive toxicity; No data available
Reproductive Effects Experiments have shown reproductive toxicity effects on laboratory animals.
Developmental Effects Developmental effects have occurred in experimental animals.
Teratogenicity Teratogenic effects have occurred in experimental animals.

(h) STOT-single exposure; No data available

(i) STOT-repeated exposure; No data available
Target Organs Skin, Eyes, Central nervous system (CNS), Liver, Kidney, Blood.

(j) aspiration hazard; No data available

Other Adverse Effects Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information

Symptoms / effects, both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting:
 Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecotoxicity effects . Do not empty into drains.

Component	Freshwater Fish	Water Flea	Freshwater Algae	Microtox
Methyl tert-butyl ether	887 mg/L LC50 96 h 100 mg/L LC50 96 h 929 mg/L LC50 96 h 672 mg/L LC50 96 h	542 mg/L EC50 = 48 h	800 mg/L EC50 > 72 h 184 mg/L EC50 = 96 h	EC50 = 11.4 mg/L 30 min EC50 = 8.23 mg/L 5 min EC50 = 9.67 mg/L 15 min

12.2. Persistence and degradability

Persistence Persistence is unlikely, based on information available.

12.3. Bioaccumulative potential Bioaccumulation is unlikely

Component	log Pow	Bioconcentration factor (BCF)
Methyl tert-butyl ether	1.06	No data available

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12.4. Mobility in soil

The product contains volatile organic compounds (VOC) which will evaporate easily from all surfaces. Will likely be mobile in the environment due to its volatility. Disperses rapidly in air.

12.5. Results of PBT and vPvB assessment

No data available for assessment.

12.6. Other adverse effects

Endocrine Disruptor Information

Component	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Methyl tert-butyl ether	Group III Chemical		

Persistent Organic Pollutant

This product does not contain any known or suspected substance

Ozone Depletion Potential

This product does not contain any known or suspected substance

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from Residues / Unused Products

Waste is classified as hazardous. Dispose of in accordance with the European Directives on waste and hazardous waste. Dispose of in accordance with local regulations.

Contaminated Packaging

Dispose of this container to hazardous or special waste collection point. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep product and empty container away from heat and sources of ignition.

European Waste Catalogue (EWC)

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific.

Other Information

Waste codes should be assigned by the user based on the application for which the product was used. Do not dispose of waste into sewer. Can be incinerated, when in compliance with local regulations.

SECTION 14: TRANSPORT INFORMATION

IMDG/IMO

<u>14.1. UN number</u>	UN2398
<u>14.2. UN proper shipping name</u>	Methyl butyl ether
<u>14.3. Transport hazard class(es)</u>	3
<u>14.4. Packing group</u>	II

ADR

<u>14.1. UN number</u>	UN2398
<u>14.2. UN proper shipping name</u>	METHYL tert-BUTYL ETHER
<u>14.3. Transport hazard class(es)</u>	3
<u>14.4. Packing group</u>	II

IATA

<u>14.1. UN number</u>	UN2398
<u>14.2. UN proper shipping name</u>	METHYL TERT-BUTYL ETHER
<u>14.3. Transport hazard class(es)</u>	3
<u>14.4. Packing group</u>	II

14.5. Environmental hazards

No hazards identified

14.6. Special precautions for user

No special precautions required

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14.7. Transport in bulk according to Not applicable, packaged goods
Annex II of MARPOL73/78 and the IBC Code

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

International Inventories X = listed

Component	EINECS	ELINCS	NLP	TSCA	DSL	NDSL	PICCS	ENCS	IECSC	AICS	KECL
Methyl tert-butyl ether	216-653-1	-		X	X	-	X	X	X	X	X

National Regulations

Component	Germany - Water Classification (VwVwS)	Germany - TA-Luft Class
Methyl tert-butyl ether	WGK 1	

Component	France - INRS (Tables of occupational diseases)
Methyl tert-butyl ether	Tableaux des maladies professionnelles (TMP) - RG 84

Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment.

Take note of Dir 94/33/EC on the protection of young people at work

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

15.2. Chemical safety assessment

A Chemical Safety Assessment/Report (CSA/CSR) has not been conducted

SECTION 16: OTHER INFORMATION

Full text of R-phrases referred to under sections 2 and 3

R11 - Highly flammable

R38 - Irritating to skin

Full text of H-Statements referred to under sections 2 and 3

H225 - Highly flammable liquid and vapor

H315 - Causes skin irritation

Legend

CAS - Chemical Abstracts Service

EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

IECSC - Chinese Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

ENCS - Japanese Existing and New Chemical Substances

AICS - Australian Inventory of Chemical Substances

NZIoC - New Zealand Inventory of Chemicals

WEL - Workplace Exposure Limit

ACGIH - American Conference of Governmental Industrial Hygienists

DNEL - Derived No Effect Level

RPE - Respiratory Protective Equipment

LC50 - Lethal Concentration 50%

NOEC - No Observed Effect Concentration

PBT - Persistent, Bioaccumulative, Toxic

TWA - Time Weighted Average

IARC - International Agency for Research on Cancer

PNEC - Predicted No Effect Concentration

LD50 - Lethal Dose 50%

EC50 - Effective Concentration 50%

POW - Partition coefficient Octanol:Water

vPvB - very Persistent, very Bioaccumulative

ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road

ICAO/IATA - International Civil Aviation Organization/International Air Transport Association

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tert-Butyl methyl ether

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IMO/IMDG - International Maritime Organization/International Maritime Dangerous Goods Code

OECD - Organisation for Economic Co-operation and Development

BCF - Bioconcentration factor

MARPOL - International Convention for the Prevention of Pollution from Ships

ATE - Acute Toxicity Estimate

VOC - Volatile Organic Compounds

Key literature references and sources for data

Suppliers safety data sheet, Chemadvisor - LOLI, Merck index, RTECS

Training Advice

Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.

Fire prevention and fighting, identifying hazards and risks, static electricity, explosive atmospheres posed by vapours and dusts.

Chemical incident response training.

Use of personal protective equipment, covering appropriate selection, compatibility, breakthrough thresholds, care, maintenance, fit and standards.

First aid for chemical exposure, including the use of eye wash and safety showers.

Creation Date 28-May-2009

Revision Date 12-Sep-2014

Revision Summary Update to Format.

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Disclaimer

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of Safety Data Sheet

A&K PETROCHEM

SAFETY DATA SHEET

1. IDENTIFICATION

Product Identifier: 1,2-Dichloroethane

Distributor Information

Name: A&K Petrochem Industries Ltd
 Address: 316 Edgeley Blvd
 Concord, Ontario, Canada L4K 3Y3
 Phone: 416-213-5611

Emergency Phone Number

CANUTEC: 613-996-6666

2. HAZARD(S) IDENTIFICATION

Hazard classification

Physical hazards

Flammable liquids Category 2

Health hazards

Acute toxicity (Oral) Category 4

Skin corrosion/irritation Category 2

Serious eye damage/eye irritation Category 2

Carcinogenicity Category 1B

Specific target organ toxicity - single exposure Category 3

Label elements

Hazard symbol:	Signal word:	Danger	Hazard statement:	Highly flammable liquid and vapor.
				Harmful if swallowed.
				Causes skin irritation.
				Causes serious eye irritation.
				May cause respiratory irritation.
				May cause cancer.

Precautionary statement

Prevention: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not eat, drink or smoke when using this product. Avoid breathing dust/fume/gas/mist/vapors. Wear protective gloves/protective clothing/eye protection/face protection. Use only outdoors or in a well-ventilated area. Wash hands thoroughly after handling.

Response: In case of fire: Use water spray, foam, dry powder or carbon dioxide for extinction. IF exposed or concerned: Get medical advice/attention. IF SWALLOWED: Call a POISON CENTER/doctor/ if you feel unwell. Rinse mouth. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell. Specific treatment (see this label).

Storage: Store in a well-ventilated place. Keep cool. Keep container tightly closed. Store locked up.

Disposal: Dispose of contents/container to an appropriate treatment and disposal

facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification:

Static accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor. May cause flash fire or explosion.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substances

Chemical identity	Common name and synonyms	CAS number	Content in percent (%)*
ETHYLENE DICHLORIDE		107-06-2	90 - 100%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. FIRST-AID MEASURES

General information:	Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.
Ingestion:	Rinse mouth. Call a POISON CENTER or doctor/physician if you feel unwell.
Inhalation:	Move to fresh air. Get medical attention if symptoms persist.
Skin contact:	Wash with soap and water. If skin irritation occurs: Get medical advice/attention. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.
Eye contact:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
Most important symptoms/effects, acute and delayed	acute and delayed
Symptoms:	Irritating to eyes, respiratory system and skin. Narcotic effect.
Indication of immediate medical attention and special treatment needed	
Treatment:	Symptoms may be delayed. Treat symptomatically.

5. FIRE-FIGHTING MEASURES

General fire hazards:	Flammable liquid and vapor.
Suitable (and unsuitable) extinguishing media	
Suitable extinguishing media:	Water spray, foam, dry powder or carbon dioxide.
Unsuitable extinguishing media:	Avoid water in straight hose stream; will scatter and spread fire.
Specific hazards arising from the chemical:	Vapors may cause a flash fire or ignite explosively. Vapors may travel considerable distance to a source of ignition and flash back. Prevent buildup of vapors or gases to explosive concentrations. Heat may cause the containers to explode.
Special protective equipment and precautions for firefighters	
Special fire fighting procedures:	Use water spray to keep fire-exposed containers cool. Water may be ineffective in fighting the fire. Fight fire from a protected location. Move containers from fire area if you can do so without risk.
Special protective equipment for fire-fighters:	Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures:	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unauthorized personnel away. Keep upwind. Use personal protective equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. See Section 8 of the MSDS for Personal
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	Protective Equipment. Methods and material for	Eliminate all ignition sources if safe to do so.
Take precautionary measures containment and cleaning up:	against static discharges. Stop leak if possible without any risk. Use only non-sparking tools. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.	
Notification Procedures:	Prevent entry into waterways, sewer, basements or confined areas. Stop leak if you can do so without risk. Inform authorities if large amounts are involved.	
Environmental precautions:	Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.	

7. HANDLING AND STORAGE

Precautions for safe handling:	DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Take precautionary measures against static discharges. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Wear protective gloves/protective clothing/eye protection/face protection. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Wash hands thoroughly after handling.
Conditions for safe storage, including any incompatibilities:	Keep away from food, drink and animal feeding stuffs. Keep container tightly closed in a cool, well-ventilated place. Ground container and transfer equipment to eliminate static electric sparks. Comply with all national, state, and local codes pertaining to the storage, handling, dispensing, and disposal of flammable liquids.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Occupational exposure limits

Chemical identity	Type	Exposure Limit values		Source
ETHYLENE DICHLORIDE	TWA	10 ppm		US. ACGIH Threshold Limit Values (2011)
	REL	1 ppm	4 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	STEL	2 ppm	8 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	TWA	1 ppm	4 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	STEL	2 ppm	8 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	TWA	50 ppm		US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)
	Ceiling	100 ppm		US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)
	MAX. CONC	200 ppm		US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)

Appropriate engineering controls	No data available.
Individual protection measures, such as personal protective equipment	
General information:	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area. Use explosion-proof ventilation equipment.
Eye/face protection:	Wear safety glasses with side shields (or goggles).
Skin protection	
Hand protection:	Chemical resistant gloves
Other:	Wear suitable protective clothing.

Respiratory protection: In case of inadequate ventilation use suitable respirator.
Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.
Provide eyewash station and safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical state:	Liquid
Form:	Liquid
Color:	Colorless
Odor:	Chloroform-like odor
Odor threshold:	No data available.
pH:	No data available.
Melting point/freezing point:	-35.3 °C
Initial boiling point and boiling range:	83 °C
Flash Point:	13 °C (Closed Cup)
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	15.9 %(V)
Flammability limit - lower (%):	6.2 %(V)
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	10.52 kPa (25 °C)
Vapor density:	No data available.
Relative density:	1.24 (20 °C)
Solubility(ies)	
Solubility in water:	8.1 g/l (20 °C)
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	1.48
Auto-ignition temperature:	413 °C
Decomposition temperature:	No data available.
Viscosity:	No data available.
Other information	
Molecular weight:	98.96 g/mol (C ₂ H ₄ Cl ₂)

10. STABILITY AND REACTIVITY

Reactivity:	No data available.
Chemical stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Hazardous polymerization does not occur.
Conditions to avoid:	Heat, sparks, flames. Contact with incompatible materials.
Incompatible materials:	Ammonia. Caustics. Reducing agents. Oxidizing agents. Alkali metals. Alkali earth metals. Organic peroxides/hydroperoxides. Amines.
Hazardous decomposition products:	By heating and fire, toxic vapors/gases may be formed.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Ingestion:	Harmful if swallowed.
Inhalation:	May cause irritation to the respiratory system. May cause drowsiness or dizziness.
Skin contact:	Causes skin irritation.
Eye contact:	Causes serious eye irritation.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral	
Product:	LD 50 (Rat): 670 mg/kg
Dermal	

Product:	No data available.	
Inhalation		
Product:	LD 50 (Rat, 7 h): 1,000 mg/l	
Repeated dose toxicity		
Product:	No data available.	
Skin corrosion/irritation		
Product:	Causes skin irritation.	
Serious eye damage/eye irritation		
Product:	Causes serious eye irritation.	
Respiratory or skin sensitization		
Product:	Not a skin sensitizer.	
Carcinogenicity		
Product:	May cause cancer.	IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
ETHYLENE	Overall evaluation: 2B. Possibly carcinogenic to humans.	
DICHLORIDE		
US. National Toxicology Program (NTP) Report on Carcinogens:		
ETHYLENE	Reasonably Anticipated to be a Human Carcinogen.	
DICHLORIDE		
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):		
No carcinogenic components identified		
Germ cell mutagenicity		
In vitro		
Product:	No mutagenic components identified	
In vivo		
Product:	No mutagenic components identified	
Reproductive toxicity		
Product:	No data available.	
Specific target organ toxicity - single exposure		
Product:	Inhalation - vapor: Respiratory System - Respiratory tract irritation.	
Specific target organ toxicity - repeated exposure		
Product:	No data available.	
Aspiration hazard		
Product:	Not classified	
Other effects:	None known.	

12. ECOLOGICAL INFORMATION

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish

Product:	No data available.
Specified substance(s):	
ETHYLENE	LC 50 (Sheepshead minnow (Cyprinodon variegatus), 96 h): > 130 - < 230 mg/l Mortality
DICHLORIDE	LC 50 (Fathead minnow (Pimephales promelas), 96 h): 110 - 123 mg/l Mortality
	LC 50 (Rainbow trout, donaldson trout (Oncorhynchus mykiss), 96 h): 225 mg/l Mortality
	LC 50 (Bluegill (Lepomis macrochirus), 96 h): 230 - 710 mg/l Mortality

Aquatic invertebrates

Product:	No data available.
Specified substance(s):	
ETHYLENE	EC 50 (Water flea (Daphnia magna), 48 h): 140 - 190 mg/l Intoxication
DICHLORIDE	LC 50 (Water flea (Daphnia magna), 48 h): 160 - 280 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish

Product: No data available.

Aquatic invertebrates

Product: No data available.

Toxicity to Aquatic Plants

Product: No data available.

Persistence and degradability

Biodegradation

Product: There are no data on the degradability of this product.

BOD/COD ratio	
Product:	No data available.
Bioaccumulative potential	
Bioconcentration factor (BCF)	
Product:	No data available on bioaccumulation.
Partition coefficient n-octanol / water (log Kow)	
Product:	Log Kow: 1.48
Mobility in soil:	The product is partly soluble in water. May spread in the aquatic environment.
Other adverse effects:	The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

13. DISPOSAL CONSIDERATIONS

Disposal instructions:	Discharge, treatment, or disposal may be subject to national, state, or local laws.
Contaminated packaging:	Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. TRANSPORT INFORMATION

DOT

UN number:	UN 1184
UN proper shipping name:	Ethylene dichloride
Transport hazard class(es)	
Class(es):	3, 6.1
Label(s):	3, 6.1
Packing group:	II
Marine Pollutant:	No

IMDG

UN number:	UN 1184
UN proper shipping name:	ETHYLENE DICHLORIDE
Transport hazard class(es)	
Class(es):	3, 6.1
Label(s):	3, 6.1
EmS No.:	F-E, S-D
Packing group:	II
Marine Pollutant:	No

IATA

UN number:	UN 1184
Proper Shipping Name:	Ethylene dichloride
Transport hazard class(es):	
Class(es):	3, 6.1
Label(s):	3, 6.1
Marine Pollutant:	No
Packing group:	II

15. REGULATORY INFORMATION

US federal regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

ETHYLENE DICHLORIDE Reportable quantity: 100 lbs.

Superfund amendments and reauthorization act of 1986 (SARA)

Hazard categories

X Acute (Immediate) X Chronic (Delayed) X Fire Reactive Pressure Generating

SARA 302 Extremely hazardous substance

None present or none present in regulated quantities.

SARA 304 Emergency release notification

Chemical identity RQ
ETHYLENE DICHLORIDE 100 lbs.

SARA 311/312 Hazardous chemical

Chemical identity Threshold Planning Quantity
ETHYLENE DICHLORIDE 500 lbs

SARA 313 (TRI reporting)

Chemical identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
ETHYLENE DICHLORIDE	100 lbs	25000 lbs.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

ETHYLENE DICHLORIDE Reportable quantity: 100 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

None present or none present in regulated quantities.

US state regulations

US. California Proposition 65

ETHYLENE DICHLORIDE Carcinogenic.

US. New Jersey Worker and Community Right-to-Know Act

ETHYLENE DICHLORIDE Listed

US. Massachusetts RTK - Substance List

ETHYLENE DICHLORIDE Listed

US. Pennsylvania RTK - Hazardous Substances

ETHYLENE DICHLORIDE Listed

US. Rhode Island RTK

ETHYLENE DICHLORIDE Listed

Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EU EINECS List:	On or in compliance with the inventory
EU ELINCS List:	Not in compliance with the inventory.
Japan (ENCS) List:	Not in compliance with the inventory.
EU No Longer Polymers List:	Not in compliance with the inventory.
China Inv. Existing Chemical Substances:	Not in compliance with the inventory.
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Japan ISHL Listing:	On or in compliance with the inventory
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

16. OTHER INFORMATION

NFPA Hazard ID

Flammability : 3
Health : 2
Reactivity : 0

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue date: 04-11-2014
Revision date: No data available.
Version #: 1.0
Further information: No data available.

DISCLAIMER

The information presented in this Safety Data Sheet (SDS/MSDS) was prepared based on data that is believed to be accurate.

A&K Petrochem / A&K Finechem / ANK Pharmaceuticals provide this information "as is" without warranty of any kind.

This SDS is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product, as is not intended to be comprehensive as to the manner and conditions of use, handling, storage, or disposal of the product. Individuals receiving this SDS must always exercise their own independent judgement in determining the appropriateness of such issues.

Accordingly, A&K Petrochem / A&K Finechem / ANK Pharmaceuticals assume no liability whatsoever for the use of or reliance upon this information. No suggestions for use are intended as, or shall be construed as, a recommendation to infringe any existing patents or to violate any laws.

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1. Identification

Product identifier	1,2-Dibromoethane	
Other means of identification		
Item	N-10150	
Synonym(s)	ETHYLENE BROMIDE	
Recommended use	For Laboratory Use Only	
Recommended restrictions	None known.	
Manufacturer/Importer/Supplier/Distributor information		
Manufacturer		
Company name	Chem Service, Inc.	
Address	660 Tower Lane West Chester, PA 19380 United States	
Telephone	Toll Free	800-452-9994
	Direct	610-692-3026
Website	www.chemservice.com	
E-mail	info@chemservice.com	
Emergency phone number	Chemtrec US	800-424-9300
	Chemtrec outside US	+1 703-527-3887

2. Hazard(s) identification

Physical hazards	Not classified.	
Health hazards	Acute toxicity, oral	Category 3
	Acute toxicity, dermal	Category 3
	Acute toxicity, inhalation	Category 3
	Skin corrosion/irritation	Category 2
	Serious eye damage/eye irritation	Category 2A
	Carcinogenicity	Category 1
	Reproductive toxicity	Category 2
	Specific target organ toxicity, single exposure	Category 3 respiratory tract irritation
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 3
	Hazardous to the aquatic environment, long-term hazard	Category 2
OSHA defined hazards	Not classified.	

Label elements



Signal word	Danger
Hazard statement	Toxic if swallowed. Toxic in contact with skin. Causes skin irritation. Causes serious eye irritation. Toxic if inhaled. May cause respiratory irritation. May cause cancer. Suspected of damaging fertility or the unborn child. Harmful to aquatic life. Toxic to aquatic life with long lasting effects.
Precautionary statement	
Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area. Avoid breathing mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection.

Response	If swallowed: Immediately call a poison center/doctor. If on skin: Wash with plenty of water. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a poison center/doctor. Specific treatment (see this label). Rinse mouth. If skin irritation occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention. Take off immediately all contaminated clothing and wash it before reuse. Collect spillage.
Storage	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	Not applicable.

3. Composition/information on ingredients

Substances

Chemical name	Common name and synonyms	CAS number	%
1,2-Dibromoethane	ETHYLENE BROMIDE	106-93-4	100

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a POISON CENTER or doctor/physician.
Skin contact	Take off immediately all contaminated clothing. Wash with plenty of soap and water. Call a POISON CENTER or doctor/physician if you feel unwell. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.
Ingestion	Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Most important symptoms/effects, acute and delayed	Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Skin irritation. May cause redness and pain.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	Take off immediately all contaminated clothing. IF exposed or concerned: Get medical advice/attention. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO ₂).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire-fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Immediately evacuate personnel to safe areas. Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Avoid inhalation of vapors. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
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Methods and materials for containment and cleaning up

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions

Avoid release to the environment. Contact local authorities in case of spillage to drain/aquatic environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage**Precautions for safe handling**

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not taste or swallow. Avoid breathing vapor. Avoid contact with skin. Avoid contact with eyes. Avoid contact during pregnancy/while nursing. Avoid prolonged exposure. Avoid contact with clothing. Use only outdoors or in a well-ventilated area. Wear appropriate personal protective equipment. Observe good industrial hygiene practices. When using, do not eat, drink or smoke. Wash hands thoroughly after handling. Wash contaminated clothing before reuse. Avoid release to the environment. Do not empty into drains.

Conditions for safe storage, including any incompatibilities

Store locked up. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection**Occupational exposure limits****US. OSHA Table Z-2 (29 CFR 1910.1000)**

Material	Type	Value
1,2-Dibromoethane (CAS 106-93-4)	Ceiling	30 ppm
	TWA	20 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Material	Type	Value
1,2-Dibromoethane (CAS 106-93-4)	Ceiling	0.13 ppm
	TWA	0.045 ppm

Biological limit values

No biological exposure limits noted for the ingredient(s).

Exposure guidelines**US - California OELs: Skin designation**

1,2-Dibromoethane (CAS 106-93-4) Can be absorbed through the skin.

US - Minnesota Haz Subs: Skin designation applies

1,2-Dibromoethane (CAS 106-93-4) Skin designation applies.

US ACGIH Threshold Limit Values: Skin designation

1,2-Dibromoethane (CAS 106-93-4) Can be absorbed through the skin.

Appropriate engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear eye/face protection. Wear safety glasses with side shields (or goggles).

Skin protection

Hand protection Wear appropriate chemical resistant gloves.

Other Wear appropriate chemical resistant clothing.

Respiratory protection In case of insufficient ventilation, wear suitable respiratory equipment.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations

When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties**Appearance**

Physical state Liquid.

Form	Liquid
Color	Colorless
Odor	Not available.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	49.95 °F (9.97 °C)
Initial boiling point and boiling range	267.8 - 269.6 °F (131 - 132 °C)
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	1.49 kPa at 25 °C 1.49 kPa at 25 °C
Vapor density	6.5
Relative density	Not available.
Solubility(ies)	
Solubility (water)	4 g/l
Partition coefficient (n-octanol/water)	2
Auto-ignition temperature	Not available.
Decomposition temperature	464 - 518 °F (240 - 270 °C)
Viscosity	Not available.
Other information	
Density	2.17 g/cm ³
Dynamic viscosity	1.73 mPa.s
Dynamic viscosity temperature	68 °F (20 °C)
Kinematic viscosity	0.8 mm ² /s estimated
Molecular formula	C ₂ H ₄ Br ₂
Molecular weight	187.86 g/mol
Percent volatile	100 %
Specific gravity	2.17
VOC (Weight %)	100 %

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	Hydrogen bromide.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Toxic if swallowed.
Inhalation	Toxic by inhalation.
Skin contact	Toxic in contact with skin. Causes skin irritation.

Eye contact Causes serious eye irritation.

Symptoms related to the physical, chemical and toxicological characteristics Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Skin irritation. May cause redness and pain.

Information on toxicological effects

Acute toxicity Toxic by inhalation. Toxic if swallowed. Toxic in contact with skin. May cause respiratory irritation.

Product	Species	Test Results
1,2-Dibromoethane (CAS 106-93-4)		
Acute		
<i>Dermal</i>		
LD50	Rabbit	300 mg/kg
	Rat	300 mg/kg
<i>Inhalation</i>		
LC50	Guinea pig, Rat	> 200 ppm, 4 Hours
	Rat	14.3 mg/l, 30 Minutes
<i>Oral</i>		
LD50	Guinea pig	110 mg/kg
	Mouse	420 mg/kg
	Rabbit	55 mg/kg
	Rat	55 mg/kg
<i>Other</i>		
LD50	Mouse	220 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Causes serious eye irritation.

Respiratory or skin sensitization

Respiratory sensitization Not available.

Skin sensitization This product is not expected to cause skin sensitization.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity May cause cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

1,2-Dibromoethane (CAS 106-93-4) 2A Probably carcinogenic to humans.

US. National Toxicology Program (NTP) Report on Carcinogens

1,2-Dibromoethane (CAS 106-93-4) Reasonably Anticipated to be a Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity Possible reproductive hazard. Suspected of damaging fertility or the unborn child.

Specific target organ toxicity - single exposure Respiratory tract irritation.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard Not available.

Chronic effects Prolonged inhalation may be harmful. Prolonged exposure may cause chronic effects.

12. Ecological information

Ecotoxicity Toxic to aquatic life with long lasting effects. Accumulation in aquatic organisms is expected.

Product	Species	Test Results
1,2-Dibromoethane (CAS 106-93-4)		
Aquatic		
Fish	LC50 Medaka, high-eyes (Oryzias latipes)	27.6 - 37.4 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential Not available.

Partition coefficient n-octanol / water (log Kow)

1.96

Mobility in soil	No data available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
US RCRA Hazardous Waste U List: Reference	
1,2-Dibromoethane (CAS 106-93-4)	U067
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information**DOT**

UN number	UN1605
UN proper shipping name	Ethylene dibromide
Transport hazard class(es)	
Class	6.1(PGI, II)
Subsidiary risk	-
Label(s)	6.1
Packing group	I
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	2, B9, B14, B32, B77, T20, TP2, TP13, TP38, TP45
Packaging exceptions	None
Packaging non bulk	227
Packaging bulk	244

IATA

UN number	UN1605
UN proper shipping name	Ethylene dibromide
Transport hazard class(es)	
Class	6.1(PGIII)
Subsidiary risk	-
Packing group	Not applicable.
Environmental hazards	No.
ERG Code	6L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Other information	
Passenger and cargo aircraft	Allowed.
Cargo aircraft only	Allowed.

IMDG

UN number	UN1605
UN proper shipping name	ETHYLENE DIBROMIDE
Transport hazard class(es)	
Class	6.1(PGI, II)
Subsidiary risk	-
Packing group	I
Environmental hazards	
Marine pollutant	No.
EmS	F-A, S-A
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not available.

DOT



IATA



IMDG



15. Regulatory information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

1,2-Dibromoethane (CAS 106-93-4)

Listed.

SARA 304 Emergency release notification

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - Yes

Delayed Hazard - Yes

Fire Hazard - No

Pressure Hazard - No

Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical

Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
1,2-Dibromoethane	106-93-4	100

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

1,2-Dibromoethane (CAS 106-93-4)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Clean Water Act (CWA) Hazardous substance
Section 112(r) (40 CFR 68.130)

Safe Drinking Water Act (SDWA) 0 mg/l
0.00005 mg/l

US state regulations

US. Massachusetts RTK - Substance List

1,2-Dibromoethane (CAS 106-93-4)

US. New Jersey Worker and Community Right-to-Know Act

1,2-Dibromoethane (CAS 106-93-4) 500 LBS

US. Pennsylvania RTK - Hazardous Substances

1,2-Dibromoethane (CAS 106-93-4)

US. Rhode Island RTK

1,2-Dibromoethane (CAS 106-93-4)

US. California Proposition 65

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

1,2-Dibromoethane (CAS 106-93-4) Listed: July 1, 1987

US - California Proposition 65 - CRT: Listed date/Developmental toxin

1,2-Dibromoethane (CAS 106-93-4) Listed: May 15, 1998

US - California Proposition 65 - CRT: Listed date/Male reproductive toxin

1,2-Dibromoethane (CAS 106-93-4) Listed: May 15, 1998

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 06-03-2014
Version # 01
NFPA ratings Health: 3
Flammability: 0
Instability: 0

Disclaimer

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded SDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Safety Data Sheet (SDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an SDS for a solution or mixture the user should refer to the SDS for every component of the solution or mixture. Chem Service warrants that this SDS is based upon the most current information available to Chem Service at the time it was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. This SDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

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Material Safety Data Sheet

MSDS ID NO.: 0127MAR019
Revision date: 12/07/2010

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Product name: Marathon Regular Unleaded Gasoline
Synonym: Conventional Regular Unleaded Gasoline
Chemical Family: Petroleum Hydrocarbon
Formula: Mixture

Manufacturer:
Marathon Petroleum Company LP
539 South Main Street
Findlay OH 45840

Other information: 419-421-3070
Emergency telephone number: 877-627-5463

2. COMPOSITION/INFORMATION ON INGREDIENTS

Gasoline is a complex combination of hydrocarbons consisting of paraffins, cycloparaffins, aromatic and olefinic hydrocarbons having carbon numbers predominantly greater than C3 and boiling in the range of 85-500 F. Can contain small amounts of dye and other additives (>0.02%) which are not considered hazardous at the concentrations used.

Product information:

Name	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA - Vacated PELs - Time Weighted Ave	Other:
Marathon Regular Unleaded Gasoline	86290-81-5	100	300 ppm TWA 500 ppm STEL		

Component Information:

Name	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA - Vacated PELs - Time Weighted Ave	Other:
Saturated Hydrocarbons	Mixture	55-85			

Name	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA - Vacated PELs - Time Weighted Ave	Other:
Aromatic Hydrocarbons	Mixture	10-40			
Unsaturated Hydrocarbons	Mixture	1-15			
Toluene	108-88-3	1-15	20 ppm TWA	= 100 ppm TWA = 375 mg/m ³ TWA = 150 ppm STEL = 560 mg/m ³ STEL	
Xylene	1330-20-7	2-10	100 ppm TWA 150 ppm STEL	= 100 ppm TWA = 435 mg/m ³ TWA = 150 ppm STEL = 655 mg/m ³ STEL	
1,2,4-Trimethylbenzene	95-63-6	1-5	= 25 ppm TWA	= 125 mg/m ³ TWA = 25 ppm TWA	
Benzene	71-43-2	0.5-3.5	Skin - potential significant contribution to overall exposure by the cutaneous route 0.5 ppm TWA 2.5 ppm STEL	= 25 ppm Ceiling = 10 ppm TWA = 50 ppm STEL	OSHA Exposure Limit as specified in 1910.1028: = 1.0 ppm TWA = 5 ppm STEL = 0.5 ppm Action Level
Hexane	110-54-3	0-3	Skin - potential significant contribution to overall exposure by the cutaneous route 50 ppm TWA	= 180 mg/m ³ TWA = 50 ppm TWA	
Ethyl Benzene	100-41-4	0.5-2.0	100 ppm TWA 125 ppm STEL	= 100 ppm TWA = 435 mg/m ³ TWA = 125 ppm STEL = 545 mg/m ³ STEL	
Naphthalene	91-20-3	0.1-0.5	Skin - potential significant contribution to overall exposure by the cutaneous route 10 ppm TWA 15 ppm STEL	= 10 ppm TWA = 50 mg/m ³ TWA = 15 ppm STEL = 75 mg/m ³ STEL	

Notes:

The manufacturer has voluntarily elected to reflect exposure limits contained in OSHA's 1989 air contaminants standard in its MSDS's, even though certain of those exposure limits were vacated in 1992.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER!

FUMES MAY CAUSE EYE AND RESPIRATORY IRRITATION.
MAY BE HARMFUL OR FATAL IF SWALLOWED
MAY CAUSE LUNG DAMAGE
OVEREXPOSURE MAY CAUSE CNS DEPRESSION
BREATHING HIGH CONCENTRATIONS CAN CAUSE IRREGULAR HEARTBEATS WHICH MAY BE FATAL

DANGER - CONTAINS BENZENE - MAY CAUSE CANCER
CAN CAUSE LEUKEMIA AND OTHER BLOOD DISORDERS.
POTENTIAL REPRODUCTIVE HAZARD
SEE TOXICOLOGICAL INFORMATION SECTION FOR MORE INFORMATION

EXTREMELY FLAMMABLE LIQUID AND VAPOR
VAPOR MAY CAUSE FLASH FIRE OR EXPLOSION
MATERIAL MAY ACCUMULATE STATIC CHARGE

STABLE

Inhalation:

Breathing high concentrations may be harmful.
May cause central nervous system depression or effects. Symptoms may include headache, excitation, euphoria, dizziness, incoordination, drowsiness, light-headedness, blurred vision, fatigue, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death, depending on the concentration and duration of exposure. Breathing high concentrations of this material, for example, in a confined space or by intentional abuse, can cause irregular heartbeats which can cause death. See Toxicological Effects (Section 11) for more information.

Ingestion:

Swallowing this material may be harmful.
May cause irritation of the mouth, throat and gastrointestinal tract.
May cause central nervous system depression or effects. Symptoms may include salivation, pain, nausea, vomiting and diarrhea. Exposure may also cause central nervous system symptoms similar to those listed under "Inhalation" (see Inhalation section).

Skin contact:

Contact may cause reddening, itching and inflammation.
Skin contact may cause harmful effects in other parts of the body.

Eye contact:

Contact may cause pain and severe reddening and inflammation of the conjunctiva.
Effects may become more serious with repeated or prolonged contact.

Carcinogenic Evaluation:

Product information:

Name	IARC Carcinogens:	NTP Carcinogens:	ACGIH - Carcinogens:	OSHA - Select Carcinogens:
Marathon Regular Unleaded Gasoline 86290-81-5	A2 - Possible Human Carcinogen		A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans	

Notes:

The International Agency for Research on Cancer (IARC) has determined that there is inadequate evidence for the carcinogenicity of gasoline in humans. IARC determined that limited evidence of carcinogenicity in animals exists. IARC's overall evaluation of gasoline, in spite of limited carcinogenicity evidence, has resulted in the IARC designation of gasoline as possibly carcinogenic to humans (Group 2B) because gasoline contains benzene.

IARC has determined that there is inadequate evidence for the carcinogenicity of gasoline engine exhaust in humans or animals. However, IARC's overall evaluation on gasoline engine exhaust, in spite of the absence of carcinogenicity data, has resulted in the IARC designation of gasoline engine exhaust as possibly carcinogenic to humans (Group 2B) because of the presence of certain engine exhaust components.

Component Information:

Name	IARC Carcinogens:	NTP Carcinogens:	ACGIH - Carcinogens:	OSHA - Select Carcinogens:
Toluene 108-88-3		male rat-no evidence; female rat-no evidence; male mice-no evidence; female mice-no evidence	A4 - Not Classifiable as a Human Carcinogen	
Xylene 1330-20-7		male rat-no evidence; female rat-no evidence; male mice-no evidence; female mice-no evidence	A4 - Not Classifiable as a Human Carcinogen	
Benzene 71-43-2	Supplement 7 [1987], Monograph 29 [1982]	Known Human Carcinogen male rat-clear evidence; female rat-clear evidence; male mice-clear evidence; female mice-clear evidence	A1 - Confirmed Human Carcinogen	Present
Ethyl Benzene 100-41-4	Monograph 77 [2000]	male rat-clear evidence; female rat-some evidence; male mice-some evidence; female mice-some evidence	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans	Present
Naphthalene 91-20-3	Monograph 82 [2002]	Reasonably Anticipated To Be A Human Carcinogen male rat-clear evidence; female rat-clear evidence; male mice-no evidence; female mice-some evidence	A4 - Not Classifiable as a Human Carcinogen	Present

Notes:

The International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), and OSHA have determined that there is sufficient evidence for the carcinogenicity of benzene in humans (Group 1A).

The International Agency for Research on Cancer (IARC) has determined that there is sufficient evidence for the carcinogenicity of alcoholic beverages (ethanol) in humans (Group 1).

The International Agency for Research on Cancer (IARC) has concluded that ethyl benzene is possibly carcinogenic to humans (Group 2B).

The International Agency for Research on Cancer (IARC) and the Environmental Protection Agency (EPA) have determined that naphthalene is a possible human carcinogen.

4. FIRST AID MEASURES

Eye Contact:

Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. GET IMMEDIATE MEDICAL ATTENTION.

Skin Contact:

Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes. Get medical attention if irritation persists. Place contaminated clothing in closed container until cleaned or discarded. If clothing is to be laundered, inform the person performing the operation of contaminant's hazardous properties.

Ingestion:

Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips to prevent aspiration and monitor for breathing difficulty. Never give anything by mouth to an unconscious person. Keep affected person warm and at rest.
GET IMMEDIATE MEDICAL ATTENTION.

Inhalation:

Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear and give oxygen. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Keep affected person warm and at rest.
GET IMMEDIATE MEDICAL ATTENTION.

NOTES TO PHYSICIAN:

INHALATION: This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

INGESTION: If ingested this material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

Medical Conditions Aggravated By Exposure:

blood (anemia), bone marrow,
blood-forming organs, skin, respiratory system, lungs, liver, kidney,

5. FIRE FIGHTING MEASURES

Suitable extinguishing media:

For small fires, Class B fire extinguishing media such as CO₂, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFF/ATC) can be used. Fire fighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

5. FIRE FIGHTING MEASURES

Specific hazards:

This product has been determined to be a flammable liquid per the OSHA Hazard Communication Standard, and should be handled accordingly. Vapors may travel along the ground or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information, see NFPA 30 or the North American Emergency Response Guide 128.

Special protective equipment for firefighters:

Avoid using straight water streams. Water may be ineffective in extinguishing low flash point fires, but can be used to cool exposed surfaces. Avoid excessive water spray application. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Keep run-off water out of sewers and water sources.

Flash point:

-50 F

Autoignition temperature:

CA 495 F

Flammable limits in air - lower (%):

1.4

Flammable limits in air - upper (%):

7.6

NFPA rating:

Health: 1

Flammability: 3

Instability: 0

Other: -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:

Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources. Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate. Contain liquid with sand or soil. Recover and return free product to proper containers. Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids.

7. HANDLING AND STORAGE

Handling:

Comply with all applicable EPA, OSHA, NFPA and consistent state and local requirements. Use appropriate grounding and bonding practices. Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Do not cut, drill, grind or weld on empty containers since they may contain explosive residues. Avoid skin contact. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

For use as a motor fuel only. Product should never be used as a solvent due to its flammable and potentially toxic properties. Siphoning by mouth can result in lung aspiration which can be harmful or fatal.

Portable containers of 12 gallons (45 liters) or less should never be filled while they are in or on a motor vehicle or marine craft. Static electric discharge can ignite fuel vapors when filling non-grounded containers or vehicles on trailers. Containers should be placed on the ground. The nozzle spout must be kept in contact with the container before and during the entire filling operation. Use only approved containers. A buildup of static electricity can occur upon re-entry into a vehicle during fueling especially in cold or dry climate conditions. The charge is generated by the action of dissimilar fabrics (i.e., clothing and upholstery) rubbing across each other as a person enters/exits the vehicle. A flash fire can result from this discharge if sufficient flammable vapors are present. Therefore, do not get back in your vehicle while refueling. Cellular phones and other electronic devices may have the potential to emit electrical charges (sparks). Sparks in potentially explosive atmospheres (including fueling areas such as gas stations) could cause an explosion if sufficient flammable vapors are present. Therefore, turn off cellular phones and other electronic devices when working in potentially explosive atmospheres or keep devices inside your vehicle during refueling.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

Engineering measures:	Local or general exhaust required in an enclosed area or when there is inadequate ventilation.
Respiratory protection:	Approved organic vapor chemical cartridge or supplied air respirators should be worn for exposures to any components exceeding the TWA or STEL. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 1910.134. Self-contained breathing apparatus should be used for fire fighting.
Skin and body protection:	Use nitrile rubber, viton or PVA gloves for repeated or prolonged skin exposure.
Eye protection:	No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields.
Hygiene measures:	No special protective clothing is normally required. Select protective clothing depending on industrial operations. Use mechanical ventilation equipment that is explosion-proof.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Appearance:	Clear Or Colored Liquid
Physical state (Solid/Liquid/Gas):	Liquid
Substance type (Pure/Mixture):	Mixture
Color:	Clear or Colored
Odor:	Strong Hydrocarbon
Molecular weight:	100
pH:	Neutral
Boiling point/range (5-95%):	90-437 F
Melting point/range:	Not determined.
Decomposition temperature:	Not applicable.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Specific gravity:	0.70-0.77
Density:	5.9-6.3 lbs/gal
Bulk density:	No data available.
Vapor density:	3-4
Vapor pressure:	Not determined.
Evaporation rate:	No data available.
Solubility:	Negligible
Solubility in other solvents:	No data available.
Partition coefficient (n-octanol/water):	2.13-4.5
VOC content(%):	100%
Viscosity:	No data available.

10. STABILITY AND REACTIVITY

Stability:	The material is stable at 70 F, 760 mm pressure.
Polymerization:	Will not occur.
Hazardous decomposition products:	Combustion produces carbon monoxide, aldehydes, aromatic and other hydrocarbons.
Materials to avoid:	Strong oxidizers such as nitrates, chlorates, peroxides.
Conditions to avoid:	Excessive heat, sources of ignition, open flame.

11. TOXICOLOGICAL INFORMATION

Acute toxicity:

Product information:

Name	CAS Number	Inhalation:	Dermal:	Oral:
Marathon Regular Unleaded Gasoline	86290-81-5	>10,000 ppm [Dog]	>5 ml/kg [Rabbit]	>14 ml/kg [Rat]

Toxicology Information:

BENZENE: Studies of Workers Overexposed to Benzene: Studies of workers exposed to benzene show clear evidence that overexposure can cause cancer and other diseases of the blood forming organs including Acute Myelogenous Leukemia (AML), and Aplastic Anemia (AA), an often fatal disease. Some studies suggest overexposure to benzene may also be associated with Myelodysplastic Syndrome (MDS). Findings from a Case-Control study of workers exposed to benzene was reported during the 2009 Benzene Symposium in Munich included an increase in Acute Myeloid Leukemias and Non-Hodgkins Lymphoid Neoplasms (NHLN) of the subtype follicular lymphoma (FL) in some occupational categories. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of AA have been reported in the offspring of persons severely overexposed to benzene. Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and minor skeletal variations. Benzene has been classified as a proven human carcinogen by OSHA and a Group 1 (Carcinogenic to Humans) material by IARC.

The current proposed IARC classification for benzene is summarized as follows: Sufficient evidence for Acute Myeloid Leukemia; limited evidence for Acute Lymphatic Leukemia, Chronic Lymphatic Leukemia, Non-Hodgkin Lymphoma, and Multiple Myeloma.

NAPHTHAS: In a large epidemiological study on over 15,000 employees at several petroleum refineries and amongst residents located near these refineries, no increased risk of kidney cancer was observed in association with gasoline exposures (a similar material). In a similar study, no increased risk of kidney cancer was observed among petroleum refinery workers, but there was a slight trend in the incidence of kidney cancers among service station employees, especially after a 30-year latency period.

ISOPARAFFINS: Studies in laboratory animals have shown that long-term exposure to similar materials (isoparaffins) can cause kidney damage and kidney cancer in male laboratory rats. However, in-depth research indicates that these findings are unique to the male rat, and that these effects are not relevant to humans.

TOLUENE: Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Abuse of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system, and can cause CNS depression, cardiac arrhythmias, and death. Studies of workers indicate longterm exposure may be related to impaired color vision and hearing. Some studies of workers suggest longterm exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest longterm exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals have been largely negative. Positive findings include small increases in minor

skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Adverse effects on the liver, kidney, thymus and nervous system were observed in animal studies following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

ETHYLBENZENE: Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). The incidence of tumors was also elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals have demonstrated evidence of ototoxicity (hearing loss) following exposure levels as low as 300 ppm for 5 days. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

XYLENES, ALL ISOMERS: Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross overexposure. Effects from Prolonged or Repeated Exposure: Impaired neurological function was reported in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure. The relevance of these observations to humans is not clear at this time. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

C9 AROMATIC HYDROCARBONS: A developmental inhalation study was conducted in laboratory mice. Increased implantation losses, reduced fetal weights, delayed ossification and an increased incidence of cleft palate were observed at the highest exposure level (1,500 ppm). This exposure level was extremely toxic to pregnant female mice (44% mortality). Reduced fetal body weights were also observed at 500 ppm. A multi-generation reproduction inhalation study was conducted in laboratory rats. Reductions in pup weights, pup weight gain, litter size, and pup survival were observed at 1,500 ppm, an exposure level at which significant maternal toxicity was observed. Reduced pup weight gain was also observed at 500 ppm.

NAPHTHALENE: Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from overexposure to naphthalene. Persons with Glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have been reported in persons overexposed to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect. Hemolytic anemia has been observed in laboratory animals exposed to

naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) in vitro. Naphthalene has been classified as Possibly Carcinogenic to Humans (2B) by IARC, based on findings from studies in laboratory animals.

N-HEXANE: Long-term or repeated exposure to n-hexane can cause peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. Testicular atrophy and partial to full loss of the germ cell line were observed in sub-chronic high-dose inhalation studies of laboratory rodents. These effects appeared irreversible. Rodent reproduction studies have shown evidence of reduced fetal weight but no frank malformations.

PENTANES: Studies of pentane isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol.%) may induce cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

CARBON MONOXIDE: is a chemical asphyxiant with no warning properties (such as odor). At 400-500 ppm for 1 hour headache and dyspnea may occur. If activity is increased, symptoms of overexposure may include nausea, irritability, increased respiration, tinnitus, sweating, chest pain, confusion, impaired judgement, dizziness, weakness, drowsiness, ataxia, irregular heart beat, cyanosis and pallor. Levels in excess of 1000 ppm can result in collapse, loss of consciousness, respiratory failure and death. Extremely high concentrations (12,800 ppm) can cause immediate unconsciousness and death in 1-3 minutes. Repeated anoxia can lead to central nervous system damage and peripheral neuropathy, with loss of sensation in the fingers, amnesia, and mental deterioration and possible congestive heart failure. Damage may also occur to the fetus, lung, liver, kidney, spleen, cardiovascular system and other organs.

COMBUSTION ENGINE EXHAUST: Chronic inhalation studies of gasoline engine exhaust in mice, rats and hamsters did not produce any carcinogenic effects. Condensates/extracts of gasoline engine exhaust produced an increase in tumors compared to controls when testing by skin painting, subcutaneous injection, intratracheal instillation or implantation into the lungs.

Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffers Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline.

TARGET ORGANS:

central nervous system, brain, peripheral nervous system, auditory system, respiratory system, mucous membranes, lungs, skin, eyes, heart, blood-forming organs, bone marrow, reproductive organs, testes, immune system, lymphatics, thymus, thyroid, pituitary gland,

12. ECOTOXICOLOGICAL INFORMATION

Mobility:

May partition into air, soil and water.

Ecotoxicity:

Toxic to aquatic organisms.

Bioaccumulation:

Not expected to bioaccumulate in aquatic organisms.

Persistence/Biodegradation:

Readily biodegradable in the environment.

13. DISPOSAL CONSIDERATIONS

Cleanup Considerations:

This product as produced is not specifically listed as an EPA RCRA hazardous waste according to federal regulations (40 CFR 261). However, when discarded or disposed of, it may meet the criteria of an "characteristic" hazardous waste. This product could also contain benzene at >0.5 ppm and could exhibit the characteristics of "toxicity" as determined by the toxicity characteristic leaching procedure (TCLP). This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). It is the responsibility of the user to determine if disposal material is hazardous according to federal, state and local regulations.

14. TRANSPORT INFORMATION

49 CFR 172.101:**DOT:**

Transport Information:	This material when transported via US commerce would be regulated by DOT Regulations.	
Proper shipping name:	Gasoline	
UN/Identification No:	UN 1203	
Hazard Class:	3	
Packing group:	II	
DOT reportable quantity (lbs):	Not applicable.	

Proper shipping name:	Gasoline
UN/Identification No:	UN 1203
Hazard Class:	3
Packing group:	II

15. REGULATORY INFORMATION

US Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b):

This product and/or its components are listed on the TSCA Chemical Inventory.

OSHA Hazard Communication Standard:

This product has been evaluated and determined to be hazardous as defined in OSHA's Hazard Communication Standard.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302:

This product contains the following component(s) that have been listed on EPA's Extremely Hazardous Substance (EHS) List:

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
Saturated Hydrocarbons	NA
Aromatic Hydrocarbons	NA
Unsaturated Hydrocarbons	NA
Toluene	NA
Xylene	NA
1,2,4-Trimethylbenzene	NA
Benzene	NA
Hexane	NA
Ethyl Benzene	NA
Naphthalene	NA

SARA Section 304:

This product contains the following component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	CERCLA/SARA - Hazardous Substances and their Reportable Quantities
Saturated Hydrocarbons	NA
Aromatic Hydrocarbons	NA
Unsaturated Hydrocarbons	NA
Toluene	= 454 kg final RQ
Xylene	= 100 lb final RQ = 45.4 kg final RQ
1,2,4-Trimethylbenzene	NA
Benzene	= 10 lb final RQ = 4.54 kg final RQ
Hexane	= 2270 kg final RQ = 5000 lb final RQ
Ethyl Benzene	= 1000 lb final RQ = 454 kg final RQ
Naphthalene	= 100 lb final RQ = 45.4 kg final RQ

SARA Section 311/312

The following EPA hazard categories apply to this product:

Acute Health Hazard
Chronic Health Hazard
Fire Hazard

SARA Section 313:

This product contains the following component(s) that may be subject to reporting on the Toxic Release Inventory (TRI) From R:

Name	CERCLA/SARA 313 Emission reporting:
Saturated Hydrocarbons	None
Aromatic Hydrocarbons	None
Unsaturated Hydrocarbons	None

Name	CERCLA/SARA 313 Emission reporting:
Toluene	= 1.0 % de minimis concentration
Xylene	= 1.0 % de minimis concentration
1,2,4-Trimethylbenzene	= 1.0 % de minimis concentration
Benzene	= 0.1 % de minimis concentration
Hexane	= 1.0 % de minimis concentration
Ethyl Benzene	= 0.1 % de minimis concentration
Naphthalene	= 0.1 % de minimis concentration

State and Community Right-To-Know Regulations:

The following component(s) of this material are identified on the regulatory lists below:

Saturated Hydrocarbons

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Aromatic Hydrocarbons

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Unsaturated Hydrocarbons

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed

Saturated Hydrocarbons

New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Toluene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	developmental toxicity, initial date 1/1/91
New Jersey Right-To-Know:	sn 1866
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan critical materials register list:	= 100 lb Annual usage threshold
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	flammable - third degree; teratogen
New Jersey - Environmental Hazardous Substances List:	SN 1866 TPQ 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	= 1 lb RQ land/water = 1000 lb RQ air

Xylene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	sn 2014
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan critical materials register list:	= 100 lb Annual usage threshold all isomers
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	flammable - third degree

Saturated Hydrocarbons

New Jersey - Environmental Hazardous Substances List: SN 2014 TPQ 500 lb
Illinois - Toxic Air Contaminants Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances: = 1 lb RQ land/water
= 1000 lb RQ air

1,2,4-Trimethylbenzene

Louisiana Right-To-Know: Not Listed
California Proposition 65: Not Listed
New Jersey Right-To-Know: sn 2716
Pennsylvania Right-To-Know: Environmental hazard
Massachusetts Right-To-Know: Present
Florida substance List: Not Listed.
Rhode Island Right-To-Know: Toxic
Michigan critical materials register list: Not Listed.
Massachusetts Extraordinarily Hazardous Substances: Not Listed
California - Regulated Carcinogens: Not Listed
Pennsylvania RTK - Special Hazardous Substances: Not Listed
New Jersey - Special Hazardous Substances: Not Listed
New Jersey - Environmental Hazardous Substances List: SN 2716 TPQ 500 lb
Illinois - Toxic Air Contaminants Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances: Not Listed

Benzene

Louisiana Right-To-Know: Not Listed
California Proposition 65: carcinogen, initial date 2/27/87
developmental toxicity, initial date 12/26/97
male reproductive toxicity, initial date 12/26/97
New Jersey Right-To-Know: sn 0197
Pennsylvania Right-To-Know: Environmental hazard; Special hazardous substance
Massachusetts Right-To-Know: Carcinogen; Extraordinarily hazardous
Florida substance List: Not Listed.
Rhode Island Right-To-Know: Toxic (skin); Flammable (skin); Carcinogen (skin)
Michigan critical materials register list: = 100 lb Annual usage threshold
Massachusetts Extraordinarily Hazardous Substances: carcinogen; extraordinarily hazardous
California - Regulated Carcinogens: Not Listed
Pennsylvania RTK - Special Hazardous Substances: Present
New Jersey - Special Hazardous Substances: carcinogen; flammable - third degree; mutagen; teratogen
New Jersey - Environmental Hazardous Substances List: SN 0197 TPQ 500 lb
Illinois - Toxic Air Contaminants Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances: = 1 lb RQ land/water
= 10 lb RQ air

Hexane

Louisiana Right-To-Know: Not Listed
California Proposition 65: Not Listed
New Jersey Right-To-Know: sn 1340
Pennsylvania Right-To-Know: Present
Massachusetts Right-To-Know: Present

Saturated Hydrocarbons

Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 1340 TPQ 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	= 1 lb RQ air = 1 lb RQ land/water

Ethyl Benzene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	carcinogen, initial date 6/11/04
New Jersey Right-To-Know:	sn 0851
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	carcinogen; flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 0851 TPQ 500 lb
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	= 1 lb RQ land/water = 1000 lb RQ air

Naphthalene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	carcinogen, initial date 4/19/02
New Jersey Right-To-Know:	sn 1322
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida substance List:	Not Listed.
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan critical materials register list:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	carcinogen

Saturated Hydrocarbons

New Jersey - Environmental Hazardous Substances List:

Illinois - Toxic Air Contaminants

New York - Reporting of Releases Part 597 - List of Hazardous Substances:

SN 1322 TPQ 500 lb

Present

= 1 lb RQ land/water

= 100 lb RQ air

Canadian Regulatory Information:

Canada DSL/NDSL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Name	Canada - WHMIS: Classifications of Substances:	Canada - WHMIS: Ingredient Disclosure:
Toluene	B2, D2A, D2B	1 %
Xylene	B2, D2A, D2B	
1,2,4-Trimethylbenzene	B3	0.1 %
Benzene	B2, D2A, D2B	0.1 %
Hexane	B2, D2A	1 %
Ethyl Benzene	B2, D2A, D2B	0.1 %
Naphthalene	B4, D2A	1 %

NOTE: Not Applicable.

16. OTHER INFORMATION

Additional Information: No data available.

Prepared by: Mark S. Swanson, Manager, Toxicology and Product Safety

The information and recommendations contained herein are based upon tests believed to be reliable. However, Marathon Petroleum Company LP (MPC) does not guarantee their accuracy or completeness nor shall any of this information constitute a warranty, whether expressed or implied, as to the safety of the goods, the merchantability of the goods, or the fitness of the goods for a particular purpose. Adjustment to conform to actual conditions of usage maybe required. MPC assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied.

End of Safety Data Sheet

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All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from us.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken.

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Safety Data Sheet



SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

Chevron Supreme Motor Oil SAE 5W-20, 5W-30, 10W-30

Product Use: Automotive Engine Oil
Product Number(s): 220013, 220135, 220155

Company Identification
Chevron Products Company
a division of Chevron U.S.A. Inc.
6001 Bollinger Canyon Rd.
San Ramon, CA 94583
United States of America
www.chevronlubricants.com

Transportation Emergency Response
CHEMTREC: (800) 424-9300 or (703) 527-3887

Health Emergency
Chevron Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623

Product Information
email : lubemsds@chevron.com
Product Information: 1 (800) 582-3835, LUBETEK@chevron.com

SECTION 2 HAZARDS IDENTIFICATION

CLASSIFICATION: Not classified as hazardous according to 29 CFR 1910.1200 (2012).

SECTION 3 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
Highly refined mineral oil (C15 - C50)	Mixture	70 - 99 %wt/wt

SECTION 4 FIRST AID MEASURES

Description of first aid measures
Eye: No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.

Skin: No specific first aid measures are required. As a precaution, remove clothing and shoes if contaminated. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

Ingestion: No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.

Inhalation: No specific first aid measures are required. If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.

Most important symptoms and effects, both acute and delayed

IMMEDIATE SYMPTOMS AND HEALTH EFFECTS

Eye: Not expected to cause prolonged or significant eye irritation.

Skin: Contact with the skin is not expected to cause prolonged or significant irritation. Contact with the skin is not expected to cause an allergic skin response. Not expected to be harmful to internal organs if absorbed through the skin.

Ingestion: Not expected to be harmful if swallowed.

Inhalation: Not expected to be harmful if inhaled. Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory irritation may include coughing and difficulty breathing.

DELAYED OR OTHER SYMPTOMS AND HEALTH EFFECTS: Not classified.

Indication of any immediate medical attention and special treatment needed

Not applicable.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

PROTECTION OF FIRE FIGHTERS:

Fire Fighting Instructions: This material will burn although it is not easily ignited. See Section 7 for proper handling and storage. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.

Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

Reporting: Report spills to local authorities as appropriate or required.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: Do not get in eyes, on skin, or on clothing. Keep out of the reach of children. Wash thoroughly after handling.

General Handling Information: Avoid contaminating soil or releasing this material into sewage and

drainage systems and bodies of water.

Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:

Use in a well-ventilated area.

PERSONAL PROTECTIVE EQUIPMENT

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: 4H (PE/EVAL), Nitrile Rubber, Silver Shield, Viton.

Respiratory Protection: No respiratory protection is normally required.

If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Occupational Exposure Limits:

Component	Agency	TWA	STEL	Ceiling	Notation
Highly refined mineral oil (C15 - C50)	ACGIH	5 mg/m3	10 mg/m3	--	--
Highly refined mineral oil (C15 - C50)	ACGIH	5 mg/m3	10 mg/m3	--	--
Highly refined mineral oil (C15 - C50)	OSHA Z-1	5 mg/m3	--	--	--
Highly refined mineral oil (C15 - C50)	OSHA Z-1	5 mg/m3	--	--	--

C50)

Consult local authorities for appropriate values.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Amber

Physical State: Liquid

Odor: Petroleum odor

Odor Threshold: No data available

pH: Not Applicable

Vapor Pressure: <0.01 mmHg @ 37.8 °C (100 °F)

Vapor Density (Air = 1): >1

Initial Boiling Point: 315°C (599°F)

Solubility: Soluble in hydrocarbons; insoluble in water

Freezing Point: Not Applicable

Specific Gravity: 1 @ 15.6°C (60.1°F) / 15.6°C (60.1°F) (Approximate)

Density: 0.8599 kg/l @ 15°C (59°F) (Typical)

Viscosity: 9.6 mm²/s @ 100°C (212°F) (Min)

Evaporation Rate: No data available

Decomposition temperature: No Data Available

Octanol/Water Partition Coefficient: No data available

FLAMMABLE PROPERTIES:

Flammability (solid, gas): No Data Available

Flashpoint: (Cleveland Open Cup) 200 °C (392 °F) Minimum

Autoignition: No data available

Flammability (Explosive) Limits (% by volume in air): Lower: Not Applicable Upper: Not Applicable

SECTION 10 STABILITY AND REACTIVITY

Reactivity: This material is not expected to react.

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Incompatibility With Other Materials: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

Hazardous Decomposition Products: None known (None expected)

Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Serious Eye Damage/Irritation: The eye irritation hazard is based on evaluation of data for product components.

Skin Corrosion/Irritation: The skin irritation hazard is based on evaluation of data for product components.

Skin Sensitization: The skin sensitization hazard is based on evaluation of data for product components.

Acute Dermal Toxicity: The acute dermal toxicity hazard is based on evaluation of data for product components.

Acute Oral Toxicity: The acute oral toxicity hazard is based on evaluation of data for product components.

Acute Inhalation Toxicity: The acute inhalation toxicity hazard is based on evaluation of data for product components.

Acute Toxicity Estimate: Not Determined

Germ Cell Mutagenicity: The hazard evaluation is based on data for components or a similar material.

Carcinogenicity: The hazard evaluation is based on data for components or a similar material.

Reproductive Toxicity: The hazard evaluation is based on data for components or a similar material.

Specific Target Organ Toxicity - Single Exposure: The hazard evaluation is based on data for components or a similar material.

Specific Target Organ Toxicity - Repeated Exposure: The hazard evaluation is based on data for components or a similar material.

ADDITIONAL TOXICOLOGY INFORMATION:

This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, severe hydrocracking, or severe hydrotreating. None of the oils requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as; carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B). These oils have not been classified by the American Conference of Governmental Industrial Hygienists (ACGIH) as: confirmed human carcinogen (A1), suspected human carcinogen (A2), or confirmed animal carcinogen with unknown relevance to humans (A3).

During use in engines, contamination of oil with low levels of cancer-causing combustion products occurs. Used motor oils have been shown to cause skin cancer in mice following repeated application and continuous exposure. Brief or intermittent skin contact with used motor oil is not expected to have serious effects in humans if the oil is thoroughly removed by washing with soap and water.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY

This material is not expected to be harmful to aquatic organisms. The ecotoxicity hazard is based on an evaluation of data for the components or a similar material. The product has not been tested. The statement has been derived from the properties of the individual components.

MOBILITY

No data available.

PERSISTENCE AND DEGRADABILITY

This material is not expected to be readily biodegradable. The biodegradability of this material is based on an evaluation of data for the components or a similar material. The product has not been tested. The statement has been derived from the properties of the individual components.

POTENTIAL TO BIOACCUMULATE

Bioconcentration Factor: No data available.

Octanol/Water Partition Coefficient: No data available

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT Shipping Description: PETROLEUM LUBRICATING OIL, NOT REGULATED AS A HAZARDOUS MATERIAL FOR TRANSPORTATION UNDER 49 CFR

IMO/IMDG Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER THE IMDG CODE

ICAO/IATA Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER ICAO TI OR IATA DGR

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code:
Not applicable

SECTION 15 REGULATORY INFORMATION

EPCRA 311/312 CATEGORIES:	1. Immediate (Acute) Health Effects:	NO
	2. Delayed (Chronic) Health Effects:	NO
	3. Fire Hazard:	NO
	4. Sudden Release of Pressure Hazard:	NO
	5. Reactivity Hazard:	NO

REGULATORY LISTS SEARCHED:

01-1=IARC Group 1	03=EPCRA 313
01-2A=IARC Group 2A	04=CA Proposition 65
01-2B=IARC Group 2B	05=MA RTK
02=NTP Carcinogen	06=NJ RTK
	07=PA RTK

No components of this material were found on the regulatory lists above.

CHEMICAL INVENTORIES:

All components comply with the following chemical inventory requirements: AICS (Australia), DSL (Canada), KECI (Korea), PICCS (Philippines), TSCA (United States).
One or more components is listed on ELINCS (European Union). Secondary notification by the importer may be required. All other components are listed or exempted from listing on EINECS.

One or more components does not comply with the following chemical inventory requirements: ENCS (Japan).

NEW JERSEY RTK CLASSIFICATION:

Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows: PETROLEUM OIL (Motor oil)

SECTION 16 OTHER INFORMATION

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

HMIS RATINGS: Health: 0 Flammability: 1 Reactivity: 0 (0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

LABEL RECOMMENDATION:

Label Category : ENGINE OIL 1 - ENG1

REVISION STATEMENT: This revision updates the following sections of this Safety Data Sheet: 8,16
Revision Date: JULY 07, 2014

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
GHS - Globally Harmonized System	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Governmental Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	SDS - Safety Data Sheet
HMIS - Hazardous Materials Information System	NFPA - National Fire Protection Association (USA)
DOT - Department of Transportation (USA)	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration
NCEL - New Chemical Exposure Limit	EPA - Environmental Protection Agency
SCBA - Self-Contained Breathing Apparatus	

Prepared according to the 29 CFR 1910.1200 (2012) by Chevron Energy Technology Company, 6001 Bollinger Canyon Road San Ramon, CA 94583.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.



MATERIAL SAFETY DATA SHEET

#1700, 407 2ND STREET S.W., CALGARY, ALBERTA T2P 2Y3
TELEPHONE: (403) 269-2242 FAX: (403) 269-2251
1-613-996-6666 – CANUTEC – Transportation Emergency

BENTONITE

SECTION I: IDENTIFICATION OF PRODUCT

Proper Shipping Name: BENTONITE
Product Name: BENTONITE
Chemical Family: Montmorillonite
WHMIS Classification: D2A
Workplace Hazard: Potential carcinogen, contains free silica.

Product Use: Drilling Fluid Additive
TDG Classification: Not regulated
Packaging Group: Not applicable
PIN: Not applicable
CAS #: 1302-78-9

SECTION II: HAZARDOUS INGREDIENTS

Ingredients	Percent	CAS Number	LD ₅₀ (Species/Route)	LC ₅₀ (Species/Route)
Crystalline Silica; Quartz	1-5 or 5-10*	14808-60-7	Not available	Not available

* The typical quartz content of western bentonite is between 2 and 6%

SECTION III: TOXICOLOGICAL PROPERTIES

Route of entry: Skin Eye Contact Inhalation Ingestion

Effects of acute exposure: Mechanical irritant to the eyes. Possible drying of skin resulting in dermatitis. May cause irritation to the upper respiratory tract.

Effects of chronic exposure: This product contains crystalline silica. Breathing silica containing dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Chronic inhalation may cause silicosis, a progressive, disabling and sometimes fatal lung disease. Chronic inhalation exposure to crystalline silica quartz has been observed to cause lymph node effects, kidney effects and auto-immune disease.

Exposure limits:
ACGIH-TLV 0.025 mg/m³ respirable

Irritancy of product: Mechanical irritant to the eyes. May cause irritation to the upper respiratory tract.

Sensitization to product: Not available

Carcinogenicity: Bentonite is not listed by ACGIH, IARC, NTP or OSHA. Crystalline silica, when inhaled from occupational sources, is considered as a human carcinogen by IARC (Class 1) and by NTP. ACGIH classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

Reproductive toxicity: No information available

Tetratogenicity: No information available

Mutagenicity: Crystalline silica has been shown to cause mutagenic effects in human cells in-vitro.

Name of toxicological synergistic products: No information available



SECTION IV: FIRST AID MEASURES

Skin contact: If irritation occurs, or when shift ends, wash with soap and water until clean.

Eye contact: Flush with gently flowing warm water until particles are removed. If irritation persists, contact a physician.

Inhalation: Move to area free from dust. If symptoms or irritation persist contact physician. Inhalation may aggravate existing respiratory illness.

Ingestion: No first aid required; material is non-toxic.

SECTION V: PHYSICAL DATA

Physical state: Solid

Appearance and odour: Light tan to grey powder; no odour

Odour threshold: Not applicable

Specific gravity (°C): 2.45 – 2.55

Vapor pressure (mmHG): Not applicable

Vapor density (Air=1): Not applicable

Evaporation rate: Not applicable

Boiling point (°C): Not applicable

Melting point (°C): ~1450

pH (%): 8.0 – 10.0 (5% aqueous suspension)

Solubility in Water: Insoluble



SECTION VI: FIRE AND EXPLOSION DATA

Conditions of flammability: Not flammable

Means of extinguishing: Use media suitable for surrounding materials and packaging.

Flash point: Not applicable

Upper flammable limit: Not applicable

Lower flammable limit: Not applicable

Auto-ignition temperature: Not applicable

Hazardous combustion products: Not known

Explosion data-sensitivity to mechanical impact: Not applicable

Explosion data-sensitivity to static discharge: Not applicable

SECTION VII: REACTIVITY DATA

Chemically unstable (conditions): Stable

Product incompatible with: None known

Conditions of reactivity: None known

Hazardous decomposition products: None know



SECTION VIII: PREVENTATIVE MEASURES

Personal protective equipment: NIOSH/MESA approved respirators for silica bearing dust. Safety glasses or goggles recommended.

Specific Engineering Controls: Use local exhaust ventilation, process enclosure or other engineering controls to maintain concentration of airborne dust below TLV.

Procedures for leak/spills: Wear an approved respirator. Vacuum if possible to avoid generating airborne dust. Collect uncontaminated material for repackaging. Collect contaminated material in an approved container for disposal. Avoid adding water; the product will become slippery when wet.

Waste disposal: Dispose in accordance with federal, provincial and local regulations. It is the responsibility of the end-user to determine if material meets the criteria of hazardous waste at the time of disposal. Empty packaging must be disposed of, or recycled, in accordance with local regulations.

Handling procedures and equipment: Avoid creating dust. Avoid breathing dust; wear an approved respirator. Practice reasonable caution and personal cleanliness. Avoid eye contact.

Storage requirements: Store in cool, dry area. Empty packages contain residual hazardous material and should be handled as if full.

Special shipping information: Not applicable

SECTION IX: PREPARATION

Date updated: January 14, 2014

Prepared by: Product Safety Committee

All the recommendations and suggestions herein concerning this product are based upon tests and data believed to be reliable, however it is the user's responsibility to determine the safety, toxicity and sustainability for their own use of the product described herein. Since the actual use by others is beyond our control, no guarantee, expressed or implied, is made by Q'Max Solutions Inc. as to the effects of such use, the results to be obtained, or the safety and toxicity of the product nor does Q'Max Solutions Inc. assume any liability arising out of use by others. Nor is the information herein to be considered as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations.

ULTIMATE DATA

PORTLAND CEMENT

(BS EN 197: CEM I) **Health and Safety Information**

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

1.1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION

An odourless white to grey powder mainly insoluble in water. When water is added it becomes a binder for construction applications. This datasheet applies to the following cements:

- PC-RM
- PC-CP
- PC
- Ferrocrete
- Snowcrete (CEM I)
- Procem
- Microcem

1.2 Use of the substance/preparation

Common cement is used as a hydraulic binder for the production of concrete, mortars, grouts, etc.

1.3 Company identification

Lafarge Tarmac Cement
Portland House
Bickenhill Lane, Birmingham B37 7BQ
Technical helpdesk: 0845 812 6232
Email: info-cement@lafargetarmac.com

1.4 Emergency telephone

Emergency telephone number available during office hours:
Tel 0845 812 6232

Emergency telephone number available outside office hours: No

2. HAZARD IDENTIFICATION

When cement reacts with water, for instance when making concrete or mortar, or when the cement becomes damp, a strong alkaline solution is produced.

2.1 Hazard characterisation

R37/38 Irritating to respiratory system and skin
R41 Risk of serious damage to eyes
R43 May cause sensitisation by skin contact

2.2 Primary route(s) of entry

Inhalation: Yes

Skin - eyes: Yes

Ingestion: No, except in accidental cases



IRRITANT

2.3 Human health

Inhalation: Frequent inhalation of large quantities of cement dust over a long period of time increases the risk of developing lung diseases.

Eyes: Eye contact with cement (dry or wet) may cause serious and potentially irreversible injuries.

Skin: Cement may have an irritating effect on moist skin (due to transpiration or humidity) after prolonged contact. Prolonged skin contact with wet cement or fresh concrete may cause serious burns because they develop without pain being felt (for example when kneeling in fresh concrete even when wearing trousers). Repeated skin contact with wet cement may cause contact dermatitis. For more details see Reference (1).

2.4 Environment

Under normal use, the product is not expected to be hazardous to the environment.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Chemical composition

Common cement types according to the EN 197-1 (Common cements) and EN 197-4 (Blast furnace cements) standards. The principal constituents of these cements are calcium silicates, aluminates, ferro-aluminates and sulfates. Small amounts of alkalis, lime, magnesia and chlorides are also present together with trace amounts of chromium compounds. Additional constituents may also be present - eg, fly ash, limestone, clay and granulated blast furnace slag.

3.2 Components presenting a health hazard

Contains less than 1% crystalline silica.

Substance:	Portland Cement Clinker
Concentration range (by weight in cement):	5 – 100%
EINECS:	266-043-4
CAS:	65997-15-1
Symbol (C&L):	 IRRITANT
R:	R37 R38 R41 R43

4. FIRST AID MEASURES

When contacting a physician, take this safety datasheet with you.

4.1 After significant accidental inhalation

Move person to fresh air. Dust in throat and nasal passages should clear spontaneously. Contact a physician if irritation persists or later develops or if discomfort, coughing or other symptoms do not subside.

4.2 After contact with eyes

Do not rub eyes, as additional cornea damage is possible by mechanical stress. Remove any contact lenses and open the eyelid(s) widely to flush eye(s) immediately by thoroughly rinsing with plenty of clean water for at least 45 minutes to remove all particles. If possible, use isotonic water (0.9% NaCl). Contact a specialist of occupational medicine or an eye specialist.

4.3 After skin contact

For dry cement, remove and rinse abundantly with water. For wet cement, wash skin with water. Remove contaminated clothing, footwear, watches, etc. and clean thoroughly before re-using them. Seek medical treatment in all cases of irritation or burns.

4.4 After significant accidental ingestion

Do not induce vomiting. If person is conscious, wash out mouth with water and give plenty of water to drink. Get immediate medical attention or contact anti poison centre.

5. FIRE-FIGHTING MEASURES

5.1 Flashpoint and method

Cements are non-combustible and non-explosive and will not facilitate nor support combustion of other materials.

5.2 Extinguishing media

All types of extinguishing media are suitable.

5.3 Fire fighting equipment

Cement poses no fire-related hazards. No need for specialist protective equipment for fire fighters.

5.4 Combustion products

None.

5.5 Flammable limits: Lower explosion limit LEL – Upper explosion limit UEL

Not applicable.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal protective measures

Wear protective equipment as described under Heading 8 and follow the advice for safe handling and use given under Heading 7. Emergency procedures are not required.

6.2 Environment protection measures

Do not wash cement down sewage and drainage systems or into bodies of water (eg. streams).

6.3 Methods for cleaning up

Recover the spillage in a dry state if possible.

Dry cement: Use dry cleanup methods that do not cause airborne dispersion - eg:

- Vacuum cleaner (Industrial portable units, equipped with high efficiency particulate filters (HEPA filter) or equivalent technique).
- Wipe up the dust by mopping, wet brushing or water sprays or hoses (fine mist to avoid the dust becoming airborne) and remove slurry. If not possible, remove by slurring with water (see Wet cement).

When wet cleaning or vacuum cleaning is not possible and only dry cleaning with brushes can be done, ensure that the workers wear appropriate personal protective equipment and prevent dust from spreading.

Avoid inhalation of cement and contact with skin. Place spilled materials into a container. Solidify before disposal as described under Heading 13.

Wet cement: Clean up wet cement and place in a container. Allow material to dry and solidify before disposal as described under Heading 13.

7. HANDLING AND STORAGE

Do not handle or store near food and beverages or smoking materials.

7.1 Handling

Follow the recommendations as given under Heading 8.

Avoid dust development:

- For (bagged) cement used in open-ended mixers: first add the water and then carefully add the cement. Keep the height of the fall low. Start the mixing smoothly. Do not compress empty bags, except when contained in another clean bag.
- To clean up dry cement, see Heading 6.3.

Carrying cement bags may cause sprains and strains to the back, arms, shoulders and legs. Handle with care and use appropriate control measures.

7.2 Storage

Bulk cement should be stored in silos that are waterproof, dry (internal condensation minimised), clean and protected from contamination.

Engulfment hazard: To prevent burial or suffocation, do not enter a confined space, such as a silo, bin, bulk truck, or other storage container or vessel that stores or contains cement without taking the proper security measures. Cement can build up or adhere to the walls of a confined space. The cement can release, collapse or fall unexpectedly.

Packed product should be stored in unopened bags clear of the ground in cool, dry conditions and protected from excessive draught in order to avoid degradation of quality.

Bags should be stacked in a stable manner.

7.3 Control of soluble Cr (VI)

For product treated with a Cr (VI) reducing agent according to the regulations given in Heading 15, the effectiveness of the reducing agent diminishes with time. Therefore cement bags and/or delivery documents will contain information on the period of time ('shelf life') for which the manufacturer has established that the reducing agent will continue to maintain the level of soluble Cr (VI) below the imposed limit of 0.0002%, according to EN 197-10. They will also indicate the appropriate storage conditions for maintaining the effectiveness of the reducing agent.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Exposure limit values (Workplace Exposure Limits (WEL))

WEL 8hr Time Weighted Average (TWA):

- Total inhalable dust 10mg/m³
- Respirable dust 4mg/m³

8.2 Exposure controls

8.2.1 Occupational exposure controls

General: During work avoid kneeling in fresh mortar or concrete wherever possible. If kneeling is absolutely necessary then appropriate waterproof personal protective equipment must be worn.

Do not eat, drink or smoke when working with cement to avoid contact with skin or mouth. Immediately after working with cement or cement-containing materials, workers should wash or shower or use skin moisturisers. Remove contaminated clothing, footwear, watches, etc. and clean thoroughly before re-using them.

Respiratory protection: When a person is exposed to dust above exposure limits, use appropriate respiratory protection. It should be adapted to the dust level and conform to the relevant EN standard. Suitable respiratory protection should be worn to ensure that personal exposure is less than the WEL.

Eye protection: Wear approved glasses or safety goggles according to EN 166 when handling dry or wet cement to prevent contact with eyes.

Skin protection: Use impervious, abrasion and alkali-resistant gloves (made of low soluble Cr (VI) containing material), internally lined with cotton, boots, closed long-sleeved protective clothing and additionally skin care products (including barrier creams) to protect the skin from prolonged contact with wet cement. Particular care should be taken to ensure that wet cement does not enter the boots. In some circumstances such as when laying concrete or screed, waterproof trousers or kneepads are necessary.

8.2.2 Environmental exposure controls

According to available technology.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 General information

Dry cement is a finely ground inorganic material (odourless, grey or white powder)

9.2 Physical data

Mean particle size: 5-30 µm

Solubility in water (T = 20 °C): slight (0.1-1.5 g/l)

Density: 2.75-3.20 g/cm³

Apparent density (ES): 0.9-1.5 g/cm³

pH (T = 20°C in water): 11-13.5

Boiling/melting point: > 1 250 °C

Vapour pressure, vapour density, evaporation rate, freezing point, viscosity: Not relevant.

10. STABILITY AND REACTIVITY

10.1 Stability

Dry cements are stable as long as they are stored properly (see Heading 7) and compatible with most other building materials. When mixed with water, cements will harden into a stable mass that is not reactive to normal environments.

10.2 Conditions to avoid

Humidity during storage may cause lump formation and loss of product quality.

10.3 Materials to avoid

Uncontrolled use of aluminium powder in wet cement should be avoided as hydrogen produced.

10.4 Hazardous decomposition products

Cements will not decompose into other hazardous by-products and do not polymerise.

11. TOXICOLOGICAL INFORMATION

11.1 Acute effects

Eye contact: Direct contact with cement may cause corneal damage by mechanical stress, immediate or delayed irritation or inflammation. Direct contact by larger amounts of dry cement or splashes of wet cement may cause effects ranging from moderate eye irritation (eg, conjunctivitis or blepharitis) to chemical burns and blindness.

Skin contact: Dry cement in contact with wet skin or exposure to moist or wet cement may cause thickening, cracking or fissuring of the skin. Prolonged contact in combination with abrasion can cause severe burns.

Acute dermal toxicity: Limit test, rabbit, 24 hours contact, 2 000 mg/kg body weight – no lethality [Reference (2)].

Ingestion: Swallowing large quantities may cause irritation to the gastrointestinal tract.

Inhalation: Cement may irritate the throat and respiratory tract. Coughing, sneezing, and shortness of breath may occur following exposures in excess of occupational exposure limits.

11.2 Chronic effects

Inhalation: Chronic exposure to respirable dust in excess of occupational exposure limits may cause coughing, shortness of breath and may cause chronic obstructive lung disease (COPD).

Carcinogenicity: A causal association between cement exposure and cancer has not been established [Reference (1)].

Contact dermatitis/Sensitising effects: Some individuals may exhibit eczema upon exposure to wet cement, caused either by the high pH which induces irritant contact dermatitis, or by an immunological reaction to soluble Cr (VI) which elicits allergic contact dermatitis [Reference (4)]. The response may appear in a variety of forms ranging from a mild rash to severe dermatitis and is a combination of those two mechanisms. An exact diagnosis is often difficult to assess. If the cement contains a soluble Cr (VI) reducing agent and as long as the mentioned period of effectiveness of the chromate reduction is not exceeded, a sensitising effect is not expected [Reference (3)].

11.3 Medical conditions aggravated by exposure

Inhaling cement dust may aggravate existing respiratory system disease(s) and/or medical conditions such as emphysema or asthma and/or existing skin and/or eye conditions.

12. ECOLOGICAL INFORMATION

12.1 Ecotoxicity

The product is not expected to be hazardous to the environment (LC50 aquatic toxicity not determined). The addition of large amounts of cement to water may, however, cause a rise in pH and may therefore be toxic to aquatic life under certain circumstances.

12.2 Mobility

Dry cement is not volatile but might become airborne during handling operations.

12.3 Persistence and degradability/Bio accumulative potential/Results of PBT assessment/Other adverse effects

Not relevant as cement is an inorganic material. After hardening, cement presents no toxicity risks.

13. DISPOSAL CONSIDERATIONS

13.1 Product - cement that has exceeded its shelf life

When demonstrated that it contains more than 0.0002% soluble Cr (VI): shall not be used/sold other than for use in controlled closed and totally automated processes or should be recycled or disposed of according to local legislation or treated again with a reducing agent.

13.2 Product - unused residue or dry spillage

Pick up dry. Mark the containers. Possibly reuse depending upon shelf life considerations and the requirement to avoid dust exposure. In case of disposal, harden with water and dispose according to 13.4.

13.3 Product – slurries

Allow to harden, avoid entry in sewage and drainage systems or into bodies of water (eg, streams) and dispose of as indicated in 13.4.

13.4 Product - after addition of water, hardened

Dispose of according to the local legislation. Avoid entry into the sewage water system. Dispose of the hardened product as concrete waste. Due to the inertisation, concrete waste is not a dangerous waste.

EWC entries: 10 13 14 (waste from manufacturing of cement – waste concrete or concrete sludge) or 17 01 01 (construction and demolition wastes - concrete).

13.5 Packaging

Completely empty the packaging and process it according to local legislation.

EWC entry: 15 01 01 (waste paper and cardboard packaging).

EWC entry: 15 01 02 (plastic packaging).

14. TRANSPORT INFORMATION

Cement is not covered by the international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID) and therefore no classification is required.

No special precautions are needed apart from those mentioned under Heading 8.

15. REGULATORY INFORMATION**15.1 Classification and labelling of cement according to 1999/45/EC****Risk phrases**

R37/38 Irritating to respiratory system and skin

R41 Risk of serious damage to eyes

R43 May cause sensitisation by skin contact

Safety phrases

S2 Keep out of reach of children

S22 Do not breathe dust

S24/25 Avoid contact with skin and eyes

S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice

S36/37/39 Wear suitable protective clothing, gloves and eye/face protection

S46 If swallowed, seek medical advice immediately and show this container or label

**15.2 The marketing and use of cement is subject to a restriction on the content of soluble Cr (VI)**

From 17 January 2005, those cements which naturally contain more than 2 ppm of soluble hexavalent chromium (chromium (VI)) by dry weight of cement, shall be treated with a chemical reducing agent (such as ferrous sulfate) that maintains the level of hexavalent chromium in the cement to below 2 ppm by dry weight of cement. The effectiveness of the reducing agent reduces with time, therefore cement bags and/or delivery documents will contain information on the period of time ('shelf life') for which the manufacturer has established that the reducing agent will continue to limit the level of hexavalent chromium to less than 2 ppm by dry weight of cement. They will also indicate the appropriate storage conditions for maintaining the effectiveness of the reducing agent.

15.3 National legislation/requirements

CONIAC Health Hazard Information Sheet No. 26 (CEMENT)

Health and Safety at Work etc Act 1974

Control of Substances Hazardous to Health (Regulations)

PORTLAND CEMENT DUST – criteria document for an occupational exposure limit. June 1994 (ISBN 07176 – 0763 – 1)

HSE Guidance Notes EH26 (Occupational Skin Diseases – Health and Safety Precautions)

HSE Guidance Note EH40 (Workplace Exposure Limits)

Any authorised manual on First Aid by St. John's/St. Andrew's/Red Cross

Manual Handling Operations Regulations

Environmental Protection Act

16. OTHER INFORMATION**Abbreviations**

- IMDG: International Maritime Dangerous Goods
- IATA: International Air Transport Association
- ADR/RID: Agreement on the transport of dangerous goods by road/Regulations on the international transport of dangerous goods by rail
- LC50 Lethal Concentration where 50% of the test animals dies.
- OEL : Occupational Exposure Limit
- TWA: Time Weighted Averages

References

- (1) Portland Cement Dust - Hazard assessment document EH75/7, UK Health and Safety Executive, 2006. Available from: <http://www.hse.gov.uk/pubns/web/portlandcement.pdf>
- (2) Observations on the effects of skin irritation caused by cement, Kietzman et al, Dermatosen, 47, 5, 184-189 (1999).
- (3) European Commission's Scientific Committee on Toxicology, Ecotoxicology and the Environment (SCTEE) opinion of the risks to health from Cr (VI) in cement (European Commission, 2002).
- (4) Epidemiological assessment of the occurrence of allergic dermatitis in workers in the construction industry related to the content of Cr (VI) in cement, NIOH, Page 11, 2003.

The information on this data sheet reflects the currently available knowledge and is reliable provided that the product is used under the prescribed conditions and in accordance with the application specified on the packaging and/or in the technical guidance literature. Any other use of the product, including the use of the product in combination with any other product or any other process, is the responsibility of the user. It is implicit that the user is responsible for determining appropriate safety measures and for applying the legislation covering his own activities.

The information in this data sheet is accurate at the time of printing, but Lafarge Tarmac Cement reserves the right to amend details as part of its product development programme.

DISCLAIMER:

This material safety data sheet (MSDS) is based on the legal provisions of the REACH Regulation (EC 1907/2006; article 31 and Annex II), as amended. Its contents are intended as a guide to the appropriate precautionary handling of the material. It is the responsibility of recipients of this MSDS to ensure that the information contained therein is properly read and understood by all people who may use, handle, dispose or in any way come in contact with the product. Information and instructions provided in this MSDS are based on the current state of scientific and technical knowledge at the date of issue indicated.

It should not be construed as any guarantee of technical performance, suitability for particular applications, and does not establish a legally valid contractual relationship. This version of the MSDS supersedes all previous versions.

For further information

Technical helpdesk

Tel: 0845 812 6232

E-mail: info-cement@lafargetarmac.com

Customer services & sales

Tel: 0845 812 6300

E-mail: customerservice@lafargetarmac.com



It's what Britain's built on.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form	: Substance
Substance name	: Mercuric Chloride
CAS No	: 7487-94-7
Product code	: LC16590
Formula	: HgCl ₂
Synonyms	: bichloride of mercury / dichloromercury / mercury bichloride / mercury perchloride / mercury (II) chloride
BIG no	: 10398

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	: Veterinary medicine Laboratory chemical Photographic chemical Chemical intermediate Disinfectant
------------------------------	--

1.3. Details of the supplier of the safety data sheet

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US classification

Acute Tox. 2 (Oral)	H300
Skin Corr. 1B	H314
Muta. 2	H341
Repr. 2	H361
STOT RE 1	H372
Aquatic Acute 1	H400
Aquatic Chronic 1	H410

2.2. Label elements

GHS-US labelling

Hazard pictograms (GHS-US) :



Signal word (GHS-US) :

Danger

Hazard statements (GHS-US) :

H300 - Fatal if swallowed
H314 - Causes severe skin burns and eye damage
H341 - Suspected of causing genetic defects
H361 - Suspected of damaging fertility or the unborn child
H372 - Causes damage to organs (central nervous system, kidneys) through prolonged or repeated exposure
H410 - Very toxic to aquatic life with long lasting effects

Precautionary statements (GHS-US) :

P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust
P264 - Wash exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P280 - Wear protective gloves, protective clothing, eye protection, face protection
P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing

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P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P308+P313 - IF exposed or concerned: Get medical advice/attention
P310 - Immediately call a POISON CENTER/doctor/...
P363 - Wash contaminated clothing before reuse
P391 - Collect spillage
P405 - Store locked up
P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS-US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substances

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Mercuric Chloride (Main constituent)	(CAS No) 7487-94-7	100	Acute Tox. 2 (Oral), H300 Skin Corr. 1B, H314 Muta. 2, H341 Repr. 2, H361 STOT RE 1, H372 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

First-aid measures after inhalation : Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

First-aid measures after skin contact : Wash immediately with lots of water (15 minutes)/shower. Remove clothing before washing. Do not apply (chemical) neutralizing agents. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

First-aid measures after eye contact : Rinse immediately with plenty of water for 15 minutes. Do not apply neutralizing agents. Take victim to an ophthalmologist.

First-aid measures after ingestion : Rinse mouth with water. Give nothing to drink. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Ingestion of large quantities: immediately to hospital. Take the container/vomit to the doctor/hospital.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Respiratory difficulties. Corrosion of the upper respiratory tract.

Symptoms/injuries after skin contact : Caustic burns/corrosion of the skin.

Symptoms/injuries after eye contact : Corrosion of the eye tissue.

Symptoms/injuries after ingestion : Nausea. Vomiting. Abdominal pain. Diarrhoea. Bleeding of the gastrointestinal tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Decreased renal function. Change in urine output. Change in urine composition.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Gastrointestinal complaints. Skin rash/inflammation. Brain affection. Affection of the renal tissue. Tremor. Affection/discolouration of the teeth. Inflammation/damage of the eye tissue.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : EXTINGUISHING MEDIA FOR SURROUNDING FIRES: All extinguishing media allowed.

Unsuitable extinguishing media : No unsuitable extinguishing media known.

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5.2. Special hazards arising from the substance or mixture

- Fire hazard : DIRECT FIRE HAZARD. Non combustible.
- Explosion hazard : DIRECT EXPLOSION HAZARD. No data available on direct explosion hazard. INDIRECT EXPLOSION HAZARD. No data available on indirect explosion hazard.
- Reactivity : On heating: release of toxic and corrosive gases/vapours (chlorine, hydrogen chloride, mercury vapours). Decomposes slowly on exposure to light. Reacts with (some) bases. Reacts with (some) metals.

5.3. Advice for firefighters

- Precautionary measures fire : Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to fire/heat: have neighbourhood close doors and windows.
- Firefighting instructions : Cool tanks/drums with water spray/remove them into safety. Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
- Protection during firefighting : Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

- Protective equipment : Gloves. Face-shield. Corrosion-proof suit. Dust cloud production: compressed air/oxygen apparatus.
- Emergency procedures : Mark the danger area. Prevent dust cloud formation. No naked flames. Wash contaminated clothes.
- Measures in case of dust release : In case of dust production: keep upwind. In case of dust production: consider evacuation. Dust production: have neighbourhood close doors and windows.

6.1.2. For emergency responders

- Protective equipment : Equip cleanup crew with proper protection. Do not breathe dust.
- Emergency procedures : Stop release. Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

- For containment : Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the solid spill. Knock down/dilute dust cloud with water spray. Take account of toxic/corrosive precipitation water.
- Methods for cleaning up : Prevent dispersion by covering with dry sand. Scoop solid spill into closing containers. See "Material-handling" for suitable container materials. Carefully collect the spill/leftovers. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Additional hazards when processed : Pulverization rapidly increases toxic concentration.
- Precautions for safe handling : Must not be used without prior permission. Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Avoid raising dust. Keep away from naked flames/heat. Observe very strict hygiene - avoid contact. Keep container tightly closed. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection.
- Hygiene measures : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

- Incompatible products : Strong bases. Strong oxidizers. metals. phosphates. Sulfites.
- Incompatible materials : Direct sunlight. Air and moisture sensitive.
- Heat and ignition sources : KEEP SUBSTANCE AWAY FROM: heat sources.
- Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: oxidizing agents. (strong) acids. (strong) bases. cellulosic materials. metals.
- Storage area : Store in a cool area. Keep out of direct sunlight. Store in a dry area. Store in a dark area. Keep container in a well-ventilated place. Keep locked up. Unauthorized persons are not admitted. Meet the legal requirements.
- Special rules on packaging : SPECIAL REQUIREMENTS: closing. dry. clean. opaque. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

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Packaging materials : SUITABLE MATERIAL: steel. stainless steel. synthetic material. glass. stoneware/porcelain.
MATERIAL TO AVOID: aluminium. lead. iron. copper.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Mercuric Chloride (7487-94-7)		
USA ACGIH	ACGIH TWA (mg/m ³)	0.025 mg/m ³
USA OSHA	OSHA PEL (TWA) (mg/m ³)	0.1 mg/m ³

8.2. Exposure controls

Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

Personal protective equipment : Protective clothing. Protective goggles. Gloves. Dust/aerosol mask with filter type P3.



Materials for protective clothing : GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: No data available. GIVE LESS RESISTANCE: No data available. GIVE POOR RESISTANCE: No data available.

Hand protection : Gloves.

Eye protection : Face shield. In case of dust production: protective goggles.

Skin and body protection : Corrosion-proof clothing. In case of dust production: head/neck protection.

Respiratory protection : Dust production: dust mask with filter type P3. On heating: gas mask with filter type Hg. High dust production: self-contained breathing apparatus.

Environmental exposure controls : Avoid release to the environment.

Consumer exposure controls : Avoid contact during pregnancy/while nursing.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid

Appearance : Crystalline solid. Crystalline powder. Grains.

Molecular mass : 271.49 g/mol

Colour : White or colourless.

Odour : Odourless.

Odour threshold : No data available

pH : 3.2 (5.0 %)

pH solution : 5.0 %

Relative evaporation rate (butylacetate=1) : No data available

Melting point : 277 °C

Freezing point : No data available

Boiling point : 302 °C

Flash point : Not applicable

Self ignition temperature : No data available

Decomposition temperature : No data available

Flammability (solid, gas) : No data available

Vapour pressure : 0.00010 hPa

Vapour pressure at 50 °C : 0.0025 hPa

Relative vapour density at 20 °C : 9.8

Relative density : 5.4

Density : 5440 kg/m³

Solubility : Moderately soluble in water. Substance sinks in water. Soluble in ethanol. Soluble in acetone. Soluble in dimethyl sulfoxide. Soluble in methanol. Soluble in hydrogenchloride. Soluble in glycerol. Soluble in acetic acid. Soluble in pyridine. Soluble in ethylacetate.
Water: 6.9 g/100ml
Ethanol: 33 g/100ml
Ether: 4 g/100ml

Log Pow : 0.1 - 0.22 (Calculated)

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Log Kow	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available
Explosive properties	: Not applicable.
Oxidising properties	: No data available
Explosive limits	: No data available

9.2. Other information

Saturation concentration	: 0.0011 g/m ³
VOC content	: Not applicable
Other properties	: Substance has acid reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

On heating: release of toxic and corrosive gases/vapours (chlorine, hydrogen chloride, mercury vapours). Decomposes slowly on exposure to light. Reacts with (some) bases. Reacts with (some) metals.

10.2. Chemical stability

Unstable on exposure to light.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Avoid dust formation. Direct sunlight. Moisture.

10.5. Incompatible materials

Strong oxidizers. Strong bases. Sulfites. metals.

10.6. Hazardous decomposition products

mercury. Chlorine.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Fatal if swallowed.

Mercuric Chloride (lf)7487-94-7	
LD50 oral rat	1 mg/kg (Rat)
LD50 dermal rat	41 mg/kg (Rat)

Skin corrosion/irritation : Causes severe skin burns and eye damage.
pH: 3.2 (5.0 %)

Serious eye damage/irritation : Not classified
pH: 3.2 (5.0 %)

Respiratory or skin sensitisation : Not classified

Germ cell mutagenicity : Suspected of causing genetic defects.

Carcinogenicity : Not classified

Mercuric Chloride (7487-94-7)	
IARC group	2B

Reproductive toxicity : Suspected of damaging fertility or the unborn child.

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Causes damage to organs (central nervous system, kidneys) through prolonged or repeated exposure.

Aspiration hazard : Not classified

Symptoms/injuries after inhalation : Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Respiratory difficulties. Corrosion of the upper respiratory tract.

Symptoms/injuries after skin contact : Caustic burns/corrosion of the skin.

Symptoms/injuries after eye contact : Corrosion of the eye tissue.

Symptoms/injuries after ingestion : Nausea. Vomiting. Abdominal pain. Diarrhoea. Bleeding of the gastrointestinal tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Decreased renal function. Change in urine output. Change in urine composition.

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Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Gastrointestinal complaints. Skin rash/inflammation. Brain affection. Affection of the renal tissue. Tremor. Affection/discolouration of the teeth. Inflammation/damage of the eye tissue.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Dangerous for the environment.
Ecology - air : TA-Luft Klasse 5.2.2/l.
Ecology - water : Severe water pollutant (surface water). Ground water pollutant. Maximum concentration in drinking water: 0.0010 mg/l (mercury) (Directive 98/83/EC); 250 mg/l (chloride) (Directive 98/83/EC). Highly toxic to fishes. Very toxic to invertebrates (Daphnia). Inhibits photosynthesis of algae. Highly toxic to bacteria. pH shift.

Mercuric Chloride (7487-94-7)	
LC50 fishes 1	0.03 mg/l (96 h; Poecilia reticulata)
EC50 Daphnia 1	0.0081 mg/l (24 h; Daphnia magna)
LC50 fish 2	0.04 mg/l (96 h; Cyprinus carpio)
EC50 Daphnia 2	0.0052 mg/l (48 h; Daphnia magna)
TLM fish 1	0.82 mg/l (168 h; Carassius auratus)
Threshold limit other aquatic organisms 1	0.01 mg/l (Pseudomonas putida)
Threshold limit algae 1	0.08 mg/l (Selenastrum capricornutum)
Threshold limit algae 2	0.07 mg/l (Scenedesmus quadricauda)

12.2. Persistence and degradability

Mercuric Chloride (7487-94-7)	
Persistence and degradability	Biodegradability: not applicable.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable

12.3. Bioaccumulative potential

Mercuric Chloride (7487-94-7)	
BCF fish 1	10000 (Pisces)
BCF fish 2	500 - 4620 (Cyprinus carpio; TEST DURATION: 10 WEEKS)
BCF other aquatic organisms 1	10000 (Ostreidae)
Log Pow	0.1 - 0.22 (Calculated)

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Remove waste in accordance with local and/or national regulations. Recycle/reuse. Remove for physico-chemical/biological treatment. Remove to an authorized dump (Class I). Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001).
Additional information : LWCA (the Netherlands): KGA category 05. Hazardous waste according to Directive 2008/98/EC.
Ecology - waste materials : Avoid release to the environment. Hazardous waste due to toxicity.

SECTION 14: Transport information

In accordance with DOT

14.1. UN number

UN-No.(DOT) : 1624
DOT NA no. : UN1624

14.2. UN proper shipping name

DOT Proper Shipping Name : Mercuric chloride
Department of Transportation (DOT) Hazard Classes : 6.1 - Class 6.1 - Poisonous materials 49 CFR 173.132

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Hazard labels (DOT) : 6.1 - Toxic substances



Packing group (DOT) : II - Medium Danger

DOT Special Provisions (49 CFR 172.102)

: IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).
IP2 - When IBCs other than metal or rigid plastics IBCs are used, they must be offered for transportation in a closed freight container or a closed transport vehicle.
IP4 - Flexible, fiberboard or wooden IBCs must be sift-proof and water-resistant or be fitted with a sift-proof and water-resistant liner.
T3 - 2.65 178.274(d)(2) Normal..... 178.275(d)(2)
TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 153

DOT Packaging Non Bulk (49 CFR 173.xxx) : 212

DOT Packaging Bulk (49 CFR 173.xxx) : 242

Marine pollutant : P



14.3. Additional information

Other information : No supplementary information available.

State during transport (ADR-RID) : as solid.

Overland transport

Packing group (ADR) : II

Class (ADR) : 6.1 - Toxic substances

Hazard identification number (Kemler No.) : 60

Classification code (ADR) : T5

Danger labels (ADR) : 6.1 - Toxic substances



Orange plates



Tunnel restriction code : D/E

Transport by sea

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.

EmS-No. (1) : F-A

EmS-No. (2) : S-A

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Air transport

DOT Quantity Limitations Passenger aircraft/rail : 25 kg
(49 CFR 173.27)

DOT Quantity Limitations Cargo aircraft only (49 : 100 kg
CFR 175.75)

SECTION 15: Regulatory information

15.1. US Federal regulations

Mercuric Chloride (7487-94-7)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 302 (Specific toxic chemical listings) Listed on SARA Section 313 (Specific toxic chemical listings)	
RQ (Reportable quantity, section 304 of EPA's List of Lists) :	500 lb
SARA Section 302 Threshold Planning Quantity (TPQ)	500 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Delayed (chronic) health hazard

15.2. International regulations

CANADA

Mercuric Chloride (7487-94-7)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
WHMIS Classification	Class D Division 1 Subdivision A - Very toxic material causing immediate and serious toxic effects Class D Division 2 Subdivision A - Very toxic material causing other toxic effects Class E - Corrosive Material

EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Muta. 2 H341
Repr. 2 H361f
Acute Tox. 2 (Oral) H300
STOT RE 1 H372
STOT RE 1 H372
Skin Corr. 1B H314
Aquatic Acute 1 H400
Aquatic Chronic 1 H410

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC or 1999/45/EC

Muta.Cat.3; R68
Repr.Cat.3; R62
T+; R28
T; R48/24/25
C; R34
N; R50/53

Full text of R-phrases: see section 16

15.2.2. National regulations

Mercuric Chloride (7487-94-7)	
Listed on the Canadian Ingredient Disclosure List	

15.3. US State regulations

Mercuric Chloride(7487-94-7)	
U.S. - California - Proposition 65 - Developmental Toxicity	Yes

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SECTION 16: Other information

Full text of H-phrases: see section 16:

Acute Tox. 2 (Oral)	Acute toxicity (oral), Category 2
Aquatic Acute 1	Hazardous to the aquatic environment — Acute Hazard, Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment — Chronic Hazard, Category 1
Muta. 2	Germ cell mutagenicity, Category 2
Repr. 2	Reproductive toxicity, Category 2
Skin Corr. 1B	Skin corrosion/irritation, Category 1B
STOT RE 1	Specific target organ toxicity — Repeated exposure, Category 1
H300	Fatal if swallowed
H314	Causes severe skin burns and eye damage
H341	Suspected of causing genetic defects
H361	Suspected of damaging fertility or the unborn child
H372	Causes damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects

NFPA health hazard

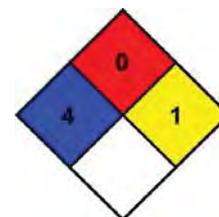
: 4 - Very short exposure could cause death or serious residual injury even though prompt medical attention was given.

NFPA fire hazard

: 0 - Materials that will not burn.

NFPA reactivity

: 1 - Normally stable, but can become unstable at elevated temperatures and pressures or may react with water with some release of energy, but not violently.



HMIS III Rating

Health

: 4 Severe Hazard - Life-threatening, major or permanent damage may result from single or repeated overexposures

Flammability

: 0 Minimal Hazard

Physical

: 1 Slight Hazard

Personal Protection

: F

SDS US (GHS HazCom 2012)

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Mixture
Product name : Nitric Acid, 6.0N (6.0M)
Product code : LC17870

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : For laboratory and manufacturing use only.

1.3. Details of the supplier of the safety data sheet

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US classification

Met. Corr. 1 H290
Skin Corr. 1B H314
Eye Dam. 1 H318

2.2. Label elements

GHS-US labelling

Hazard pictograms (GHS-US) :



GHS05

Signal word (GHS-US) :

Danger

Hazard statements (GHS-US) :

H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage

Precautionary statements (GHS-US) :

P234 - Keep only in original container
P260 - Do not breathe mist, vapours, spray
P264 - Wash exposed skin thoroughly after handling
P280 - Wear protective gloves, protective clothing, eye protection, face protection
P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - IF INHALED: remove victim to fresh air and keep at rest in a position comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P363 - Wash contaminated clothing before reuse
P390 - Absorb spillage to prevent material damage
P405 - Store locked up
P406 - Store in corrosive resistant container with a resistant inner liner
P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS-US)

No data available

Nitric Acid, 6.0N (6.0M)

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SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

Full text of H-phrases: see section 16

3.2. Mixture

Name	Product identifier	%	GHS-US classification
Water	(CAS No) 7732-18-5	68	Not classified
Nitric Acid, 70% w/w	(CAS No) 7697-37-2	32	Ox. Liq. 3, H272 Met. Corr. 1, H290 Skin Corr. 1A, H314 Eye Dam. 1, H318

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general	: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).
First-aid measures after inhalation	: Remove to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.
First-aid measures after skin contact	: Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a POISON CENTER or doctor/physician.
First-aid measures after eye contact	: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.
First-aid measures after ingestion	: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor/physician.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries	: Causes severe skin burns and eye damage.
Symptoms/injuries after eye contact	: Causes serious eye damage.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	: Foam. Dry powder. Carbon dioxide. Water spray. Sand.
Unsuitable extinguishing media	: Do not use a heavy water stream.

5.2. Special hazards arising from the substance or mixture

Reactivity	: Thermal decomposition generates : Corrosive vapours.
------------	--

5.3. Advice for firefighters

Firefighting instructions	: Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Avoid (reject) fire-fighting water to enter environment.
Protection during firefighting	: Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	: Protective goggles. Protective clothing. Gloves. Combined gas/dust mask with filter type B/P3.
Emergency procedures	: Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment	: Equip cleanup crew with proper protection.
Emergency procedures	: Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up	: Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials. Absorb spillage to prevent material damage.
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Nitric Acid, 6.0N (6.0M)

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6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Additional hazards when processed : May be corrosive to metals.
- Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapour. Do not breathe mist, vapours, spray.
- Hygiene measures : Wash exposed skin thoroughly after handling. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Comply with applicable regulations.
- Storage conditions : Keep only in the original container in a cool, well ventilated place away from : incompatible materials. Keep container closed when not in use.
- Incompatible products : Strong bases. Halogens. metals. aluminium. Strong reducing agents.
- Incompatible products : Sources of ignition. Direct sunlight.
- Packaging materials : Store in corrosive resistant/... container with a resistant inner liner.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Nitric Acid, 70% w/w (7697-37-2)		
USA ACGIH	ACGIH TWA (ppm)	2 ppm
USA ACGIH	ACGIH STEL (ppm)	2 ppm
USA OSHA	OSHA PEL (TWA) (mg/m ³)	5 mg/m ³
USA OSHA	OSHA PEL (TWA) (ppm)	2 ppm

8.2. Exposure controls

- Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.
- Personal protective equipment : Avoid all unnecessary exposure. Combined gas/dust mask with filter type B/P3. Gloves. Protective clothing. Protective goggles.



- Hand protection : Wear protective gloves.
- Eye protection : Chemical goggles or face shield.
- Skin and body protection : Wear suitable protective clothing.
- Respiratory protection : Wear appropriate mask.
- Other information : Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- Physical state : Liquid
- Appearance : Colorless to pale yellow liquid.
- Colour : Colourless to light yellow.
- Odour : characteristic. Pungent.
- Odour threshold : No data available
- pH : No data available
- Relative evaporation rate (butylacetate=1) : No data available
- Melting point : No data available
- Freezing point : No data available

Nitric Acid, 6.0N (6.0M)

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Boiling point	: No data available
Flash point	: No data available
Self ignition temperature	: No data available
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapour pressure	: No data available
Relative vapour density at 20 °C	: No data available
Relative density	: No data available
Density	: 1.2 g/ml
Solubility	: Soluble in water.
Log Pow	: No data available
Log Kow	: No data available
Viscosity, kinematic	: 1.13 cSt
Viscosity, dynamic	: No data available
Explosive properties	: No data available
Oxidising properties	: No data available
Explosive limits	: No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Thermal decomposition generates : Corrosive vapours.

10.2. Chemical stability

Not established.

10.3. Possibility of hazardous reactions

Not established.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

Strong reducing agents. Strong bases. metals. aluminium. Ammonia. combustible materials. Halogens.

10.6. Hazardous decomposition products

Nitrogen oxides. Thermal decomposition generates : Corrosive vapours.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Water (7732-18-5)

LD50 oral rat	≥ 90000 mg/kg
---------------	---------------

Skin corrosion/irritation : Causes severe skin burns and eye damage.

Serious eye damage/irritation : Causes serious eye damage.

Respiratory or skin sensitisation : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

Nitric Acid, 6.0N (6.0M)

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Potential Adverse human health effects and symptoms : Based on available data, the classification criteria are not met.
Symptoms/injuries after eye contact : Causes serious eye damage.

SECTION 12: Ecological information

12.1. Toxicity

Nitric Acid, 70% w/w (7697-37-2)	
LC50 fishes 1	25 - 36 mg/l (96 h; Lepomis macrochirus; Pure substance)
EC50 Daphnia 1	180 mg/l (48 h; Daphnia magna; Pure substance)
LC50 fish 2	72 ppm (Gambusia affinis; Pure substance)
Threshold limit algae 1	> 19 mg/l (Algae; Pure substance)

12.2. Persistence and degradability

Nitric Acid, 6.0N (6.0M)	
Persistence and degradability	Not established.

Nitric Acid, 70% w/w (7697-37-2)	
Persistence and degradability	Biodegradability: not applicable. No (test)data on mobility of the components of the mixture available.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable

12.3. Bioaccumulative potential

Nitric Acid, 6.0N (6.0M)	
Bioaccumulative potential	Not established.

Nitric Acid, 70% w/w (7697-37-2)	
BCF fish 1	<= 1 (Pisces)
Log Pow	-2.3 (OECD 107: Partition Coefficient (n-octanol/water): Shake Flask Method)
Bioaccumulative potential	Bioaccumulation: not applicable.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Dispose of contents/container to comply with local, state and federal regulations.
Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN2031 Nitric acid (other than red fuming, with more than 20% and less than 65 percent nitric acid), 8, II
UN-No.(DOT) : 2031
DOT NA no. : UN2031
DOT Proper Shipping Name : Nitric acid
other than red fuming, with more than 20% and less than 65 percent nitric acid
Department of Transportation (DOT) Hazard Classes : 8 - Class 8 - Corrosive material 49 CFR 173.136

Nitric Acid, 6.0N (6.0M)

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Hazard labels (DOT) : 8 - Corrosive substances



Packing group (DOT) : II - Medium Danger

DOT Special Provisions (49 CFR 172.102) : A6 - For combination packagings, if plastic inner packagings are used, they must be packed in tightly closed metal receptacles before packing in outer packagings.
B2 - MC 300, MC 301, MC 302, MC 303, MC 305, and MC 306 and DOT 406 cargo tanks are not authorized.
B47 - Each tank may have a reclosing pressure relief device having a start-to-discharge pressure setting of 310 kPa (45 psig).
B53 - Packagings must be made of either aluminum or steel.
IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized.
IP15 - For UN2031 with more than 55% nitric acid, rigid plastic IBCs and composite IBCs with a rigid plastic inner receptacle are authorized for two years from the date of IBC manufacture.
T8 - 4 178.274(d)(2) Normal..... Prohibited
TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = $95 / (1 + a (tr - tf))$ Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: $a = (d15 - d50) / 35 * d50$ Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively.

DOT Packaging Exceptions (49 CFR 173.xxx) : None

DOT Packaging Non Bulk (49 CFR 173.xxx) : 158

DOT Packaging Bulk (49 CFR 173.xxx) : 242

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : Forbidden

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 30 L

DOT Vessel Stowage Location : D - The material must be stowed "on deck only" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers or one passenger per each 3 m of overall vessel length, but the material is prohibited on passenger vessels in which the limiting number of passengers is exceeded.

DOT Vessel Stowage Other : 44 - Stow "away from" oxidizers,66 - Stow "separated from" flammable solids,74 - Stow "separated from" oxidizers,89 - Segregation same as for oxidizers,90 - Stow "separated from" radioactive materials

Additional information

Other information : No supplementary information available.

ADR

Transport document description :

Transport by sea

No additional information available

Air transport

No additional information available

SECTION 15: Regulatory information

15.1. US Federal regulations

Nitric Acid, 6.0N (6.0M)

SARA Section 311/312 Hazard Classes : Immediate (acute) health hazard

Nitric Acid, 70% w/w (7697-37-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory
Listed on SARA Section 313 (Specific toxic chemical listings)

Nitric Acid, 6.0N (6.0M)

Safety Data Sheet

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Nitric Acid, 70% w/w (7697-37-2)

RQ (Reportable quantity, section 304 of EPA's List of Lists) :	1000 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard

15.2. International regulations

CANADA

Nitric Acid, 6.0N (6.0M)

WHMIS Classification	Class E - Corrosive Material
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Nitric Acid, 70% w/w (7697-37-2)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification	Class E - Corrosive Material Class C - Oxidizing Material
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EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Classification according to Directive 67/548/EEC or 1999/45/EC

Not classified

15.2.2. National regulations

Nitric Acid, 70% w/w (7697-37-2)

Listed on the Canadian Ingredient Disclosure List

15.3. US State regulations

No additional information available

SECTION 16: Other information

Other information : None.

Full text of H-phrases: see section 16:

Eye Dam. 1	Serious eye damage/eye irritation, Category 1
Met. Corr. 1	Corrosive to metals, Category 1
Ox. Liq. 3	Oxidising Liquids, Category 3
Skin Corr. 1A	Skin corrosion/irritation, Category 1A
Skin Corr. 1B	Skin corrosion/irritation, Category 1B
H272	May intensify fire; oxidiser
H290	May be corrosive to metals
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage

NFPA health hazard

: 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard

: 0 - Materials that will not burn.

NFPA reactivity

: 1 - Normally stable, but can become unstable at elevated temperatures and pressures or may react with water with some release of energy, but not violently.

NFPA specific hazard

: OX - This denotes an oxidizer, a chemical which can greatly increase the rate of combustion/fire.



Nitric Acid, 6.0N (6.0M)

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HMIS III Rating

Health	:	3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
Flammability	:	0 Minimal Hazard
Physical	:	1 Slight Hazard
Personal Protection	:	H

SDS US (GHS HazCom 2012)

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Mixture
 Product name. : Sodium Thiosulfate, 0.1N (0.1M)
 Product code : LC25060

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : For laboratory and manufacturing use only.

1.3. Details of the supplier of the safety data sheet

LabChem Inc
 Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
 16063 Zelenople, PA - USA
 T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US classification

Not classified

2.2. Label elements

GHS-US labelling

No labelling applicable

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable

Full text of H-phrases: see section 16

3.2. Mixture

Name	Product identifier	%	GHS-US classification
Water	(CAS No) 7732-18-5	97.5	Not classified
Sodium Thiosulfate, Pentahydrate	(CAS No) 10102-17-7	2.48	Not classified
Sodium Carbonate, Anhydrous	(CAS No) 497-19-8	0.02	Skin Irrit. 2, H315 Eye Irrit. 2A, H319

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).
 First-aid measures after inhalation : Assure fresh air breathing. Allow the victim to rest.
 First-aid measures after skin contact : Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse.
 First-aid measures after eye contact : Rinse immediately with plenty of water. Obtain medical attention if pain, blinking or redness persist.
 First-aid measures after ingestion : Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : Not expected to present a significant hazard under anticipated conditions of normal use.

4.3. Indication of any immediate medical attention and special treatment needed

None.

Sodium Thiosulfate, 0.1N (0.1M)

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according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.
Unsuitable extinguishing media : Do not use a heavy water stream.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Not flammable.
Explosion hazard : Not available.
Reactivity : None.

5.3. Advice for firefighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Avoid (reject) fire-fighting water to enter environment.
Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : None.

6.1.1. For non-emergency personnel

Protective equipment : Safety glasses.
Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Equip cleanup crew with proper protection.
Emergency procedures : Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : Dam up the liquid spill.
Methods for cleaning up : Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapour.
Hygiene measures : Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Keep container closed when not in use.
Incompatible products : Strong oxidizers. Strong acids.
Incompatible materials : Direct sunlight.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.2. Exposure controls

Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Personal protective equipment : Avoid all unnecessary exposure.
Hand protection : Wear protective gloves.
Eye protection : Chemical goggles or safety glasses.
Respiratory protection : Wear appropriate mask.
Other information : Do not eat, drink or smoke during use.

Sodium Thiosulfate, 0.1N (0.1M)

Safety Data Sheet

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SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Liquid
Appearance	: Clear, colorless liquid.
Colour	: Colourless.
Odour	: None.
Odour threshold	: No data available
pH	: No data available
Relative evaporation rate (butylacetate=1)	: No data available
Melting point	: No data available
Freezing point	: No data available
Boiling point	: No data available
Flash point	: No data available
Self ignition temperature	: No data available
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapour pressure	: No data available
Relative vapour density at 20 °C	: No data available
Relative density	: No data available
Solubility	: Miscible with water.
Log Pow	: No data available
Log Kow	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available
Explosive properties	: Not applicable.
Oxidising properties	: None.
Explosive limits	: No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

None.

10.2. Chemical stability

Not established.

10.3. Possibility of hazardous reactions

Not established.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

Strong oxidizers. Strong acids.

10.6. Hazardous decomposition products

Sulfur compounds. Carbon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Sodium Thiosulfate, Pentahydrate (10102-17-7)

LD50 oral rat	5000 mg/kg
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Water (7732-18-5)

LD50 oral rat	≥ 90000 mg/kg
---------------	---------------

Sodium Carbonate, Anhydrous (497-19-8)

LD50 oral rat	4090 mg/kg
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Skin corrosion/irritation : Not classified

Sodium Thiosulfate, 0.1N (0.1M)

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Serious eye damage/irritation	: Not classified
Respiratory or skin sensitisation	: Not classified
Germ cell mutagenicity	: Not classifiedBased on available data, the classification criteria are not met
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classifiedBased on available data, the classification criteria are not met
Specific target organ toxicity (single exposure)	: Not classified
Specific target organ toxicity (repeated exposure)	: Not classifiedBased on available data, the classification criteria are not met
Aspiration hazard	: Not classifiedBased on available data, the classification criteria are not met
Potential Adverse human health effects and symptoms	: Based on available data, the classification criteria are not met.

SECTION 12: Ecological information

12.1. Toxicity

Sodium Thiosulfate, Pentahydrate (10102-17-7)	
LC50 fishes 1	≥ 10000

Sodium Carbonate, Anhydrous (497-19-8)	
LC50 fishes 1	300 mg/l
EC50 Daphnia 1	265 mg/l
LC50 fish 2	740 mg/l

12.2. Persistence and degradability

Sodium Thiosulfate, 0.1N (0.1M)	
Persistence and degradability	Not established.

Sodium Thiosulfate, Pentahydrate (10102-17-7)	
Persistence and degradability	Not established.

Sodium Carbonate, Anhydrous (497-19-8)	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Sodium Thiosulfate, 0.1N (0.1M)	
Bioaccumulative potential	Not established.

Sodium Thiosulfate, Pentahydrate (10102-17-7)	
Log Pow	-4.35
Bioaccumulative potential	Not established.

Sodium Carbonate, Anhydrous (497-19-8)	
Bioaccumulative potential	Not established.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations.
Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

In accordance with ADR / RID / ADNR / IMDG / ICAO / IATA

14.1. UN number

Not applicable

14.2. UN proper shipping name

Not applicable

14.3. Additional information

Other information : No supplementary information available.

Sodium Thiosulfate, 0.1N (0.1M)

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Overland transport

No additional information available

Transport by sea

No additional information available

Air transport

No additional information available

SECTION 15: Regulatory information

15.1. US Federal regulations

Sodium Thiosulfate, Pentahydrate (10102-17-7)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Sodium Carbonate, Anhydrous (497-19-8)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. International regulations

CANADA

Sodium Thiosulfate, 0.1N (0.1M)

WHMIS Classification	Uncontrolled product according to WHMIS classification criteria
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Sodium Thiosulfate, Pentahydrate (10102-17-7)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification	Uncontrolled product according to WHMIS classification criteria
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Sodium Carbonate, Anhydrous (497-19-8)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification	Class D Division 2 Subdivision B - Toxic material causing other toxic effects
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EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Classification according to Directive 67/548/EEC or 1999/45/EC

Not classified

15.2.2. National regulations

Sodium Thiosulfate, Pentahydrate (10102-17-7)

Not listed on the Canadian Ingredient Disclosure List

Sodium Carbonate, Anhydrous (497-19-8)

Listed on the Canadian Ingredient Disclosure List

15.3. US State regulations

No additional information available

SECTION 16: Other information

Indication of changes : Revision - See : *

Other information : None.

Full text of H-phrases: see section 16:

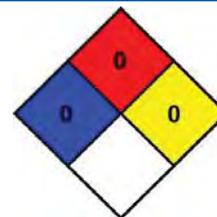
Eye Irrit. 2A	Serious eye damage/eye irritation, Category 2A
Skin Irrit. 2	Skin corrosion/irritation, Category 2
H315	Causes skin irritation
H319	Causes serious eye irritation

Sodium Thiosulfate, 0.1N (0.1M)

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

NFPA health hazard	: 0 - Exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials.
NFPA fire hazard	: 0 - Materials that will not burn.
NFPA reactivity	: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health	: 0 Minimal Hazard - No significant risk to health
Flammability	: 0 Minimal Hazard
Physical	: 0 Minimal Hazard
Personal Protection	: B

SDS US (GHS HazCom 2012)

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